

**The Lifestyle and Health of Saudi Women
with Special Reference to Type 2 Diabetes Mellitus**

by

Hana Al-Bannay

MA, Royal Roads University, 2008

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

(Rehabilitation Sciences)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

June 2013

© Hana Al-Bannay, 2013

ABSTRACT

Although the health of Saudi women has been severely compromised by lifestyle-related conditions like Type 2 Diabetes Mellitus (T2DM), this topic has been understudied particularly in relation to women's cultural and religious contexts. This thesis constitutes exploratory work with the aim of informing lifestyle-related health studies for women in Saudi Arabia. Its objectives included: Study One, to examine Saudi women's lifestyle-related health beliefs and behaviours and their understanding of religious teachings in relation to health behaviours and; Study Two, to explore the outcomes of a pilot intervention study of a T2DM education program, based on international standards and adapted to participants' cultural and religious contexts, and compare outcomes of this intervention with outcomes of usual care for diabetes in Saudi Arabia. The studies were conducted in Dammam, Saudi Arabia. In Study One, a cross-section of women (n=407) participated in interviews based on a survey questionnaire about lifestyle-related health beliefs and behaviours, and related religious teachings. In Study Two, women at risk of or diagnosed with T2DM (n=35 including drop-outs) were assigned to two groups; an Intervention Group participated in a T2DM education program, based on international standards and tailored to Saudi women's cultural and religious contexts, and a Usual Care Group received the usual care for diabetes in Saudi Arabia. Outcomes included blood glucose, body composition, six-minute walk test, life satisfaction, quality of life, and diabetes knowledge. At the end of the study, the Intervention Group participated in a focus group discussion of their program experience. For the analysis of our data, we used mixed methods; descriptive statistics (SPSSv.20) were used to analyze the quantitative data and Atlas.ti® software to code themes in the

qualitative data. Results from Study One showed that Saudi women commonly report lifestyle-related conditions that are associated with unhealthy behaviours in contrast to their positive beliefs about healthy lifestyle and their understanding of related Islamic teachings. Study Two showed that Saudi women may benefit from a T2DM education program, based on international standards and adapted to their cultural and religious contexts. These findings provide several avenues for future research related to the health of Saudi women.

PREFACE

Studies described in Chapters Three and Four on which this thesis is based were approved by the UBC Human Ethics Board (UBC BREB # H10-01825, H11-02361 for Study One and Study Two, respectively) and the Ministry of Health in Saudi Arabia. Specific chapters of this dissertation are in preparation for publication. Chapter Two has been published in Health Promotion Journal. The Description of the tailoring of the Harvard Special Health Reports on diabetes to the cultural and religious contexts of women in Saudi Arabia in Chapter Four was accepted as a book chapter. Chapters Three and Four are in preparation for publication. All chapters have multiple authors. The details of authorship contributions are listed below.

Chapter 2: Co-authors are Dr. Elizabeth Dean, Dr. Lyn Jongbloed, Dr. Tal Jarus, and Dr. Maya Yazigi. Dr. Dean was responsible for jointly writing the paper with me as well as reviewing and editing all chapters. Dr. Jongbloed, Dr. Jarus, and Dr. Yazigi contributed to designing, reviewing, and editing the chapter draft.

Chapter 3: Co-authors are Dr. Elizabeth Dean, Dr. Lyn Jongbloed, and Dr. Tal Jarus. Dr. Dean was responsible for jointly developing the study concept with me, as well as reviewing and editing all chapters. Dr. Jongbloed and Dr. Jarus contributed to the study design and data analysis as well as reviewing the chapter draft.

Chapter 4: Co-authors are Dr. Elizabeth Dean, Dr. Lyn Jongbloed, and Dr. Tal Jarus. Dr. Dean was responsible for jointly developing the study concept with me, as well as reviewing and editing all chapters. Dr. Jongbloed and Dr. Jarus contributed to the study design and data analysis as well as reviewing the chapter draft.

Chapter 4: Tailoring the Harvard Special Health Reports on Diabetes to the Cultural and Religious Contexts of Women in Saudi Arabia; co-authors are Dr. Elizabeth Dean, Dr. Lyn Jongbloed, Dr. Tal Jarus, and Dr. Zhenyi Li. Dr. Dean was responsible for jointly developing the study concept with me, as well as reviewing and editing all chapters. Dr. Jongbloed, and Dr. Jarus contributed to the study design and data analysis as well as reviewing the draft. Dr. Li contributed to the reviewing and editing the draft.

TABLE OF CONTENTS

ABSTRACT	ii
PREFACE.....	iv
TABLE OF CONTENTS.....	vi
LIST OF TABLES	x
LIST OF FIGURES	xiv
ACKNOWLEDGEMENTS	xv
DISCLAIMER.....	xvii
DEDICATION	xviii
1. INTRODUCTION, LITERATURE REVIEW, AND RATIONALE FOR THE THESIS	1
1.1. Introduction	1
1.2. Literature Review	1
1.2.1. Smoking	1
1.2.2. Hypertension	2
1.2.3. Obesity	3
1.2.4. Diabetes Mellitus.....	3
1.2.5. Women and Diabetes.....	4
1.2.6. Health Promotion and Diabetes Management in Saudi Arabia.....	5
1.2.7. The World Health Organization Recommendations for Diabetes Self- Management	7
1.2.8. Diabetes Management and Culture	7
1.2.9. Islamic Perspective on Health.....	8
1.2.10. The International Classification of Functioning, Disability and Health.	10
1.2.11. Health Behaviour Theories	11
1.2.12. Health Behaviour Definitions.....	12
1.2.13. The Social Ecological Model of Health Behaviour	12
1.2.14. Community and the Social Ecological Model of Health Behaviour	13
1.2.15. Health Promotion and Health Education.....	14
1.2.16. Saudi Arabia: Historical and Cultural Backgrounds	15
1.2.17. Women's Health in the Islamic Culture of Saudi Arabia	19
1.3. Rationale for the Thesis.....	20
1.3.1. Rationale	20
1.3.2. Goals and Objectives.....	21
1.4. Thesis Chapters	22

2. CULTURE AS A VARIABLE IN HEALTH RESEARCH: PERSPECTIVES AND CAVEATS	24
2.1. Summary	24
2.2. Introduction	25
2.2.1. Culture and Research Paradigms.....	27
2.2.2. Culture in Health Promotion Research.....	28
2.3. Culture as a Variable in the Research Processes	29
2.3.1. The Research Problem	31
2.3.2. Sampling.....	32
2.3.3. Surveys.....	35
2.3.4. Interviews.....	37
2.4. Conclusion	39
3. STUDY ONE: LIFESTYLE-RELATED HEALTH BELIEF AND BEHAVIOURS OF SAUDI WOMEN LIVING IN DAMMAM.....	40
3.1. Introduction	40
3.2. Research Objectives	41
3.2.1. Primary Objectives	41
3.2.2. Secondary Objectives	41
3.3. Methods	41
3.3.1. Sampling Frame.....	41
3.3.2. Sampling and Recruitment.....	42
3.3.3. Survey Questionnaire Construction	43
3.4. Data Analysis	45
3.4.1. Quantitative Data	45
3.4.2. Qualitative Data	45
3.5. Results	46
3.5.1. Response Rate	46
3.5.2. Demographic Data	46
3.5.3. Subject Characteristics	46
3.5.4. Health Status.....	47
3.5.5. Health Conditions	47
3.5.6. Physical Activity Behaviours	47
3.5.7. Nutrition Behaviours.....	47
3.5.8. Smoking, Stress, and Sleep Behaviours	48
3.5.9. Health Beliefs.....	48
3.5.10. Quotes Reported by Participants.....	48
3.6. Discussion of the Results in Relation to the Study Objectives.....	48
3.6.1. Participants' Health Profiles with Special Reference to Lifestyle-related Conditions.....	48
3.6.2. Participants' Lifestyle-related Health Behaviours	51
3.6.3. Participants' Lifestyle-related Health Beliefs	59

3.6.4.	Participants' Understanding of Islamic Teachings in Relation to Health Behaviours.....	60
3.6.5.	Participants' Responses from the Open-Ended Question Section	61
3.7.	Informing Study Two.....	61
3.8.	Strengths, Limitations and Future Implications	62
3.8.1.	Strengths	62
3.8.2.	Limitations.....	63
3.8.3.	Future Implications.....	63
3.9.	Conclusion	63
3.10.	Tables	65
4.	STUDY TWO: EVALUATION OF AN EDUCATION PROGRAM RELATED TO TYPE 2 DIABETES MELLITUS FOR SAUDI WOMEN: A PILOT INVESTIGATION	88
4.1.	Introduction	88
4.2.	Diabetes Prevention and Management	89
4.3.	Study Goals and Objectives	91
4.4.	Methodology	92
4.4.1.	Theoretical Background.....	92
4.4.2.	Trained Researcher.....	93
4.4.3.	Sampling and Recruitment.....	94
4.4.4.	Grouping Participants	95
4.4.5.	Measurements and Psychometrics	96
4.4.6.	Assessment and Re-evaluation.....	98
4.4.7.	Procedures.....	99
4.4.8.	Deliverables	107
4.4.9.	Data Analysis	107
4.5.	Results.....	108
4.5.1.	Participants' Discussion of their Health Behaviours after the Education Program	108
4.5.2.	Outcome Variables	112
4.6.	Discussion.....	115
4.6.1.	Objective One: Outcomes of a T2DM Education Program Adapted to the Cultural and Religious Contexts of Saudi Women.....	115
4.6.2.	Objective Two: Informing Future Studies Related to the Health Needs of Women in Saudi Arabia	125
4.7.	Strengths and Limitations	129
4.7.1.	Strengths	129
4.7.2.	Limitations.....	130
4.8.	Conclusion	130
4.9.	Tables and Graphs	132
	BIBLIOGRAPHY	168

APPENDICES	188
-------------------------	------------

LIST OF TABLES

Table 3.1 Participants' Reporting of their Ages, Heights and Weights.....	65
Table 3.2 Participants' Demographic Characteristics.....	66
Table 3.3 Self-reported Physical Health Measures and General Health.....	67
Table 3.4 Self-reported Morbidity	68
Table 3.5 Self-reported Other Morbidity	68
Table 3.6 Types of Physical Activity Participants Reported Performing	69
Table 3.7 Amount of Time Participants Reported Spending to Performing Physical Activities of Various Difficulties	70
Table 3.8 Average Weekly Consumption of Rice, Pasta, Bread and Cereals Reported by Participants	70
Table 3.9 Times per Week Participants Reported Consuming Rice, Pasta, Bread and Cereals	70
Table 3.10 Types of Bread Participants Reported Consuming.....	71
Table 3.11 Types of Soft Drinks Participants Reported Consuming.....	71
Table 3.12 Cans per Week of Soft Drinks Participants Reported Consuming	72
Table 3.13 Types of Oil Participants Reported Consuming	73
Table 3.14 Participants Reporting of Being on a Diet and Consuming of Sugar Substitutes	73
Table 3.15 Average Consumption of Fruits, Vegetables and Dates Reported by Participants	74
Table 3.16 Times per Week Participants Reported Consuming Fruits, Vegetables and Dates	75
Table 3.17 Number of Daily Servings Participants Reported Consuming Fruits and Vegetables	75
Table 3.18 Average Weekly Consumption of Meat, Poultry and Seafood Reported by Participants	76

Table 3.19 Times per Week Participants Reported Consuming Meat, Poultry and Seafood	76
Table 3.20 Average Weekly Consumption of Eggs, Nuts and Legumes Reported by Participants	76
Table 3.21 Times per Week Participants Reported Consuming Eggs, Nuts and Legumes	77
Table 3.22 Average Weekly Consumption of Milk and Dairy Reported by Participants	77
Table 3.23 Times per Week Participants Reported Consuming Milk and Dairy	77
Table 3.24 Types of Milk and Dairy Participants Reported Consuming.....	78
Table 3.25 Self-reported Behaviours of Smoking, Stress and Sleep	78
Table 3.26 Average Number of Hours Participants Reported Sleeping	79
Table 3.27 Number of Hours Participants Reported Sleeping.....	79
Table 3.28 Participants' Beliefs in the Importance of Health Behaviours for the Overall Health.....	80
Table 3.29 Participants' Beliefs in the Importance of Health Behaviours for the Treatment and Management of Diabetes	80
Table 3.30 Hadith and Qur'anic Verses on Health in General Reported by Participants.	81
Table 3.31 Hadith and Qur'anic Verses on Nutrition Reported by Participants	82
Table 3.32 Hadith and Qur'anic Verses on Physical Activity Reported by Participants .	83
Table 3.33 Hadith and Qur'anic Verses on Sleep Reported by Participants	84
Table 3.34 Qur'anic Verses on Stress Reported by Participants	84
Table 3.35 Participants' Quotes of Health Priorities, the Implications of Islamic Teachings of Health Behaviours, Proverbs on Health, Health Advice, Social and Cultural Barriers to Health Behaviours; and a Reform to the Social Structure.....	85
Table 4. 1 Content Covered in Sessions One and Two of the Type 2 Diabetes Mellitus Health Education Program (Source: Harvard Health Publications: Diabetes: A Plan for Living).....	132
Table 4. 2 Topics Covered from the Harvard Publications on Health.....	133

Table 4.3 Posters and Pamphlets	137
Table 4.4 Discussion Topics: Personal, Enviromental, and Social Factors that Affect Weight	138
Table 4.5 Tailoring the Harvard Education for Positive Psychology with Religious Quotes	139
Table 4.6 Other Examples of Tailoring Health Education to the Saudi Culture	139
Table 4.7 Participant Characteristics by Group	140
Table 4.8 Physical Measurements, Pre-Program (Baseline) and Post-Program by Group	141
Table 4.9 BMI Categories, Pre-Program (Baseline) and Post-Program by Group	142
Table 4.10 Waist-to-Hip Ratio Categories, Pre-Program (Baseline) and Post-Program by Group	143
Table 4.11 Physical Measurements, Pre-Program (Baseline) / Post-Program Difference by Group	144
Table 4.12 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) and Post-Program by Group	145
Table 4.13 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) and Post-Program	146
Table 4.14 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) / Post-Program Difference by Group	147
Table 4.15 SF12, Group Comparisons for Pre/Post Differences	148
Table 4.16 Life Satisfaction, Pre-Program (Baseline) and Post-Program by Group	148
Table 4.17 Life Satisfaction, Pre-Program (Baseline) and Post-Program Totals and Pre/Post Difference by Group.....	151
Table 4.18 Diabetes Knowledge Test, Number and Percent Correct, Pre-Program (Baseline) and Post-Program by Group.....	152
Table 4.19 Diabetes Knowledge Test, Pre-Program (Baseline) and Post-Program Totals and Pre/Post Difference by Group.....	153
Table 4.20 Types of Physical Activity Participants Reported Performing, Pre-Program (Baseline) by Group.....	154

Table 4.21 Amount of Time Participants Reported Performing Physical Activities of Various Difficulties, Pre-Program (Baseline) by Group	155
Table 4.22 Self-reported Physical Health Measures and General Health, Pre-Program (Baseline) by Group.....	156
Table 4.23 Self-reported Morbidity, Pre-Program (Baseline) by Group	157
Table 4.24 Average Weekly Consumption of Rice or Pasta, Bread and Cereals, Meat, Poultry, Seafood, Eggs, Nuts, Legumes, and Milk and Dairy Reported by Participants, Pre-Program (Baseline) by Group	158
Table 4.25 Average Consumption of Fresh Fruits, Vegetables, and Dates Reported by Participants, Pre-Program (Baseline) by Group	159
Table 4.26 Average Consumption of Soft Drinks Participants Reported, Pre-Program (Baseline) by Group.....	159
Table 4.27 Types of Soft Drinks, Bread, and Oil Participants Reported Consuming, Pre-Program (Baseline) by Group.....	160
Table 4.28 Participants Reporting of Being on a Diet and Consumption of Sugar Substitutes, Pre-Program (Baseline) by Group.....	161
Table 4.29 Self-Reported Behaviours of Smoking, Stress and Sleep, Pre-Program (Baseline) by Group.....	161
Table 4.30 Average Hours of Sleep Participants Reported, Pre-Program (Baseline) by Group	162
Table 4.31 Exit Interview for Program Satisfaction, Post-Program with the Intervention Group	162
Table 4.32 Exit Interview for Recommending Program, Post-Program with the Intervention Group	162

LIST OF FIGURES

Figure 4.1 BMI Categories, Pre-Program (Baseline) and Post-Program by Group.....	163
Figure 4.2 SF12, Physical Functioning to Vitality, Pre-Program (Baseline) and Post-Program by Group	164
Figure 4.3 SF12, Social Functioning to Mental Component, Pre-Program (Baseline) and Post-Program by Group	165
Figure 4.4 Diabetes Knowledge Test, Pre-Program (Baseline) and Post-Program by Group	166
Figure 4.5 Life Satisfaction, Pre-Program (Baseline) and Post-Program by Group.....	166
Figure 4.6 Waist to Hip Ratio, Pre-Program (Baseline), Post-Program, and Pre/Post Difference by Group	167
Figure 4.7 Six Minute Walking Test Distance, Pre-Program (Baseline), Post-Program, and Pre/Post Difference by Group	167

ACKNOWLEDGEMENTS

I am mostly thankful to Almighty God, Allah, for my accomplishments during my years in Canada as an international student aspiring for a higher education. I am thankful to God for overcoming some challenges and obstacles and for enabling me to reach the final stages of completing my thesis.

I would like to give special thanks to my supervisor Dr. Elizabeth Dean for her wise guidance throughout the years of my PhD studies. Special thanks to my supervisory committee, Dr. Lyn Jongbloed and Dr. Tal Jarus, for their supportive attendance to my progress. Special thanks to John-Paul Baker for his edits in the second chapter of this thesis, and Dr. Maya Yazigi for her collaboration in the development of the thesis proposal. Special thanks to Doug Talling for his intellectual guidance and contribution for the statistical analysis of my both studies. Special thanks to Ellen O'Brien for her thorough edits of my thesis. Very special thanks to Dr. Tawfik Khoja for his continuing support to facilitate the launching of my two studies in Saudi Arabia. Special thanks to Dr. Sami Abdulwahab for his willingness to provide support during my field work in Saudi Arabia. Special thanks to Dr. Zeyad Al-Sabbagh and my brother in-law Dr. Baker Ashour for their support in launching my second study at the Iskan Clinic. Special thanks to the staff at the Iskan Clinic for their cooperation and support while conducting the education sessions of the second study. Special thanks to all my family particularly my mum, Batool Ismaeil, and my sisters, Dr. Ameera Al-Bannay, Engr. Zahra and Sukaina Al-Bannay, for their familial and instrumental support during the times I encountered challenges while launching my studies in Saudi Arabia. Special thanks to my friends and colleagues in the Department of Rehabilitation Sciences particularly Mineko Wada,

Regina Casey, Shalini Li, and Tahereh Mosavi for being there for me during the times I needed them. Finally, special thanks to the Michigan Diabetes Research and Training Center for their permission to use the diabetes knowledge survey instrument in my research. Also, special thanks to QualityMetric for providing me with a license to score my data for the health-related quality of life (SF12 v.2) questionnaire.

DISCLAIMER

Discussions on the social and political backgrounds of the Saudi Arabian cultural in this thesis are based on cited references and do not reflect my personal opinions.

DEDICATION

To mum

To all women in my family

To all Saudi women

To all Arab women

To all Muslim women

To all women

1. INTRODUCTION, LITERATURE REVIEW, AND RATIONALE FOR THE THESIS

1.1. Introduction

As in other Middle Eastern countries, the discovery of oil in Saudi Arabia has contributed to urban lifestyles with a major transition to fast food consumption, smoking, and physical inactivity (Dean, 2008; Al-Nuaim, Bamgboye, Al-Rubeaan, & Al-Mazrou, 1997; Al-Nozha et al. 2007; Al-Nozha et al., 2004a; Al-Nozha et al., 2004b; Al-Nuaim, 1997; Al-Rajeh, Awada, Niazi, & Larbi, 1993). Lifestyle-related conditions including ischemic heart disease, smoking-related conditions, hypertension, type 2 diabetes mellitus (T2DM) and obesity have become leading causes of morbidity and mortality among men and women in Saudi Arabia (Al-Nuaim, Bamgboye, Al-Rubeaan, & Al-Mazrou, 1997; Al-Malki, Al-Jaser, & Warsy, 2003; Elhadd, Al-Amoudi, & Alzahrani, 2007).

In this chapter, we discuss literature in relation to lifestyle-related conditions and diabetes management and health promotion services in Saudi Arabia. We also discuss the World Health Organization recommendations for diabetes management, tailoring culture and religion to health promotion, and the international classification of functioning, disability, and health. We then discuss theories of health behaviours and definitions of health behaviours, health education, and community. Finally, we briefly discuss the history of Saudi Arabia, the sociocultural context, and women health in that country.

1.2. Literature Review

1.2.1. Smoking

Tobacco smoking, a risk factor for several lifestyle-related conditions, is socially unacceptable for women in Saudi Arabia especially in rural areas. Therefore, more men in Saudi Arabia smoke tobacco than women (Al-Dawood, 2000; Jarallah, Al-Rubeaan,

Al-Nuaim, Al-Ruhaily, & Kalantan, 1999). Based on recent statistics in Saudi Arabia, men reported smoking cigarettes twice as much as women; however, the stigma against women smoking likely contributes to their underreporting smoking (Jarallah et al., 1999). The Saudi culture like other Arab cultures stigmatizes women who smoke cigarettes (Jarallah et al., 1999). Urban women, however, appear less concerned about stigma and continue to smoke cigarettes. Cigarette smoking among married couples in Saudi Arabia has become prevalent (Al-Dawood, 2000). Moreover, shisha smoking (water pipe) like cigarette smoking is becoming more common.

Scholarly articles use different Arabic words to refer to shisha smoking such as narghile smoking, water pipe smoking, hookah, and hubble bubble (Nuwayhid, Yamout, Azar, Al Kouatly, & Kambris, 1998). In Saudi Arabia, shisha smoking is preferred to cigarette smoking, considered more socially acceptable for women, and perceived as less harmful than cigarette smoking (Nuwayhid et al., 1998; Saudi Gazette, 2011). More women in Saudi Arabia and other Arab countries therefore prefer to smoke shisha than cigarettes even when they are pregnant (Nuwayhid et al., 1998; Millat & Florey, 1992; Saudi Gazette, 2011). Nuwayhid et al. (1998) cite two primary reasons for the scant data related to the patterns and hazards of shisha smoking in Arab cultures: first, shisha smoking is a relatively recent trend in Arab societies; and second, shisha smoking is less prevalent in western cultures. Whether smoking among women in Saudi Arabia is a social trend or used by them to reduce stress is not reported.

1.2.2. Hypertension

Hypertension has increased in Saudi Arabia over the last decade (Al-Nozha et al., 2007). A 10% incidence of hypertension has been reported in the Saudi population between the ages of 40 and 60 years (Al-Rajeh et al., 1993). This condition has been

associated with an urban lifestyle, illiteracy, poor nutrition, overweight and obesity (Al-Nozha et al., 2007; Al-Nozha et al., 2004b, Siddiqui et al., 2001). Older age, especially among women, is associated with increased incident of hypertension in Saudi Arabia (Al-Nozha et al., 2007; Al-Nozha et al., 2004b, Siddiqui et al., 2001). In the Qassim region of Saudi Arabia, 25% of men and 20% of women with hypertension reported not knowing their blood pressures (Kalantan, Mohammed, Al-Taweel, & Abdul Ghani, 2001). Moreover, two thirds of people with hypertension across Saudi Arabia reported being unaware of having the condition (Siddiqui, Ogbeide, Karim, & Al Khalifa, 2003). The prevalence of hypertension in the Saudi Arabia population depicts the reported increase of hypertension in the United States. In this respect, recent data shows that one in three adults in the United States has high blood pressure, and 8% of American adults have undiagnosed hypertension (American Heart Association, 2012. p.e88).

1.2.3. Obesity

Obesity is an independent risk factor for T2DM (Baird, 2007). Urban living is believed to be a primary contributor to increased prevalence of overweight and obesity among Saudi women (Al-Nuaim, 1997). In contrast to the reporting that diabetes was higher among men than women in Saudi Arabia, other studies report that Saudi women have higher rates of obesity than men. This increases women risk of ischemic heart disease and other lifestyle conditions such as T2DM, hypertension, and stroke (Al-Khalidi & Khan, 2000; Al-Nuaim et al., 1997; Al-Nozha et al., 2007; Al-Nozha et al., 2007; Al-Nozha et al., 2004b; Al-Rajeh et al., 1993).

1.2.4. Diabetes Mellitus

Data before 1998 shows that the prevalence of insulin-dependent diabetes mellitus, non-insulin-dependent diabetes mellitus and impaired glucose tolerance in Saudi men

was 0.23%, 5.63% and 0.50% respectively, and in Saudi women was 0.30%, 4.53% and 0.72% respectively (Aftab, 2007; El-Hazmi et al., 1998). The reporting of diabetes mellitus was higher in men compared to women in all provinces of Saudi Arabia except in the Eastern province (Aftab, 2007; El-Hazmi et al., 1998). Gestational diabetes mellitus is prevalent in Saudi women and ranged from 10.3% to 19.3% (Elhadd, Al-Amoudi, & Alzahrani, 2007; AlShawaf, Akeil, & Mograby, 1998; Mwambingen, Al Meshari, & Akeil, 1988; Khawja, AlSuleiman, & al-Sibai, 1989).

Type 2 diabetes mellitus is a health risk factor that varies in frequency (2% to 12%) across regions of Saudi Arabia (Al-Nozha et al., 2004a; Al-Rajeh et al., 1993). Family history of T2DM, obesity, age, overweight, and geographic locations are factors that are believed to account for variations in the prevalence of T2DM in Saudi Arabia (Akbar & Al-Ghamdi, 2000; Akbar, 2001; Al-Nuaim, 1997). A study that examined glucose intolerance in people living in rural and urban communities in Saudi Arabia has reported that T2DM is higher in those living in urban rather than in rural areas (Al-Nuaim, 1997).

1.2.5. Women and Diabetes

Diabetes mellitus is a stronger risk factor for fatal ischemic heart disease in women than in men (Barrett-Connor, Cohn, Wingard, Edelstein, 1991). In this respect, Schenck-Gustafsson (2012) reported that “diabetes mellitus increases the risk of cardiovascular disease by three to four times in women and two to three times in men, after adjusting for other risk factors” (p.1). This observation is explained by “increased risk-factor burden and comorbidity in women compared with men with diabetes [and] less aggressive preventive treatment in women with diabetes” (Schenck-Gustafsson, 2012, p.3). Another suggested explanation was that insulin resistance is impacted by sex hormones and lifestyle factors (Schenck-Gustafsson, 2012). The increased risk of ischemic heart

diseases in women with diabetes is yet to be elucidated but highlights the importance of preventing and managing T2DM in women.

1.2.6. Health Promotion and Diabetes Management in Saudi Arabia

Health promotion in Saudi Arabia is mostly introduced through primary health care. The ministry of health manages the health care system in Saudi Arabia (Almalki, Fitzgerald, & Clark, 2011). It provides free health care to Saudi citizens at three levels: primary, secondary, and tertiary. The primary level in primary health clinics provides prevention and treatment services and a referral for conditions that require specialized care to public hospitals, the secondary level of care (Almalki, Fitzgerald, & Clark, 2011). Public hospitals give referrals for the more complex cases such as cancers and complex surgeries to specialized hospitals with more advanced health care system, which are the tertiary level of care (Almalki, Fitzgerald, & Clark, 2011).

Health promotion preventive services in Saudi Arabia are mostly focused on maternal and child health care such as immunization and antenatal care (Almalki, Fitzgerald, & Clark, 2011). Services for disease control, on the other hand, are focused on infectious diseases such as tuberculosis and malaria (Almalki, Fitzgerald, & Clark, 2011).

Health education services are expected to be performed by nurses (Jradi, Zaidan, & Al Shehri, 2012). Recent studies however show that most nurses in Saudi Arabia are expatriates from non-Arabic speaking countries and thus unable to communicate effectively with patients (Jradi, Zaidan, & Al Shehri, 2012). Moreover, these nurses and others including those who speak Arabic as their first language were not trained in public health or health promotion (Jradi, Zaidan, & Al Shehri, 2012).

With the gradual increase of lifestyle-related conditions and the growing need to provide competent health promotion services to the population in Saudi Arabia, a few

studies have explored the efficacy of health promotion services in Saudi Arabia. One recent study in the Aseer region of Saudi Arabia reported that standards of health promotion in primary health care are not efficient for the prevention of diabetes, as 21% of study participants were identified as pre-diabetic (Al-Shahrani & Al-Khaldi, 2011). The investigators suggested providing preventive care for lifestyle-related conditions in primary care settings. Another study suggested the need to integrate culture and religion in Saudi Arabia in another type of health promotion, specifically hand hygiene (Allegranzi, Memish, Donaldson, & Pittet, 2009).

Health education programs such as those for T2DM are not well established in Saudi Arabia (Abahussain & El-Zubier, 2005). At present, diabetes education programs in Saudi Arabia tend to target people diagnosed with diabetes rather than including those at risk and aiming to increase patients' awareness of diabetes care through medical instruction and care with less emphasis on lifestyle modification and prevention (El-Hazmi, Warsy, AR. Al-Swailem, AM, Al-Swailem, & Sulaimani, 1998; Sharaf, 2010). Thus, self-management through lifestyle modification and prevention has been relatively neglected in practice in favour of medical management in Saudi Arabia (Al-Elq, 2009; Sharaf, 2010).

Education for T2DM in Saudi Arabia is conducted by physicians, particularly in health centers where there are no diabetes educators (Al-Hussein, 2008). According to a study that examined a diabetes education program in the Asir region of Saudi Arabia, 27% of diabetic patients received no health education and of the remaining 73% of patients who received education, only 26% of them reported receiving instructions about exercise in managing diabetes (Al-Khaldi & Khan, 2000). Overall, diabetes education in Saudi

Arabia does not comply with the World Health Organization recommendations that require active collaboration between educators and the program recipients (Al-Khaldi & Khan, 2000; Al-Hussein, 2008).

1.2.7. The World Health Organization Recommendations for Diabetes Self-Management

Through its 'Diabetes Action Now' initiative, the World Health Organization advocates aggressive self-management approach to control T2DM (WHO, 2004a, and 2004b). The World Health Organization has formulated international standards for diabetes self-management that are evidence-based and aim to improve the patients' quality of life (Mensing et al., 2003; Funnell et al., 2009). These international standards are based on lifestyle modification strategies such as increased physical activity, healthy nutrition, reduced stress, sound sleep, and non-smoking (WHO, 2004a, and 2004b).

1.2.8. Diabetes Management and Culture

Evidence suggests that diabetes education programs based on international standards are more effective when tailored to the cultural contexts of targeted groups (Osuna et al., 2011; Goody & Drago, 2009; Hawthorne, Robles, Cannings-John, & Edwards, 2010; Song et al., 2010; Osborn et al., 2010). Culturally appropriate programs for diabetes self-management among African-Americans and Mexican-Americans, for example, could improve the outcomes of diabetes education (Anderson et al., 2005; Brown & Hanis, 1999). Moreover, the relationship between health and religion has been advocated as a promising mediator in health education programs (Ellison & Levin, 1998, Holt & McClure, 2006; Benjamins, Ellison, Krause, & Marcum, 2011; Kenneth, Maton, & Wells, 2010). For example, the involvement in a religious community and attending religious services can positively impact both the physical and psychological wellbeing of

individuals (Ellison & Levin, 1998, Holt & McClure, 2006; Benjamins, Ellison, Krause, & Marcum, 2011). A study that examined religious involvement in African American communities and health behaviours, for example, showed that religious beliefs could lead to positive health behaviours (Holt, Roth, Clark, & Debnam, 2012).

1.2.9. Islamic Perspective on Health

A call for a lifestyle that is based on an Islamic perspective on health was raised for the first time in the “the Amman Declaration on Health Promotion”. In 1989, the World Health Organization Regional Office for the Eastern Mediterranean convened “the Amman Declaration on Health Promotion” consultation with the Islamic Organization for Medical Sciences and the Royal Academy for Research in Islamic Civilization along with a group of theologians and scholars of various disciplines such as physicians, economists, sociologists, scientists, and journalists to discuss the adaptation of health promotion to Islamic teachings (World Health Organization, 1996). The objectives of this consultation were twofold: 1. to provide a detailed description of a lifestyle that is consistent with the religious teachings of Islam; 2. to identify unhealthy behaviours that are forbidden in Islam (World Health Organization, 1996). Moreover, based on the premise that faith is an “essence” that contributes to overall physical, psychological, and spiritual wellbeing (World Health Organization, 1996, p.12), the consultation aimed to identify relevant Islamic teachings about health. To achieve these objectives, the consultation suggested collaboration among members and groups specialized in Islamic, scientific, and cultural education (World Health Organization, 1996). In short, the Amman Declaration was convened by the World Health Organization to help align the wisdom of the Qur’an and Hadith to contemporary health issues, e.g., smoking.

The Qur'an is the holy book for Muslims and its words are believed to be direct revelations from Almighty God, Allah. From this book, Muslims learn appropriate conduct so that their behaviours are shaped by God's messages. Muslims believe that obedience to God will lead to a blessed life and afterlife.

The Hadith is another trusted source for Muslims to learn about their religious teachings. The Hadith is a collection of the "saying(s) or action(s) ascribed to the Prophet [peace be upon him] (PBUH) or acts(s) approved by the prophet (PBUH)" (Al Khayat, 1997). The Prophet Mohammad (PBUH) is considered to be the model for all Muslims; therefore Muslims use the Hadith to learn from the Prophet's morals and follow his words and behaviours. In short, the Qur'an and Hadith are the two main sources that describe how Muslims should lead their lives. Health is one of the many topics addressed in the Qur'an and Hadith (Al Khayat, 1997).

(a) Excerpts from "the Ammam Declaration on Health Promotion" Meeting

Health is a blessing from God. "People should make good use of it, and preserve the blessing of health by strengthening and developing it." (World Health Organization, 1996, p.7). By recognizing the blessing of health and maintaining it, people will become more connected to God.

To avoid illnesses and diseases, people require awareness about healthy lifestyles (World Health Organization, 1996). Thus, health education based on religious messages could be employed as a tool to educate the Ummah (Muslim public) about healthy lifestyles (World Health Organization, 1996). Islamic health messages can be found in the two primary sources of Islamic teachings: the Qur'an and Hadith. For example, God in his Holy Book, Qur'an, has advised people to maintain balanced lives (World Health

Organization, 1996). He warned against excessiveness including excessive eating and drinking (World Health Organization, 1996).

1.2.10. The International Classification of Functioning, Disability and Health

The International Classification of Functioning, Disability and Health (ICF) reflects a historical shift from other models that defined disability as a medical impairment (World Health Organization, 2011b). Following the medical model, the social model emerged. The social model acknowledges societal factors as contributors to disability (World Health Organization, 2011b). The ICF later added a broader psychosocial context within which to frame an individual's ill health or disability, namely, personal and environmental factors (World Health Organization, 2011b).

The ICF was developed by the World Health Organization in 2001 to understand and evaluate health and disability (World Health Organization, 2011b). According to the ICF, health and disability can be framed at two levels: the individual level and the environmental level (World Health Organization, 2011b). The ICF frames health and disability within three health and health related domains, specifically body functions and structure, activities, and participation (World Health Organization, 2011b). Each of these domains is influenced by personal factors and environmental factors (World Health Organization, 2011b).

Examples of personal factors in the ICF include gender, age, and education (World Health Organization, 2011b). Environmental factors include culture, work, and government legislation (World Health Organization, 2011b). Body Functions and Structures include the state of a person's underlying anatomy, physiology, and psychology (World Health Organization, 2011b). Activity refers to the functioning status of an individual such as self-care and capacity to perform household chores (World

Health Organization, 2011b). Participation refers to an individual's capacity to participate in society such as social interaction and interpersonal relationships (World Health Organization, 2011b).

According to the ICF, health and disability are universal experiences of people around the world. Health and disability can be measured by examining the body structure and its functions and whether impairments exist, the level of activity and factors that limit activity, and the degree of social participation and factors that restrict individuals from participating in their societies (World Health Organization, 2011b). At all levels: body functions and structures, activity, and participation, factors that affect the overall experience of health or disability include personal, environmental, or both (World Health Organization, 2011b).

In line with the ICF, the World Health Organization had defined health as "complete physical, mental, and social functioning of a person and not merely the absence of disease" (World Health Organization, 2006).

1.2.11. Health Behaviour Theories

Health behaviour came to the attention of scholars interested in the social determinants of health in the 1980s (Glanz, Rimer, & Viswanath, 2008). This provided a basis for a holistic approach to health promotion that includes social, political, and economic factors (Glanz, Rimer, & Viswanath, 2008). Improving health behaviour, in this respect, supported the need for a social reform at multiple levels starting with the individual and extending to family, community, and social and political institutions (Glanz, Rimer, & Viswanath, 2008).

1.2.12. Health Behaviour Definitions

Early scholars of health such as Gochman (1982, 1997), Kasl and Cobb (1996a, 1996b) have attempted to define health behaviour (Glanz, Rimer, & Viswanath, 2008). A contemporary definition of health behaviour is “actions of individuals, groups, and organizations, as well as their determinants, correlates, and consequences, including social change, policy development and implementation, improved coping skills, and enhanced quality of life” (Glanz, Rimer, & Viswanath, 2008, p.13; Parkerson and others, 1993). Kasl and Cobb (1996a, 1996b) have classified health behaviour into three categories: one, preventive health behaviour; two, illness health behaviour; and third, sick role behaviour (Glanz, Rimer, & Viswanath, 2008).

1.2.13. The Social Ecological Model of Health Behaviour

The term ecology “refers to the interrelations between organisms and their environments” (Glanz, Rimer, & Viswanath, 2008, p.466). Thus, the social ecological model of health behaviour focuses on interactions between individuals and their environments (Stokols, 1992; Glanz, Rimer, & Viswanath, 2008). Environment, in this respect, refers to economical, political, and socio-cultural contexts that affect individuals and their communities (Glanz, Rimer, & Viswanath, 2008).

According to the social ecological model, health behaviour is influenced by factors at multiple levels. These factors include intrapersonal, interpersonal, organizational, community, and public policy (Glanz, Rimer, & Viswanath, 2008). Health behaviour in this sense co-interacts at all levels and behavioural change should be targeted across these levels. Intervention studies based on the social ecological model have been shown to be mostly effective when agencies across various levels cooperate to provide healthy choices for individuals (Glanz, Rimer, & Viswanath, 2008).

Only recently, the social ecological model of health behaviour has been applied to health promotion interventions (Glanz, Rimer, & Viswanath, 2008). Examples are: McLeroy and others (1988), Stokols and others (2003), Glanz and others (2001), and Glass and McAtee (2007). To maximize the outcomes of an intervention, according to the social ecological model of health behaviour, individuals need to be educated about healthy choices while providing supportive environments for the individuals to make such choices (Glanz, Rimer, & Viswanath, 2008; Ottawa Charter for Health Promotion, 1986). For example, by providing facilities for physical activity and healthy eating options for individuals in their communities, people will be better able to adopt healthy behaviours in daily life (Glanz, Rimer, & Viswanath, 2008). In brief, for a health promotion intervention to be effective, it needs to address both the individual and the environmental levels (Glanz, Rimer, & Viswanath, 2008).

Up to now, the social ecological model of health behaviour has been adopted as a basis for several initiatives (Glanz, Rimer, & Viswanath, 2008). Among these are Healthy People 2010 (U.S. Department of Health and Human Services, 2000), the World Health Organization Framework Convention on Tobacco Control and strategies for lifestyle-related health behaviours including nutrition, obesity, and physical activity (World Health Organization, 2003, 2004).

1.2.14. Community and the Social Ecological Model of Health Behaviour

The construct of community is fundamental to the social ecological model. Community can be defined as “a group of people having a common interest or identity and goes beyond the physical environment. Community includes the physical, social, and symbolic characteristics that cause people to connect” (Purnell & Paulanka, p.21).

In turn, the social ecological model of health behaviour is central to the conceptualization of community (Glanz, Rimer, & Viswanath, 2008). Community in the social ecological model refers to an autonomous geographical location, population characteristics, physical environment, social structure, and all other interrelating contexts (Glanz, Rimer, & Viswanath, 2008).

The term community organization was developed in the late 1800s by social workers in the United States to categorize the health needs of immigrant communities (Glanz, Rimer, & Viswanath, 2008). Later in 1950 and onwards, social movements such as women's rights, gay rights, and anti-abortions movements have adopted the concept community organization in reference to the targeted communities (Glanz, Rimer, & Viswanath, 2008). Moreover, in 1980s, the World Health Organization has employed health promotion strategies through social changes at the community level with the objective of increasing individuals' control to make healthy choices (Glanz, Rimer, & Viswanath, 2008; World Health Organization, 1986).

According to Glanz, Rimer, and Viswanath (2008) the term community has developed to integrate the concepts of community building and community organization. Community, in this respect, can be defined as a geographical location in which people share characteristics such as ethnicity, language, and religious orientation (Glanz, Rimer, & Viswanath, 2008). In short, community refers to a "collective identity" (Hunter, 1975; Glanz, Rimer, & Viswanath, 2008, p.290).

1.2.15. Health Promotion and Health Education

Early scholars of health promotion such as Griffiths (1972) and Green (1980) attempted to define health education. A comprehensive definition of health education is "the process of assisting individuals, acting separately or collectively, to make informed

decisions about matters affecting their personal health and that of others” (Glanz, Rimer, & Viswanath, 2008, p.10).

Objectives of health education include prevention of diseases, disease management and prevention, and rehabilitation (Glanz, Rimer, & Viswanath, 2008). Health education can be delivered in multiple settings such as schools and universities, hospitals, community centers like recreation centers, religious institutions such as temples, mosques and churches, and worksites; and through the mass media (Glanz, Rimer, & Viswanath, 2008).

1.2.16. Saudi Arabia: Historical and Cultural Backgrounds

The population of Saudi Arabia is 27 million including 8.4 million foreign residents (Royal Embassy of Saudi Arabia Washington, DC, 2013). The capital city is Riyadh, located in the center of the country. Saudi Arabia is divided into 13 provinces, each with its capital (Royal Embassy of Saudi Arabia Washington, DC, 2013). Islam is the only religion practiced in Saudi Arabia. Official spoken languages are Arabic and English (Royal Embassy of Saudi Arabia Washington, DC, 2013). The latter is mostly spoken in urban areas (Royal Embassy of Saudi Arabia Washington, DC, 2013).

Saudi Arabia is located in the middle of a desert, surrounded by seawater at its south and east borders (Royal Embassy of Saudi Arabia Washington, DC, 2013). The size of Saudi Arabia is around 1.96 million square kilometers, the 14th largest country in the world (Royal Embassy of Saudi Arabia Washington, DC, 2013).

Saudi Arabia was recognized as a kingdom in 1932. Saudi Arabia is “the most theocratic state in the contemporary Sunni Muslim world” (Humphreys, 1979). It is based on the Wahhabi interpretation of Islam (Humphreys, 1979). The Wahhabi religion of Islam was introduced to Saudi Arabia by Mohammad bin Abdulwahab, a native scholar

from Najad (Riyadh today) (Humphreys, 1979). In 1740, Mohammad bin Abdulwahab bonded with Saud bin Abduaziz, the founder of Saudi Arabia, to establish a religious state based on the Wahhabi interpretations of Islam (Humphreys, 1979, Baki, 2004).

The followers of Wahabbi Islam call themselves Salafis (Dekmejian, 1994, p.637). Based on the Salafi doctrine, Muslims should strictly follow the Qur'an and Sunnah (Prophet Mohammad and his followers) (Dekmejian, 1994; Humphreys, 1979). It considers the period lived by Prophet Mohammad and his followers the golden era of Islam (Dekmejian, 1994; Humphreys, 1979). According to the Salafis, Muslims today are required to follow the lifestyle of Prophet Mohammad and his followers (Dekmejian, 1994; Humphreys, 1979). Moreover, an Islamic state has to be socially and politically structured similar to the sociopolitical system during the golden era of Islam (Dekmejian, 1994; Humphreys, 1979). Anything that came after that golden era of Islam is considered an inventory to Islam (bida'a) (Dekmejian, 1994; Humphreys, 1979). The Salafi doctrine as such forbids modern lifestyles including western norms and customs (Dekmejian, 1994; Humphreys, 1979).

Under the Salafi doctrine in Saudi Arabia, religious authorities intervene in every aspect of public social life (Dekmejian, 1994; Humphreys, 1979). This is instituted to prevent people getting diverted from the Islamic behaviours of the golden era of Islam (Dekmejian, 1994; Humphreys, 1979). In Saudi Arabia, one's social behaviours are expected to conform to his/her affiliated group and Islamic behaviours (Baki, 2004; Rugh, 1973). Social behaviours in public are observed and regulated by the religious police, the Committee of Encouraging Virtue and Preventing Vice (Baki, 2004).

The political system in Saudi Arabia is authoritarian and based on a monarchy, consistent with the law of governance during the golden era of Islam. Authority is shared among the Saudi King and his royalty and religious leaders (Ulama) (Baki, 2004; Humphreys, 1979).

Education in Saudi Arabia is also structured to correspond with the Islamic teachings of the golden era of Islam. It emphasizes obedience to God, the prophet, and those in authority (Prokop, 2004; Baki, 2004). Some scholars argue that in Saudi Arabia, the “philosophy of education in teaching inculcates passivity, dependence, an a priori aspect for authority and an unquestionable attitude” (Prokop, 2004, p.80). Religious authorities dominate curricula starting from kindergarten to university. Girls are segregated from boys in schools and universities (Prokop, 2004; Baki, 2004). Girls have a different curriculum to boys even at university. Sports, for instance, are allowed only for boys (Mobaraki & Söderfeldt, 2010; Prokop, 2004). Some fields such as law, journalism, and civil engineering are not available for female students. Conservatives initially resisted the establishment of formal education for women until the 1960s (Mobaraki & Söderfeldt, 2010). Based on recent data, female students constitute over 50 percent of Saudi university students (Mobaraki & Söderfeldt, 2010; Baki, 2004; Prokop, 2004). Despite these, around 30% of women in Saudi Arabia are illiterate (Mobaraki & Söderfeldt, 2010).

The Ulama have opposed the employment of women (Baki, 2004; Prokop, 2004). They restricted women participating in the work force by forbidding them to drive (Baki, 2004; Prokop, 2004). Thus, working-women need to hire a driver to get to work. At work, women are placed in secondary positions to men in line with the Salafi beliefs that women

are subordinate to men (Baki, 2004). Decision-making is not allowed for women in the Saudi patriarchal system even in high-ranking positions (Baki, 2004). For instance, female university professors have to forward students' exam papers after marking them to male professors for their reviews (Baki, 2004).

Saudi law, called Shariah, is based on the Salafi interpretations of Islam (Mobaraki & Söderfeldt, 2010; Baki, 2004; Prokop, 2004). These interpretations contribute to placing women in a subordinate position (Mobaraki & Söderfeldt, 2010; Prokop, 2004). Woman, for example, are required to get the consent of a man related to her in if she wants to pursue education, work, travel, or even undergo invasive medical surgery (Mobaraki & Söderfeldt, 2010).

In the tribal system of Saudi Arabia, women are treated as properties of men (Mobaraki & Söderfeldt, 2010). Unmarried, women are properties of their fathers (Mobaraki & Söderfeldt, 2010). Divorced and widowed women are properties of their sons (Mobaraki & Söderfeldt, 2010).

Historically, before the emergence of Islam, Arab elite women veiled their faces to represent their prestigious status (Baki, 2004). The Salafi Islam has adopted the veiling practice for women and sometimes has forbidden women from showing their faces in some regions of Saudi Arabia (Mobaraki & Söderfeldt, 2010). Only recently a Saudi woman has been allowed to have official government identification, show her face in the photo of her identification, and do not require the consent of a male relative to attain such identification (Mobaraki & Söderfeldt, 2010).

Before the discovery of oil, Saudi Arabia was a poor country. The national income relied mostly on the revenues paid by pilgrims to Mecca and Medina, the two holiest

cities for Muslims (Rugh, 1973). Oil for the first time was discovered in 1938, which led to the economic development of the country (Rugh, 1973). With the establishment of the Arabian-American Oil Company (Aramco) in 1949, foreigners including Americans and other westerners migrated to Saudi Arabia for skilled jobs in that company (Rugh, 1973). With the upward economy in the 1970s, Saudi Arabia continued to receive immigrants from around the world (Rugh, 1973). These immigrants have limited access to citizenship or integration into the native culture of Saudi Arabia. Saudi employees after the discovery of oil were mostly unskilled workers (Rugh, 1973). As time went by, Saudis acquired more education that qualified them to attain highly skilled jobs (Rugh, 1973).

(a) Saudi Arabian Society Based on a Clearly Defined Class Structure

The upper class in Saudi Arabia includes the royal family, top Ulama, and wealthy merchants (Rugh, 1973). The Lower class includes nomads and unskilled workers (Rugh, 1973). Upper middle class includes educated professionals such as medical doctors, engineers, and professors (Rugh, 1973). Lower middle class includes skilled workers such as clerics and those working in administration (Rugh, 1973).

Traditionally, extended family members live in the same household. With the emergence of the middle class, extended families gave way to nuclear family households (Rugh, 1973). Polygyny is vanishing with the increased cost of marriage and household living (Rugh, 1973).

1.2.17. Women's Health in the Islamic Culture of Saudi Arabia

Cultural characteristics can be either primary or secondary. Primary characteristics of culture refer to “things that a person cannot easily change” or can be changed with challenging transformations (Purnell & Paulanka, p.7). These include “nationality, race, color, gender, age, and religious affiliation” (Purnell & Paulanka, p.7) Secondary

characteristics of culture include “educational status, socio-economic status, occupation, military experience, political beliefs, urban versus rural residence [...] physical characteristics, gender issues, reason, for migration” (Purnell & Paulanka, p.7). In reference to these classifications, we discuss the Saudi Arabian culture in relation to its primary characteristics.

The Saudi Arabian culture is structured by fundamental Islamic teachings. These teachings include the belief that women should remain inside their homes and be excluded from public physical activities such as riding a bike or running in public. Women’s activities in Saudi Arabia are thus centered at their homes (Abahussain & El-Zubier, 2005). Whether cultural factors contribute to the findings that Saudi women have poorer diet adherence than men is not known (Al-Khaldi & Khan, 2000). Saudi women’s health beliefs and behaviours are framed by the Saudi culture and the Islamic faith. In a study that describes Saudi women’s knowledge and beliefs about illnesses, for example, women reported causes of illness as God, in addition to contact with an ill person, the weather, and germs (Ide & Sanli, 1992).

As mentioned earlier, the Saudi Arabian socio-cultural context is structured in line with the Salafi interpretations of Islam. These could impose limitations on Saudi women’s adaptabilities to adopt healthy lifestyle. Saudi women thus may require special health needs that may be distinct from the needs of Muslim women living in other Islamic countries.

1.3. Rationale for the Thesis

1.3.1. Rationale

Women’s health in Saudi Arabia is only now emerging as a primary concern, recognized as being underrepresented in literature. Women in Saudi Arabia have special

health needs including the prevention and management of T2DM. The degree to which cultural and religious factors impact Saudi women's lifestyle-related health beliefs and behaviours is unclear. The outcomes of international standards for T2DM education have not been previously studied in Saudi Arabia particularly in women.

1.3.2. Goals and Objectives

(a) Study One

The goal was to examine the self-reported health status of Saudi women, their lifestyle-related health beliefs and behaviours, and their understanding of related Islamic teaching, to serve as a basis for designing and implementing a T2DM education program, based on international standards and adapted to the cultural and religious contexts of Saudi women.

i) Primary Objectives

With respect to Saudi women and lifestyle-related conditions:

1. To examine their self-reported health profile
2. To elucidate their lifestyle-related health beliefs and behaviours
3. To examine their understanding of Islamic teachings in relation to health behaviours

ii) Secondary Objectives

1. To inform recommendations for a subsequent study, Study Two, to explore the outcomes of a pilot intervention study of a T2DM education program based on international standards and adapted to the cultural and religious contexts of Saudi women

(b) Study Two

In the absence of existing data, the goal was to conduct a pilot intervention study to explore the outcomes of launching a T2DM education program, based on international standards and tailored to the cultural and religious contexts of Saudi women, compared with outcomes of usual care for diabetes in Saudi Arabia. Our primary research question was “What are the outcomes of a pilot intervention study of a T2DM education program based on international standards and adapted to the cultural and religious contexts of Saudi women?”

i) Primary Objectives

1. To explore whether a T2DM education program, based on international standards and adapted to the cultural and religious contexts of Saudi women, could impact health outcomes (e.g., physical measures, diabetes knowledge, life satisfaction and health-related quality of life) compared to outcomes of those who receive usual care for diabetes in Saudi Arabia
2. To use knowledge gained from conducting this pilot study to inform future studies related to the health needs of women in Saudi Arabia

1.4. Thesis Chapters

This thesis is organized as follows. Chapter 1 (INTRODUCTION, LITERATURE REVIEW, AND RATIONALE FOR THE THESIS) is an overview and a discussion of the literature and rationale for the thesis. Chapter 2 (CULTURE AS A VARIABLE IN HEALTH RESEARCH: PERSPECTIVES AND CAVEATS) is the basis of an article that addresses culture as an important methodological consideration in health research (Al-Bannay, H., Jarus, T., Jongbloed, L., Yazigi, M., & Dean, E. (2013). Culture as a variable in health research: Perspectives and caveats. *Health Promotion International*,

28(1), 1-9). Chapter 3 (STUDY ONE: LIFESTYLE-RELATED HEALTH BELIEF AND BEHAVIOURS OF SAUDI WOMEN LIVING IN DAMMAM) is Study One in this thesis i.e. the self-reported health status of Saudi women, their lifestyle-related health beliefs and behaviours, and their understanding of related Islamic teaching. Chapter 4 (STUDY TWO: EVALUATION OF AN EDUCATION PROGRAM RELATED TO TYPE 2 DIABETES MELLITUS FOR SAUDI WOMEN: A PILOT INVESTIGATION) is Study Two, i.e., a study that explored the outcomes of a pilot intervention study of a T2DM education program, based on international standards and tailored to the cultural and religious contexts of Saudi women, compared with outcomes of usual care for diabetes in Saudi Arabia.

2. CULTURE AS A VARIABLE IN HEALTH RESEARCH: PERSPECTIVES AND CAVEATS

This chapter is the basis for the following article:

Al-Bannay, H., Jarus, T., Jongbloed, L., Yazigi, M., & Dean, E. (2013). Culture as a variable in health research: Perspectives and caveats. *Health Promotion International*, 28(1), 1-9.

2.1. Summary

To augment the rigor of health promotion research, this article describes how cultural factors impact the outcomes of health promotion studies either intentionally or unintentionally. It proposes ways in which these factors can be addressed or controlled in designing studies and interpreting their results. We describe how variation within and across cultures can be considered within a study, e.g., the conceptualization of research questions or hypotheses, and the methodology including sampling, surveys and interviews. We provide multiple examples of how culture influences the interpretation of study findings. Inadequately accounting or controlling for cultural variations in health promotion studies, whether they are planned or unplanned, can lead to incomplete research questions, incomplete data gathering, spurious results and limited generalizability of the findings. In health promotion research, factors related to culture and cultural variations need to be considered, acknowledged or controlled irrespective of the purpose of the study, to maximize the reliability, validity and generalizability of study findings. These issues are particularly relevant in contemporary health promotion research focusing on global lifestyle-related conditions where cultural factors have a pivotal role and warrant being understood.

Key words: cultural variation; health promotion research; lifestyle-related conditions; methodological considerations

2.2. Introduction

The need to increase awareness of culture as a variable in health promotion research is germane for three reasons. First, health promotion research is mostly conducted in high-income countries that are experiencing unprecedented immigration of people from diverse cultures. The populations of the countries of North America and Europe, for example, have become increasingly culturally diverse. Second, research related to lifestyle-related conditions, given their global prevalence and enormous social and economic burdens, (Dean et al., 2011; World Health Organization, 2011a) is a priority. Lifestyle practices cannot be addressed independently from people's cultural backgrounds. Third, health promotion research often originates from investigators in high-income and western countries, whose personal cultural biases and perspectives influence their lenses of scientific inquiry.

Despite the need to consider culture as an important variable in health research, debate persists regarding the elements and definition of this construct. Culture has been defined in many ways, for example, “an historically transmitted pattern of meaning embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men (sic) communicate, perpetuate and develop their knowledge about and attitudes toward life” (Geertz, 1973, p.89). Another definition of culture is “a socially constructed and historically transmitted pattern of symbols, meaning, premises, and rules” (Philipsen, 1992, p.7-8).

According to Trinandis (1994), culture is classified as either objective or subjective. Objective culture “refers to the institutional aspects of culture, such as political and

economic systems, and to the products of culture, such as art, music, cuisine, and so on” (Landis, Bennett & Bennett, 2004, p.151). Subjective culture, on the other hand, “refers to the experience of social reality formed by the experience of the social reality formed by a society’s institutions, in other words, the worldview of a society’s people” (Landis, Bennett & Bennett, 2004, p.151). A contemporary definition of culture is “a system of meaning that guides the construction of reality in a social community” (Cheney, Christensen, Zorn & Ganesh, 2004, p.76).

Purnell, in her book “Guide to Culturally Competent Health Care” (2009), notes that “major influences that shape people’s worldview and the extent to which people identify with their cultural group of origin are called the primary and secondary characteristics of culture. The primary characteristics are nationality, race, color, gender, age, and religious affiliation. The secondary characteristics include educational status, socioeconomic status, occupation, military experience, political beliefs, urban versus rural residence, enclave identity, marital status, parental status, physical characteristics, sexual orientation, gender issues, reason for migration (sojourner, immigrant, or undocumented status), and length of time away from the country of origin” (p.3).

For the purposes of this article, we have selected a definition of culture that includes many agreed upon elements, that is, “patterned ways of thinking, feelings, acquired and transmitted mainly by symbols, consisting of the distinctive achievements of human groups” (Kluckhohn, 1951a, p. 86 note 5 as cited by Hofstede, 1981, p. 23). Culture is often confused with race, which categorizes people based on their “physical appearance, name, language, history, religion, nationality”, and also ethnicity, which categorizes people based on their biological characteristics (Isaacs, 1975, p.386). In turn, cultural

variation reflects a collection of variables that define the uniqueness of individuals within groups based on race, ethnicity, symbols, traditions, language, and customs (Kim, 1993).

Cultural sensitivity is another key construct fundamental to health promotion research. It can be defined as “sensitivity to the characteristics of a culture or to the dynamics of a social group” (Marin, 1993, p.151) and is achieved with increased awareness of cultural differences in relation to norms, beliefs and values (Ridley, Mendoza, Kanitz, Angermeier, & Zenk, 1994). Sensitizing researchers about their views in relation to their cultures increases their awareness of cultures other than their own. Also researchers who are aware of their personal biases may more likely identify their biases when studying other cultures.

This article examines the proposition that health promotion research is often cross-cultural serendipitously as well as by design. We argue that by systematically considering the impact of culture on the elements of their study proposals, investigators can augment their outcomes. Specifically, we describe how variation across cultures can be considered within a study including the conceptualization of research questions or hypotheses, sampling with respect to methodology, and in constructing and administering tools such as surveys and interviews. In describing these elements, we provide multiple examples of how cultural factors affect the interpretation of a study’s results.

2.2.1. Culture and Research Paradigms

Qualitative researchers argue that qualitative methods are those of choice for universal studies designed to explore the influences of social, cultural and historical contexts on health (Veugelers & Kephart, 2001). Given that physical, mental and emotional wellbeing are influenced by cultural contexts, culture in itself has become of greater interest in health studies (Boddington & Raisanen, 2009). Similar to the evolution

of universal health as a construct that accounts for cultural variation in health disparity or unequal delivery of healthcare, researchers in health disparity are adding “socio-cultural beliefs and values” to their definition of health disparity (Fink, 2009, p. 354). The same trend can be observed in measures designed to examine quality of life, one’s subjective experience of one’s health overall (Saylor, 2004). Favouring one theoretical approach over others should not necessarily limit adopting culture into health promotion research. Rather, a study’s goal(s) and objective(s) shape the way culture informs its methodology.

2.2.2. Culture in Health Promotion Research

Culture can be conceptualized as either static or dynamic (Aneas & Sandin, 2009). Static aspects of culture “remain relatively constant” whereas the dynamic aspects of culture “shift over time” (Martin & Nakayama, 2010, p.75). For instance, based on the dynamic perspective, relationships “are constantly in flux, responding to various personal and contextual dynamics” (Martin & Nakayama, 2010, p.391), and individuals’ identities changes over time. The static perspective, on the other hand, is based on the premise that relationships are structured by cultural ideologies and identities are fixed entities within individuals (Martin & Nakayama, 2010). In short, culture is a dialectical conception (Martin & Nakayama, 2010). In contrast to the dynamic conceptualization of culture that perceives culture as homogenous, and relationships and individual identities as changing in response to changes in time and contexts, the static culture involves homogeneity, predictable relationships, and generalizability from individual-based experiences (Levy, Plaks, Hong, Chiu, & Dweck, 2001).

Because the dialectical nature of culture can be challenging to researchers, scholars of culture have suggested quantitative tools to study the static aspects of culture and qualitative methods to study the dynamic ones (Aneas & Sandin, 2009). When studying

nutritional behaviours among cultural groups, for example, demographic characteristics such as religion and ethnicity can be quantified as predictive variables. If a researcher wants to examine how religious beliefs affect eating patterns of a cultural group however, qualitative methods may be preferable. Until recently, biomedical research relied almost exclusively on quantitative methods. This may be reflected by the reductionist analysis and the belief that objective reality is achieved by controlling external factors to study the variables of interest. Alternatively, others argue that reality is framed by “a complex interaction between the objective and subjective worlds” (Eckersley, 2007, p.194) and culture in itself is a primary predictor of health.

Given these trends, we argue that attention to culture-related variables at all levels across various types of research studies could augment not only their scientific rigor but also the richness of their quality. To illustrate these points, we describe examples at these various levels, i.e., inception of a study and formulation of its research questions, the design, sampling, analysis, and interpretation of the study results.

2.3. Culture as a Variable in the Research Processes

According to Hofstede (1980), cultures can be classified in relation to their characteristics with respect to individualism versus collectivism, masculinity versus femininity, power distance, and uncertainty avoidance. These characteristics are known as cultural dimensions to the description of cultures. Cultural dimensions have been useful tools to study cultures.

Individualism versus collectivism refers to “the form of the relationship between the individual and the collectivity in a given society” (Bochner & Hesketh, p.236). Based on these two opposing notions, people from Asian cultures like Japan are collectivistic and they “give priority to in group goals rather than to personal goals” (Triandis, 2004, p.90).

In some circumstances however, individuals can have both individualistic and collectivist traits if they grew up in collectivistic cultures and later lived in individualistic cultures or the reverse happened (Triandis, 2004). Moreover, prosperity and affluence in collectivistic cultures make people more adaptable to individualistic traits over time (Triandis, 2004).

Similar critique applies to other dimensions of culture. Masculinity versus femininity refers to the definition of gender roles in a culture in relation to the biological sexes of men and women. In masculine cultures, men are expected to be “assertive, ambitious, and competitive, to strive for material success” whereas women are expected to care for the domestic chores and their families. In feminine cultures, gender roles of men and women are overlapping and not necessarily defined by their biological sexes (Hofstede, p.390). With women having comparable education to men in masculine cultures, however women are adapting to social roles that are similar to men’s. Masculine societies are gradually becoming feminine, and the distinction between masculinity and femininity is dissipating.

Other dimensions of culture are power distance, defined as “the degree of inequality existing between a less powerful and a more powerful person” (Bochner & Hesketh, 1984, p.235); and uncertainty avoidance, which refers to societal tolerance of ambiguity and uncertainty. According to these two notions, Asian cultures like Japan are distinguished from western cultures like the United States by being hierarchically structured and regulated by tight rules and norms (Triandis, 2004). As cultures modernize and astride to democracy however, power is being distributed and cultures are becoming closer with respect to accepting diverse rules from various groups in a given society.

In the following sections, we examine the role of cultural factors at each level of the health promotion research process.

2.3.1. The Research Problem

Typically, scientific studies first conceptualize the research problem. Intercultural studies classify research methods in two categories. The culture-specific (emic) approach is where the research problem focuses on a particular culture and generalizations made within the contextual boundaries of that particular culture (Aneas & Sandin, 2009; Morris, Leung, Ames, & Lickel, 1999). For example, the findings of a study on the relationship between religious beliefs and eating preferences of a Buddhist community in Canada may be distinct from the findings of a similar study with a sample of Buddhists in Thailand. Another way to study the relationship between religion and eating preferences is to use demographic data to determine whether people's adherence to their religion predicts such preferences. Using demographic information to study culture in this manner is referred to as a culture-general (etic) approach (Aneas & Sandin, 2009; Morris, Leung, Ames, & Lickel, 1999). In this view, the goal is usually to understand the impact of culture on people's attitudes and behaviours (Aneas & Sandin, 2009; Schaffer & Riordan, 2003). To further illustrate this point, an Israeli study examined parents' compliance with home rehabilitation therapy for children with disabilities. Bedouin parents tended to adhere less to home therapy for their children than Jewish parents (Galil, Carmel, Lubetzky, Vered, & Heiman, 2001). Because these findings cannot be generalized to Jewish and Bedouin parents in countries other than Israel, these findings could be used to make cross-cultural comparisons (Aneas & Sandin, 2009; LeCompte, 1982). In the example of eating preferences in Buddhist communities, Buddhist communities in Canada can be compared with those in Thailand. Such comparisons may elucidate

similarities and differences among cultures and expand knowledge.

2.3.2. Sampling

Sampling techniques in cross-cultural research are governed by two rules. One, an identical representation of a culture is only achieved when the population of that culture is homogeneous (Lonner & Berry, 1986; Ember & Outterbein, 1991; Sekaran, 1983). Two, the purpose of a study and the distinctiveness of study participants are two determinants of the sampling methods (Lonner & Berry, 1986; Sivakumar & Nakata, 2001; Sekaran, 1983). Contrary to the traditional belief that random sampling is more representative of a population than structured sampling, in cross-cultural studies, where the aim is to make comparisons based on culture, structured sampling such as stratified sampling and systematic sampling may be more justifiable.

Systematic sampling in biomedical research will improve a study's reproducibility. By replicating a study across cultures, researchers can better assess the generalizability of their findings. Complex cultural factors in scientific studies of experimental designs can be measured by systematic sampling of the target population. Systematic sampling in scientific research will enable researchers to define the uniqueness of the study sample and later replicate the study. Non-random sampling techniques, e.g., convenience and purposive sampling, can be useful to systematically define the culture of a population in health promotion research.

Cultural dimensions are less apparent in cultures where immigration is in flux. When people emigrate, they experience a range of enculturation processes. Although some become more acculturated through successive generations, others choose to live in enclaves for expediency, and the transmission of their traditions including religion and language continue to be transmitted from one generation to the next (Landis, Bennett, &

Bennett, 2004). The degree to which each generation is acculturated to the adopted country's traditions varies widely, thus, cannot be assumed. One means of sampling individuals from cultural groups in western countries is to categorize them as traditional, transitional and acculturated (Lonner & Berry, 1986; Hubert Snider, & Winkleby, 2005).

With respect to immigration to Arab countries, immigration to these countries has diversified communities and, in places, has contributed to ethnic and cultural segregation. This has given rise to discrimination and other social problems. Fargues (2011) argues that expatriates living in Arab countries have limited residential rights. Expatriates in the Arab countries are foreign workers with temporary residencies, low job security, and not allowed to have an access to citizenship or participate in the society (Fargues, 2011). Arabs interact with foreign workers in the workplace only; foreign workers in Arab countries are integrated into the economic structure but excluded from the social one (Skok, & Tahir, 2011; Forgoes, 2011). The transition from the traditional structures from the time Arabs lived as tribes to modern times post oil discovery, may contribute to Arabs attitudes to the treatment of immigrant workers as minorities (Forgoes, 2011).

Selecting a sample representative of a culture varies with and within the social and political situations of the countries where cultural groups are targeted. For instance, the culture of Arab countries such as Iraq, Kuwait and Saudi Arabia are more homogeneous than western cultures. This assumption is attributed to the fact that Arab countries are unified by one language, religion, and ethnicity whereas in western countries, immigrants come from multiple ethnic and religious backgrounds with various cultural norms and values (Harris, Gleason, Sheean, Boushey, Beto, & Bruemmer, 2009; Lonner & Berry, 1986; Trimble, 1990).

When sampling, researchers need to distinguish ethnicity and culture as overlapping constructs. Ethnic categories such as race, language and nationality can be used to represent elements of a culture but not define it (Bradby, 2003). In the previous example, people in Arab countries more likely descend from one ethnic category, whereas in a mosaic culture such as the United States and Canada, an American or Canadian can be virtually of any ethnicity or combination of ethnicities. Sampling in multicultural countries constitutes unique methodological considerations. Because of practical considerations and resources, e.g., convenience and time, however, optimal sampling may be compromised. Nonetheless, it behooves researchers to address this as a limitation.

Contemporary health promotion research largely depends on volunteers. Volunteers are often recruited through posters and signs in public places and clinics. Readers of the advertisement self-select and decide whether to phone or contact a research coordinator. Although common practice in western cultures this method may be a barrier to recruitment in other cultures. First, it relies on an individual having the necessary literacy skills to understand the poster. Second, volunteering for research studies is not a common practice in non-western cultures due to factors such as trepidation and distrust. Third, should an immigrant respond to the notice, it is likely that a base level of communication skills is required, and potential participants can be excluded at this stage due to inadequate communication skills which are important for safety, following instructions and adhering to a regimen. Fourth, adhering to a regimen and/or the requirement to return for a follow-up visit can be foreign to people in some cultures. Fifth, signing a consent form can be daunting and formidable for people in some cultures, thus may discourage participation. Overall, recruiting study participants through self-volunteering, e.g.,

responding to notices and posters (which respects individuals' right to select and not be coerced), may exclude potential immigrant groups who comprise the mainstream population; or, in other cultures, will only attract a minimal number of participants, potentially educated or familiar with this as a western practice.

Comparable to variations among cultures, individual differences within cultural groups warrant consideration. For example, one way of sampling adolescents to study their sexual practices is clustering regions of a geographic region into strata and randomly selecting schools from each region. Random selection of students from each school however does not exclude differences with respect to sexual beliefs, views and practices as a result of individuals' acculturation experiences. One way to measure the impact of acculturation experiences in this example is to replicate the study in another age group, e.g., university students and comparing the results of both age groups. A key question is 'how can we ensure a representative sample of students when their identities change over time through their acculturation experiences?' Answering this question makes the traditional way of categorizing individuals based on the duration of their acculturation experiences spurious.

2.3.3. Surveys

Familiarity with a nation's research enterprise through media reports on biomedical breakthroughs varies within and between cultures. People in cultures that have less exposure to the translation of research advances or access to media reports about findings of health promotion research may be less comfortable with the research process. This is supported by the work of Barata, Gucciardi, Ahmad, & Stewart (2006, p.487) who noted that "lack of accessibility due to fewer opportunities to hear about individual research projects" makes people suspicious of researchers and unwilling to participate. Moreover,

in cases where researchers are from cultures different than the culture of participants, participants may be concerned about the image of their culture and withhold responses that portray their culture negatively (Sekaran, 1983). Researchers therefore need to establish rapport and trust with study participants to make them comfortable with the process and willing to provide valid information. Interestingly, using incentives to encourage participation may not work well across cultures. Whereas people in western cultures often welcome incentives, particularly financial, some cultures view incentives suspiciously as a bribe and being offensive (Rosenthal, 1963).

In accordance with the universal code of ethics, the Helsinki Declaration has highlighted cultural differences to researchers that could lead to participant exploitation (WMA Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Subjects). Participants are not exempt from giving their consent to participate in cultures where people are illiterate. In this case, researchers need to explain the study to participants transparently including a literate advocate or family member who could consent and sign as needed on a person's behalf.

In cross-cultural studies, translation approaches usually provide semantic rather than literal translation. Translators pay particular attention to the equivalence of concepts, items, and measures such as scales and factor scores (Sperber, Devellis, & Boehilecke, 1994). An established translation method is back translation where translators with proficiency in the two dialects/languages translate research items from the source language to the target one (McGorry, 2000). Then, translators translate the items back to the original language. In this way, culturally insensitive items can be revised, as well as their validity evaluated based on systematic comparison of the original version and the

back translated version. Providing a dialectical translation to research consent forms may help illiterate participants to better understand the research process and their rights to withdraw before giving consent to participate.

2.3.4. Interviews

Participants' responses to questionnaires or interview questions are reflected by their cultural values or what is called "cultural response set" (Matsumoto, 1994; Clarke, 2001; Fischer, 2004). In Chinese culture, for instance, inner strength may be viewed as a virtue and ill health caused by sins committed by the ill person or his or her family (Waxler-Morrison, Anderson, Richardson, & Chambers, 2005). To avoid embarrassment and save face, Chinese people may avoid acknowledging pain to healthcare providers (Waxler-Morrison, Anderson, Richardson, & Chambers, 2005). Although the impact of cultural response set is not always avoidable, researchers can minimize its influence by being aware of participants' cultural attitudes (Matsumoto, 1994; Fischer, 2004).

A noteworthy example of cultural attitudes toward health is the stigma associated with psychological and neurological illnesses in South East Asian cultures. In these cultures, the parents of children with mental health problems may hide related diagnoses from healthcare providers to save face and protect their children's marriage prospects (Waxler-Morrison, Anderson, Richardson, & Chambers, 2005). Similar attitudes have been reported in Middle Eastern cultures where people may be unwilling to admit psychosocial complaints to avoid social stigma (Hamdan, 2009; Harakati, Shaheen, Tamim, Taher, Al Qublan, & Al Sayyari, 2011; Becker, 2004). Stigma in these cultures encourages people to use socially acceptable forms of illnesses such as headache and fatigue to report consciously or unconsciously their psychosocial health problems (Al-

Krenawi & Graham, 2000). Knowledge of such attitudes can help to reduce response bias and potentially invalid responses and results.

Another example that illustrates the need for researchers to understand cultural considerations is the issue of cultural attitudes toward gender. In some Muslim cultures, men may prefer to confer with men, and women with women (Al-Shahri, 2002). In Bedouin cultures, women are expected to veil their faces and not expose their faces to men, even in the form of a photograph (Yehia, 2007). In both situations, researchers are advised to modify their research process in a way that does not violate these cultural norms. Muslim participants should decide on whether researchers of the same gender will interview them and whether they prefer to be segregated on this basis. When using Photovoice® method (Wang, Yi, Tao, & Carovano, 1998) with Bedouin women, researchers need to inform female participants if male researchers will view their photographs. Women may not agree to participate in such a study thus, informing them of such a possibility before they sign consent is ethically required. Cross-cultural research ethics highlight the need to modify research methods to the cultural needs of the people being studied.

To be culturally sensitive, we recommend paying attention to the language used by researchers when examining cultures. In questionnaires, researchers may need to avoid using both medical terms and questions directly addressing mental health. Instead of asking participants, for example, “Have you ever been diagnosed with depression?” a researcher might ask, “Have you ever been diagnosed with health problems related to your mood?” Engaging participants in pilot work before initiating the study will help researchers ascertain participants’ cultural attitudes and avoid language that may lead

participants to give biased responses. Communicating with participants will help to develop trust and rapport.

2.4. Conclusion

Because culture profoundly impacts health, lifestyle choices, perception of healthcare, and health seeking behaviour, cultural factors need to be considered in designing health promotion studies. However, the dimensions of culture remain hotly debated, which contributes to challenges in describing how cultural variations need to be considered in health research particularly health promotion. Health care researchers could benefit from cultural knowledge to date although this remains limited, given that they are not trained as interculturalists. In this article, we described how researchers can account for cultural variations in their studies and could minimize serendipitous contaminating cultural factors and skewing the results in some unforeseen way. We discussed issues related to cultural variation throughout a study's process including its inception and research questions or hypotheses, methods of sampling, and developing and administering surveys and interviews. Given that lifestyle-related conditions are closely associated with cultural factors and are a global priority, we propose that cultural factors be addressed in health-related studies. Finally, the interface between health care and cultural factors points to a rich and fertile collaboration between health practitioners and researchers, anthropologists, sociologists, and others in intercultural studies in the pursuit of best practices in health care.

3. STUDY ONE: LIFESTYLE-RELATED HEALTH BELIEF AND BEHAVIOURS OF SAUDI WOMEN LIVING IN DAMMAM

3.1. Introduction

The incidence and prevalence of lifestyle-related conditions such as ischemic heart disease, smoking-related conditions, hypertension, type 2 diabetes mellitus (T2DM), and obesity continue to increase in Saudi Arabia (Al-Nozha et al., 2007; Al-Nozha et al., 2004b; Al-Nuaim et al., 1997; Al-Rajeh, Awada, Niazi, & Larbi, 1993). Saudi women have a higher prevalence of obesity than men, which increases their risk of lifestyle-related conditions like T2DM (Al-Nuaim et al., 1997). T2DM and obesity have become prevalent in Saudi women constituting substantial social and economic burdens (Al-Nozha et al., 2007; Al-Nozha et al., 2004b; Al-Nuaim et al., 1997; Al-Rajeh, Awada, Niazi, & Larbi, 1993). Because Saudi women are restricted from public physical activities and they are expected to center their roles at their homes, their health needs are distinct from those of men (Abahussain & El-Zubier, 2005). Overall, lifestyle-related conditions among women in Saudi Arabia are influenced by social, cultural, and religious factors however these factors are rarely addressed in literature in relation to health (Khatib, 2004, Al-Khaldi & Khan, 2000; Al-Hussein, 2008).

In the interest of increasing attention to the impact of Islamic teachings on health, the World Health Organization has initiated an Islamic perspective on health promotion (World Health Organization, 1996). In this respect, health promotion will address the context of Islamic faith to disseminate health messages (Ide & Sanli, 1992, World Health Organization, 1996). In Saudi Arabia, the degree to which cultural and religious factors impact Saudi women's lifestyle-related health beliefs and behaviours is unclear. For this study, thus, we were interested in examining Saudi women's self-reported health status,

their lifestyle-related health beliefs and behaviours, and their understanding of related Islamic teaching, to serve as a basis for designing and implementing a T2DM education program based on international standards and adapted to the cultural and religious contexts of Saudi women.

3.2. Research Objectives

3.2.1. Primary Objectives

With respect to Saudi women and lifestyle-related conditions:

1. To examine their self-reported health profile.
2. To elucidate their lifestyle-related health beliefs and behaviours
3. To examine their understanding of Islamic teachings in relation to health behaviours

3.2.2. Secondary Objectives

1. To inform recommendations for a subsequent study, Study Two, to explore the outcomes of a pilot study of a T2DM education program based on international standards and adapted to the cultural and religious contexts of Saudi women

3.3. Methods

The research proposal was reviewed by the relevant institutional ethics boards, namely, the University of British Columbia and the Saudi Administration of Medical Research. Participants provided informed consent and were assured confidentiality of their responses.

3.3.1. Sampling Frame

There were no existing data on which to base a power analysis and to derive a sample size, thus, a descriptive exploratory study was conducted based on sample size estimates

from studies conducted in other countries in the region. Comparable health surveys in Kuwait and Singapore have reported sampling sizes ranged from 50 to over 800 (Li, Peng, Bodner, Dean, in preparation; Alfadley, Al-Mazeedi, Bodner, Dean, in preparation; Wong et al., 2012). The one study that described Saudi women's knowledge and beliefs about illnesses was based on a sample size of 50 women (Ide & Sanli, 1992). For our preliminary study in Saudi Arabia, we selected an intermediate sample size (N=400) that could be used to estimate sample size in subsequent studies.

3.3.2. Sampling and Recruitment

The study consisted of a cross-sectional survey questionnaire. The primary investigator interviewed women from Dammam, the capital city of the Eastern Province in Saudi Arabia. This province is one of the largest populated regions in the country. The most recent census (2004) reported that its population was 3,360,031 and in Dammam was 745,658 (Central Department of Statistics & Information). The study was conducted over 6 months.

Sequential convenience sampling was used. A sample of 407 Saudi women was selected. The number of participants was proportionately selected based on the number of visiting patients to the 21 primary health centers in Dammam. Since the establishment of primary health clinics in Saudi Arabia, each family is registered with a primary health clinic in its residential neighborhoods. Using proportional sampling (i.e., the number of visitors registered at each center in proportion to the overall number of visitors at all centers in Dammam), the number of women was proportionally selected from each center (Appendix 2).

Inclusion criteria were women, 17 years of age and over, living in the residential areas of Dammam, Saudi Arabia, where the health centers were located. Exclusion criteria

were the inability to complete the survey questionnaire interview based on preliminary screening to assess cognition (specifically, whether the respondent was able to indicate reasonable knowledge about requirements of the survey questionnaire as it was explained, and respond to basic demographic information, e.g., age, marital status, and occupation). Ten women participated in piloting the survey questionnaire and ensuring that participants were able to respond to all questions within the Saudi context.

Eligible women were approached for potential face-to-face interviews with the primary researcher who was responsible for collecting the survey questionnaire data, for consistency in the data collection. Participants were approached sequentially in the waiting rooms of the participating general health centers. Participants in the waiting areas were visiting the clinics for reasons such as their children's checkups, to accompany a family member or a friend, or to see doctors for their own medical checkups.

3.3.3. Survey Questionnaire Construction

The survey questionnaire was mostly a composite of other established and published questionnaire surveys. These were modified somewhat to be culturally appropriate. To examine the effectiveness of this, the closed-ended and open-ended questions were piloted with ten women. Section 3 in the survey questionnaire was extracted from a survey questionnaire study conducted in the neighboring Gulf State of Bahrain titled "National Non-communicable Diseases Risk Factors Survey 2007, Kingdom of Bahrain" and was validated by the World Health Organization. The other sections of the survey questionnaire were based on a tool that was trialed in other countries such as Singapore (Wong et al., 2012) and in China and Kuwait (Li, Peng, Bodner, & Dean, in preparation; Alfadley, Al-Mazeedi, Bodner, & Dean, in preparation).

The survey questionnaire consisted of six sections of closed-ended and open-ended questions. The sections were demographic data, self-reported health status, lifestyle-related health behaviours, lifestyle-related health beliefs for the overall health, beliefs related to diabetes prevention and management, and understanding of health-related religious teachings. The survey questionnaire appears in Appendix 1. It was designed to be completed within twenty minutes.

Section 1 of the survey questionnaire included closed-ended questions related to demographic data, i.e., gender, age, height, weight, education, marital status, and number of children. To the best of our knowledge, no national data for the scaling of income in Saudi Arabia exists. We therefore used our local knowledge and data of average monthly income by job category and region in Saudi Arabia to categorize income (Salary Explorer, 2012; Pay Scale, 2013). To assess participants' socioeconomic status, thus, income was grouped into four categories ranging from low income (<SR 3,000/month) to high income (>SR 10,000/month).

Section 2 assessed participants' self-reports of their health status with closed-ended questions. The first question in this section was related to weight with answers on a 3-point scale ranging from 'underweight' to 'over weight' and 'I don't know' answer. The next three questions were related to heart rate, blood pressure, and blood sugar with answers on a 3-point scale ranging from 'low' to 'high' and 'I don't know' answer. The fifth question was related to health status with answers on a 5-point scale ranging from 'excellent' to 'poor' and 'I don't know' answer. The sixth question in this section was related to morbidities with 'yes' or 'no' answers. Section 3 consisted of closed-ended questions to assess participants' lifestyle-related health behaviours: a. physical activity

and exercise; b. diet and nutrition; c. smoking behaviours; d. stress and sleep behaviours. Section 4 consisted of closed-ended questions to assess participants' lifestyle-related health belief for the overall health: a. physical activity and exercise beliefs; b. diet and nutrition beliefs; c. smoking beliefs; stress and sleep beliefs. Section 5 consisted of closed-ended questions to assess participants' beliefs related to the prevention and management of diabetes. Section 6 consisted of open-ended questions to assess participants' understanding of health-related religious teachings; the sayings of the Qur'an and Hadith about physical activity and exercise, diet and nutrition, smoking, stress and sleep, and health and healthy living.

3.4. Data Analysis

3.4.1. Quantitative Data

Descriptive statistics (SPSS v20.0.0) were used to analyze data for the sections of the survey questionnaire with closed-ended questions and discrete responses. Tables and graphs were used to show frequencies, mean, median, and mode of the variables of interest.

3.4.2. Qualitative Data

Atlas.ti®, a software program, was used to code and organize the qualitative data from the open-ended questions in Section 6. The responses to these questions were coded and analyzed based on key words and phrases in accordance with the thematic analysis approach (Braun & Clarke, 2006). This approach facilitated the classification of data into categories for collation. Themes were then processed in Excel for frequency of occurrence.

3.5. Results

3.5.1. Response Rate

Of 480 women approached, completed survey questionnaires were obtained from 407. Refusals were due to time constraints, lack of interest, being sick at the time, or looking after a sick child. Tables 3.1 to 3.29 show the results of participants' socio-demographic characteristics, their age, height, and weight, health profiles, physical activity behaviours, nutritional behaviours, stress and sleep behaviours, lifestyle-related health beliefs, and finally their beliefs about the importance of a healthy lifestyle for the prevention and management of diabetes.

Participants' responses to Section 6 questions, the sayings of the Qur'an and Hadith about good health (i.e., physical activity and exercise, diet and nutrition, smoking, stress and sleep, and health and healthy living, cultural and religious quotes about lifestyle-related health, suggestions and advice to maintaining good health) are shown in Tables 3.30 to 3.35. Frequencies of the quoted Qur'anic verses and Hadith sayings are also included. Our data are based on participants' self-reporting of their age, weight, and height. The accuracy of participants' reporting was not examined.

3.5.2. Demographic Data

The majority of participants reported they were between the ages of 17 and 30 years (54.1%), their heights between 155 to 178 cm (64.1%), and their weights between 55 and 75 kg (61.2%). Table 3.1 shows participants' demographic characteristics with means and standard deviations.

3.5.3. Subject Characteristics

The majority of respondents were married (80.8%), had 3 to 8 children (54.1%), had secondary school education or lower (57.2%), were homemakers and unemployed

(55.9%), had their guardians or husbands as a primary source of income (65.7%), and were in the middle-income category (35.8%). Participants' demographic characteristics appear in Table 3.2.

3.5.4. Health Status

The majority of respondents reported their weight was normal (44.0%), their resting heart rates was normal (80.5%), their blood sugar was normal (89.1%), their blood pressure was normal (82.5%), and their health was average (44.4%). Participants' reporting of their health measures and general health appears in Table 3.3.

3.5.5. Health Conditions

In total, 35 health conditions were reported by participants. The most common health conditions reported were anaemia (19.4%), irritable bowel syndrome (19.9%), and irregular menstrual cycles (18.9%). Tables 3.4 and 3.5 show participants' reports of their morbidity.

3.5.6. Physical Activity Behaviours

The majority of participants (98.3%) responded with yes to the question "Do you do physical activity for more than 10 minutes daily?" Of all participants, 51.3% reported performing moderate activities such as brisk walking, riding a bike or carrying objects of lightweight, and only 9.8% reported performing strenuous physical activities such as running or carrying heavy objects. Table 3.6 shows the types of physical activities reported. Table 3.7 shows the means and standard deviations for the amount of time participants reported spending to performing various physical activities.

3.5.7. Nutrition Behaviours

Poor nutrition habits reported by participants were: low consumption of brown bread (36.9%), high consumption of soft drinks (62.8%), low consumption (less than 6 to 7

times a week) of fresh fruit (67.3%) and vegetables (51.1%), and low consumption of nuts and legumes (89.9%). Poor nutrition habits are highlighted in Tables 3.10, 3.11, 3.12, 3.16, and 3.21.

3.5.8. Smoking, Stress, and Sleep Behaviours

Most participants reported healthy behaviours with respect to smoking and sleep behaviours. Most participants (97.7%) reported they did not smoke and over half of the participants (60.9%) reported that they slept soundly. On the other hand, the majority of participants (89.0%) reported their stress levels as moderate to high. Participants' reporting of smoke, stress, and sleep behaviours appear in Table 3.25.

3.5.9. Health Beliefs

The majority of participants believed that exercise (99.2%, 98.5%), nutrition (99.7%, 99.7%), smoking (98.5%, 93.9%), and stress (97.2%, 97.7%) impact health in general, and affect the management for treatment of diabetes in particular, respectively. Participants' responses under this section appear in Tables 3.22 and 3.23.

3.5.10. Quotes Reported by Participants

At the end of the survey questionnaire, participants reported their health priorities, the implications of Islamic teachings of health behaviours, proverbs on health, health advice, social and cultural barriers to health behaviours, and a reform to the social structure. Participants' quotes are listed in Table 3.35.

3.6. Discussion of the Results in Relation to the Study Objectives

3.6.1. Participants' Health Profiles with Special Reference to Lifestyle-related Conditions

Ours is the first study to provide a detailed description of Saudi women's lifestyle-related health beliefs and behaviours. Most apparent in Saudi culture with respect to

health is the escalating rate of overweight and obesity, both established risk factors for T2DM (Badran & Laher, 2012; Musaiger, 2011). Obesity and its related conditions continue to increase among women and men in Saudi Arabia and other Arab Gulf countries (Badran & Laher, 2012; Musaiger, 2011). AL Qauhiz (2012) reported an increase in obesity among Saudi female university students in Riyadh. Of participants in her study, 31.4% were overweight (AL Qauhiz, 2012). Similar weight patterns were observed among men in the Qassim region of Saudi Arabia (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010). In our study, 38% of participants reported that they were overweight, and 10.9% reported not knowing their weight.

In addition to those who reported not knowing their weight, 43.2% did not know their height. Not reporting their weight, we propose, could be attributed to women avoiding embarrassment should they have a negative body image. Other studies suggest that husbands' perceptions of their wives' weights can influence women's images of their bodies (Sotoudeh, Khosravi, Karbakhsh, Khajehnasiri, & Khalkhali, 2008, p.99). Similar trends have been observed in Saudi women. In a study conducted in Saudi Arabia, 33.8% of obese women considered their weights to be normal (Rasheed, 1998). In general, awareness of the relationship between weight and height and its related impact on health among Saudi women is lacking. More attention on women's awareness of their body mass index and how it influences their lifestyle-related behaviours is needed.

People in Saudi Arabia can be at risk of or having T2DM without their knowledge (Al-Baghli, Al-Turki, Al-Ghamdi, El-Zubaier, Al-Ameer, & Al-Baghli, 2010). A recent study conducted in the Eastern Province of Saudi Arabia reported that in a random screening for T2DM, 30.4% of those who were screened were diagnosed with T2DM

(Al-Baghli, Al-Turki, Al-Ghamdi, El-Zubaier, Al-Ameer, & Al-Baghli, 2010). We propose that some overweight participants in our study may have had T2DM but were unaware. The Saudi public likely lacks awareness of obesity as a risk factor for T2DM.

A recent study of Saudi women showed that in addition to obesity, low dietary calcium and vitamin D contribute to bone impairments (Rouzi, Al-Sibiani, Al-Senani, Radaddi, & Ardawi, 2011; Alissa, Qadi, Alhujaili, Alshehri, & Ferns, 2011). Despite considerable amounts of sunshine in Saudi Arabia, vitamin D deficiency is alarmingly high among women in Saudi Arabia (Kanan, Al Saleh, Fakhoury, Adham, Aljaser, & Tamimi, 2012; Ardawi, Qari, Rouzi Maimani, & Raddadi, 2011), and studies support that increased vitamin D intake could curb T2DM risk factors (Maxwell & Wood, 2011). Furthermore, strategies are needed to enable women to access more sunlight, given their traditional clothing and their limited access to outdoors. Rheumatoid arthritis as well as bone conditions are also prevalent among women in Saudi Arabia (Attar & Al-Ghamdi, 2009; Pereira, Peleteiro, Araújozya, Brancoxa, Santoska, & Ramoszya, 2011) and both were prevalent in participants in our study, where 13.7% reported having rheumatoid diseases, 6.4% had osteoarthritis, 1.2% had osteoporosis, and 3.2% had other bone conditions. The prevalence of osteoarthritis among participants of our study is consistent with research findings that osteoarthritis increases with age. For example, in a study in the Qassim region of Saudi Arabia, the onset of knee osteoarthritis increased with age and 30.8% of participants between 46 and 55 years of age had the condition (Al-Arfaj et al., 2002). Obesity is believed to be a leading factor contributing to osteoarthritis and related bone conditions in women (Asokan, Hussain, Ali, Awate, Khadem, & Al-Safwan, 2011).

Hematological conditions are alarmingly prevalent among Saudi women (AlQuaiz, Abdulghani, Khawaja, & Shaffi-Ahamed, 2012). This was confirmed in our study in which women (21.1%) reported having such a condition. Some of these conditions are genetic such as sickle cell and G6PD (Jastaniah, 2011). Others are related to iron deficiency and low hemoglobin (AlQuaiz, Abdulghani, Khawaja, & Shaffi-Ahamed, 2012). The latter conditions are prevalent among female adolescents and women of child bearing age and are largely preventable with lifestyle modifications such as weight loss, consuming natural foods high in iron, and exercising (Jalambo, Hamad, & Abded, 2012).

Menstrual irregularities are common among women in Saudi Arabia particularly in those who are obese (Al-Nuaim, 2011). One fifth of our study participants (18.9%) reported menstrual irregularities. Obesity and psychosocial distress are believed to be contributing factors to menstrual irregularities and pre-menstrual pain (Al-Nuaim, 2011). Stress also contributes to gastrointestinal conditions such as irritable bowel syndrome (Humaida, 2012). One fifth of our study participants (19.9%) reported having irritable bowel syndrome.

3.6.2. Participants' Lifestyle-related Health Behaviours

(a) Nutrition Behaviours

With respect to nutrition, the consumption of whole grains in Saudi Arabia has decreased over recent time (Bakhotmah, 2012). Saudi women have been reported to be less partial to the taste of whole grains and tend to consume more refined cereals (Bakhotmah, 2012). This trend was supported by our findings in that only 36.9% of participants reported eating brown bread. Based on research findings, the source of fiber intake for people in Saudi Arabia continues to be mostly from vegetables, fruit, and cereals (Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012).

Kabsa, a traditional Saudi dish of rice and meat, is common and consumed by most people in Saudi Arabia (Bakhotmah, 2012, Midhet, Al Mohaimeed, & Sharaf, 2010; Alhemoud, 2011). Rice is “one of the oldest food sources [in the country and] has played a major role in the cultural, social and economic aspects of the lives of the Saudi people” (Alhemoud, 2011, p.93). Rice is consumed almost daily by Saudi people (Mohieldein, Alzohairy, & Hasan, 2011). In our study, participants reported consuming rice and bread almost daily. The pattern of rice consumption in Saudi Arabia can be explained by the way Alhemoud (2011) referred to rice as inferior. In other words, rice is an affordable food item for almost all Saudi people regardless of their socioeconomic status.

Traditional Saudi food such as *kabsa* and *ghee* (butter) contain large amounts of fat (Winter, King, Stafford, Winkleby, Haskell, & Farquhar, 2012; Bakhotmah, 2012; Midhet, Al Mohaimeed, & Sharaf, 2010). In our study, only 14.7% of participants reported using butter or margarine in food preparation. Further, all participants reported consuming chicken rather than red meat. Participants’ reporting of their consumption of chicken, shrimp, and fish appear in Tables 3.18 and 3.19. Our findings confirm the suggestion that “the intake of animal source foods is growing steady [and] poultry and eggs were more consumed compare to red meat, and fish less than that of poultry and eggs” (Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012, p.2).

Our study participants consumed nuts less frequently than eggs and legumes less frequently than nuts. Of those who reported 6 to 7 times per week consumption, only (29.3%) reported consuming eggs, 23.6% consumed nuts, and 10.1% consumed legumes. Similar pattern of legumes consumption among participants in our study has been reported among female university students in Riyadh (Abdel-Megeid, Abdelkarem, & El-

Fetouh, 2011). Of those students, only 5.5% consumed legumes on a daily basis and of the remained group, and 5.6% rarely consumed legumes (Abdel-Megeid, Abdelkarem, & El-Fetouh, 2011). Generally, consumption of eggs, legumes and nuts in Saudi Arabia and other Arab Gulf countries is lower than that recommended for optimal health (Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012).

Dates, a traditional nutrient source that is rich in sugar, are consumed almost daily in Saudi Arabia (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010; Winter, King, Stafford, Winkleby, Haskell, & Farquhar, 2011). Bakhotmah (2012) reported that “Most Saudis were Bedouin Arabs who lived in a wide dry country with limited resources. They relied on consuming the available foods in their environment which included dates as the main fruit” (p.321). The majority of our study participants reported consuming dates regularly.

Comparable to the nutrition trends of people in other Arab countries, the nutrition of Saudis “has shifted towards a high-energy-density diet with more fat and added sugar in foods” (Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012, p. 2). The recent influence of the western lifestyle on the Saudi culture is considered responsible for the increased consumption of fat and junk food in Saudi Arabia (Winter, King, Stafford, Winkleby, Haskell, & Farquhar, 2011; Alfawaz, 2012). Soft drinks are consumed widely in Saudi Arabia (Mohieldein, Alzohairy, & Hasan, 2011; Midhet, Al Mohaimeed, & Sharaf, 2010). In our study, over half of participants (62.8%) consumed soft drinks. Few participants (8.1%) reported heavy consumption of soft drinks. For example, 2.7% consumed 21 to 31 cans and 0.2% consumed 48 cans in a week. These findings suggest an association between consumption of soft drinks and obesity and T2DM among Saudi women.

The consumption of fruit and vegetables among people in Saudi Arabia and other Gulf countries is below daily-recommended requirements (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010; Bakhotmah, 2012; Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012). According to the Food-Based Dietary Guidelines for the Arab Gulf Countries (Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012), one should consume 3 to 5 servings of vegetables and 2 to 4 servings of fruit daily. Similar recommendations are based on cross-cultural food pyramids (Painter, Rah & Lee, 2002). In our study, 12.3% participants did not consume fruit and 6.1% ate no vegetables at all. Only 32.8% of fruit consumers and 49.0% of vegetable consumers reported eating fruits and vegetables respectively 6 to 7 times a week. Participants' reporting of their consumption of fruits and vegetables appear in Tables 3.15, 3.16, and 3.17. The nutrition profile of university students in Riyadh shows slightly lower consumption of vegetables (23.9% consumed vegetables daily) than our participants but, overall, a similar pattern of fruit consumption (Abdel-Megeid, Abdelkarem, & El-Fetouh, 2011). In the Jeddah region of Saudi Arabia, women acknowledged their low consumption of fruit and vegetables yet expressed interest in achieving the recommended servings (Bakhotmah, 2012). Low intake of fruit and vegetables by inhabitants of the Qassim and Riyadh regions of Saudi supports the overall low consumption of fruit and vegetables in Saudi women (AL Qauhiz, 2012).

Low dairy intake predisposes Saudi women to health risks (Alissa, Qadi, Alhujaili, Alshehri, & Ferns, 2011). Osteoporosis and bone conditions for example are prevalent among Saudi women who suffer from vitamin D deficiency and low calcium (Alissa, Qadi, Alhujaili, Alshehri, & Ferns, 2011; Attar & Al-Ghamdi, 2009). Overarching risk factors such as low calcium intake, physical inactivity, smoking, and wearing a face-veil

affect the absorption of vitamin D that contributes to bone conditions that are prevalent in Saudi women (Alissa, Qadi, Alhujaili, Alshehri, & Ferns, 2011; Kanan, Saleh, Fakhoury, Adham, Aljaser, & Tamimi, 2012; Rouzi, Al-Sibiani, Al-Senani, Radaddi, & Ardawi, 2011). To combat the prevalence of bone conditions in Saudi Arabia, medical scholars have suggested women increase their intake of calcium and vitamin D from milk and dairy products (Alissa, Qadi, Alhujaili, Alshehri, & Ferns, 2011; Kanan, Saleh, Fakhoury, Adham, Aljaser, & Tamimi, 2012). Despite these suggestions, the consumption of milk and dairy is still poor among Saudi women (Musaiger, Takturi, Hassan, & Abu-Tarboush, 2012). In our study, 23.6% of participant reported not drinking milk and 4.2% reported not consuming any dairy products. Participants' reporting of their consumption of milk and dairy appear in Tables 3.22, 3.23, and 3.24. Findings of studies of the nutritional practices of people living in the Riyadh region of Saudi Arabia reported that only about one third of study participants (29.5%) consumed milk daily (Al Qauhiz, 2010) and 36.1% of female consumers consumed full fat milk (Abdel-Megeid, Abdelkarem, & El-Fetouh, 2011). In Jeddah, on the other hand, women acknowledged their low consumption of milk and dairy and their wish to increase it (Bakhotmah 2012). Overall, Saudi health authorities need to consider launching health awareness campaigns addressing the importance of increasing the intake of milk and dairy products in Saudi Arabia to minimize the risk factors of vitamin D deficiency.

(b) Physical Activity Behaviours

The sedentary lifestyle of women in Saudi Arabia and its relation to obesity has been well discussed (Al-Eisa & Al-Sobayel, 2012; Rouzi, Al-Sibiani, Al-Senani, Radaddi, & Ardawi, 2011; Alissa, Qadi, Alhujaili, Alshehri, & Ferns, 2011). No data, however, exist on Saudi women's self reported physical activity. In our study, 51.2% of participants

performed moderate physical activity, and only 9.8% performed strenuous physical activity.

In Saudi Arabia, women are not permitted to drive and require a male guardian when they commute in some regions of the country. These constraints were identified as cultural barriers to Saudi women to be physically active outside their homes (Al-Eisa & Al-Sobayel, 2012). AlQuaiz and Tayel (2009) listed barriers to healthy lifestyle among Saudi women including women's lack of resources for accessing sports clubs, lack of determination and motivation, lack of time, and lack of social support. Women from lower socioeconomic backgrounds in Saudi Arabia are confronted with financial constraints such as membership fees for women-only sports clubs and/or the cost of transportation to such clubs (AlQuaiz & Tayel, 2009). Suggestions in overcoming the social and cultural barriers for women in Saudi Arabia for the prevention and management of lifestyle-related conditions include integrating physical activity into female education curriculum and integrating Islamic teachings into the education of physical activity in schools (Winter, King, Stafford, Winkleby, Haskell, & Farquhar, 2012).

(c) Smoking Behaviours

Smoking continues to increase in Saudi Arabia and neighbouring Arab Gulf countries (Musaiger, Takturi, Hassan, & Abu-Tarboush, 2012). "The smoking of *shisha* (water pipe) has [...] increased sharply in the region and become more acceptable in the community" (Musaiger, Takturi, Hassan, & Abu-Tarboush, 2012, p.4). In our study, only 1.7% reported smoking shisha and 0.5% smoked cigarettes. Moreover, a few participants (1.5%, 1.6%) respectively stated that smoking has no negative impact on health and quitting smoking is not important for the prevention and management of T2DM and its

complications. Although a small group, our participants and potentially Saudi women could benefit from more awareness of health risk as a result of smoking and the exposure to smoke.

(d) Stress Related Behaviours

Psychosocial conditions and mental illnesses have been reported to be prevalent among women in Saudi Arabia (Al-Gelban, Al-Amri, & Mostafa, 2009; Alqahtani & Salmon, 2008). Pressures of modern living and daily stresses contribute to somatic symptoms among Saudi women such as irritable bowel syndrome, gastrointestinal ulcers, and blood pressure problems (Alqahtani, & Salmon, 2008; Hassellund, Flaa, Sandvik, Kjeldsen, & Rostrup; 2011; Kanno et al., 2012). In our study, 57.3% of participants reported their stress as moderate, and 31.7% reported their stress as high. Stressors reported included conflicting demands between home and work, if they were employed. Stressors at home were attributed to taking care of children, schooling children, increased household chores but having no maids, conflict in relationships with husbands, family problems, and household responsibilities in general. At work, participants reported long working hours and increased job demands as stressors. Other stressors that participants reported included being obese, having illnesses and pain, addiction to caffeine, having husbands who smoke, having a sick family member, daily stressors, unemployment, lacking purpose in life, financial problems, housing problems, separation from loved ones, school demands, irritation, bad mood, psychosocial distress, worries, lack of sleep, unreasonable sadness, nervousness, fear and uncontrolled thoughts, thinking of future, time pressure, and other stressors they chose not to divulge. Comparable stressors to these reported by our participants have also been reported in Arab women in the United Arab Emirates (Hamdan, Hawamdeh, & Hussein, 2008).

A link between obesity and depression has been documented in Saudi women (Abdel-Fattah, Asal, Hifnawy, & Makhoulf, 2008). Based on these findings, Saudi women would benefit from education on establishing life balance and managing stress in their lives. Tailoring psychological approaches for the prevention and treatment of emotional and mental conditions to the socio-cultural contexts of people in Saudi Arabia and other Arab cultures was suggested (Ratner & El-Badwi, 2011; Sayar & Kose, 2012; Gearing et al., 2012).

(e) Sleep Behaviours

Few studies have examined sleep disorders in the people of Saudi Arabia. Recent findings suggest that sleep disorders, such as insomnia and obstructive sleep apnoea are common but not routinely screened by physicians in primary care settings (Senthilvel, Auckley, & Dasarathy, 2011). Moreover, obstructive sleep apnoea is identified as an alarmingly prevalent condition among obese Saudi women and this problem increases with aging (BaHammam, 2011a; Linné, 2004). Insomnia, on the other hand, can be a somatic condition and is associated with chronic conditions like T2DM (Linné, 2004). A key finding is that abnormal sleep conditions are associated with obesity and the prevalence of T2DM across age groups (AlDabal & BaHammam, 2011; Kathrotia, Rao, Paralakar, Shah, & Oommen, 2010). To combat the epidemic of sleep deprivation for people in Saudi Arabia, prescription of sleep medicine was suggested (BaHammam, 2011a). In our study, 27.9% of the respondents reported an average of 4 to 5 hours sleep nightly, and 4.5% reported 2 to 3 hours of sleep each night. Participants in these two groups reported that the amount of sleep they had was not sufficient. Saudi women would therefore benefit from increasing the awareness about healthy sleep and strategies to have a good night sleep. Muslim health scholars have addressed the Qur'anic teachings of

sleep behaviours and suggested educating Saudi physicians and other health care providers about the significance of early detection of sleep conditions for better treatment outcomes (BaHammam, 2011b; Senthilvel, Auckley, & Dasarathy, 2011).

3.6.3. Participants' Lifestyle-related Health Beliefs

Findings in the Jeddah region of Saudi Arabia show a discrepancy between Saudi women's knowledge of nutrition and their healthy eating behaviours (Bakhotmah, 2012). All but one participant in our study believed that nutrition has an impact on overall health and is important for the management and treatment of T2DM and its complications.

The impact of health beliefs on Saudi women's physical activity has received some attention in recent literature (Al-Eisa1 & Al-Sobayel, 2012). The socialization process of women in the Saudi Arabian culture contributes to women's "lower internal sense of control and lower confidence level" and potentially their beliefs about their abilities to maintain physical activity (Al-Eisa1 & Al-Sobayel, 2012, p.3). In our study, only 0.8% of participants believed that exercise has no impact on health and only 1.5% stated that physical activity is not important for the treatment and management of T2DM and its complications.

To date, there appear to be no studies on the health beliefs of Saudi women related to stress, and their stress management strategies. In our study, only a very small group of women (2.8%) were not aware of the negative impact of stress on health. Saudi women in other studies have reported increased stress after being diagnosed with T2DM (Farag & Gaballa, 2010). In brief, our findings indicate that Saudi women are generally aware of the negative impacts of stress for the treatment and management of T2DM.

3.6.4. Participants' Understanding of Islamic Teachings in Relation to Health Behaviours

With respect to Islamic religious teachings, participants in our study were overall able to list Qur'anic verses and quotes from the Hadith on physical activity, nutrition, stress, and sleep. Whether the level of participants' knowledge of Islamic teachings in relation to health can predict personal health behaviours was beyond the scope of our study. Most religious quotes reported by our participants were general statements about domains such as the physical body, physical activities, night and sleep, and variety of food. The quotes were Qur'anic verses and sayings of the prophet Mohammad and are open to interpretations. For instance, the Qur'anic verse "Do not throw yourselves into destruction" can be interpreted in diverse contexts. In a health context, one could interpret this verse as a religious admonition to avoid unhealthy behaviours such as smoking, excessive eating, and sleep deprivation. In another context, this verse could be interpreted as a call for taking precautions and considering safety issues in each and every situation. This also applies to quotes from the Hadith with respect to context-based interoperations. For example, the Hadith "O young boy, say Bismillaah, eat with your right hand, and eat from what is directly in front of you" could be interpreted as a religious tenet for eating habits, a direct order to eat with moderation, or both.

Given the various interpretations of the Qur'anic verses and Hadith quotations, one cannot assume that awareness of Islamic-related health teachings will reflect on the individual's health behaviours. In the case of our study findings, it is more appropriate to conclude that participants were able to perceive the consistency between Islamic teachings and healthy lifestyle; given that Muslims believe that Islamic teachings are for the benefit of the individual. Muslims are accustomed to the belief that quotes directly

from God in the Qur'an and the sayings of Prophet Mohammad in Hadith are to direct individuals to desirable behaviours, including healthy lifestyle, and to refrain them from wrong doing. Muslims thus may better adapt to the content of health education if it is framed with Islamic teachings, as per the World Health Organization's initiative with respect to health education through religion. Saudi women, we propose, will benefit from health education programs that are adapted to their religious and cultural contexts, to combat the prevalence of T2DM and other lifestyle-related conditions.

3.6.5. Participants' Responses from the Open-Ended Question Section

At the end of the interview survey, participants articulated their health priorities, their understanding of the implications of Islamic teachings with respect to health behaviours, proverbs on health, health advice, the social and cultural barriers to health behaviours, and potential reform to the social structure to access their health needs as listed in Table 3.35. The novelty of our study lies in the contribution of participants' voices to addressing the social and cultural obstacles Saudi women experience when having their health needs met. This is unlike some recent studies that discuss the social and cultural hindrances to women's health that are based on the researchers' views only (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010; Winter, King, Stafford, Winkleby, Haskell, & Farquhar, 2012).

3.7. Informing Study Two

The findings are consistent with the literature. They provided a solid basis for Study Two, a pilot intervention study to explore the outcomes of tailoring an education program related to T2DM, based on international standards and tailored to the cultural and religious contexts of Saudi women, compared with outcomes of usual care for diabetes in Saudi Arabia.

Findings in this study provided us with the following information: 1. the health of Saudi women is compromised with lifestyle-related conditions due to unhealthy lifestyles such as poor nutrition and inactivity; 2. women dealt with stresses they rated high; 3. most women believed in the importance of a healthy lifestyle for overall health and for the treatment and management of T2DM and its complications; 4. some women were aware that Islamic teachings are consistent with healthy lifestyles, and were able to provide religious quotes in relation to health behaviours; 5. women acknowledged their poor adherence to healthy lifestyles and endorsed social and cultural barriers as factors that prevented them from healthy behaviours; and 6. they expressed their need for health awareness and strategies to overcome social and cultural barriers to healthy living.

From these findings, we propose that Saudi women could benefit from: 1. a health education program focused on lifestyle modification in relation to physical activity, nutrition, and stress-management; 2. integrating the social and cultural barriers to women's health in Saudi Arabia into the content of the health education program we referred to in one; and 3. adapting the content of the health education program to Islamic teachings, as per the World Health Organization initiative with respect to health education through religion.

3.8. Strengths, Limitations and Future Implications

3.8.1. Strengths

One of the strengths of this study is the large sample size drawn from across the city of Dammam in the Eastern Region of Saudi Arabia. Participants highlighted the social and cultural factors that impacted their overall health. This is the first study in the Eastern Region of Saudi Arabia that examined Saudi women's lifestyle-related health beliefs and behaviours, and their understanding of related religious teachings. The findings of this

study were essential in informing the design of an education program related to T2DM in Study Two.

3.8.2. Limitations

This study has several limitations. Selected participants were visitors to primary health clinics in Dammam and this limited the outreach to other participants. Next, our findings cannot be generalized beyond the city of Dammam. The Eastern Province of Saudi Arabia is a large area consisting of several cities. Finally, although much information can be gained easily in a survey interview questionnaire, the responses are limited by being self-report.

3.8.3. Future Implications

Studies are needed to validate the information our study provided. Replicating this study in other cities and regions of Saudi Arabia will assist in expanding the description of Saudi women's health status. More studies are needed to assess Saudi women's knowledge of religious teachings in relation to health. This information will assist in designing health education programs based on religion, as per the World Health Organization initiative.

3.9. Conclusion

The health of Saudi women is compromised by unhealthy lifestyles in contrast to their positive beliefs about healthy lifestyles and their understanding of related Islamic teachings. More research on the social and cultural barriers to the health of women in Saudi Arabia will help to design health education programs that address these barriers. The findings of this study, for the first time, have provided benchmark profiling of the health of women living in the Eastern province of Saudi Arabia. In addition, these data served as a basis for tailoring health education to the needs of these Saudi women in

Study Two. Establishing health education programs and potentially health awareness campaigns, based on up to date research findings, would help to curb the social and economic burdens of lifestyle-related conditions among Saudi women. Given the pivotal role of women in their families, targeting Saudi women will likely impact the health of their families.

3.10. Tables

Table 3.1 Participants' Reporting of their Ages, Heights and Weights

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Age (beginning of study)	407	32.0	30.0	9.4	.5	17	60	31.04, 32.87
Height (cm)	231	156.7	157.0	8.0	.5	110	178	155.71, 157.78
Weight (kg)	361	69.1	67.0	17.8	.9	30	160	67.25, 70.93

Table 3.2 Participants' Demographic Characteristics

Variable	Category	N	Percent
Age categories (yr)	17 to 30	220	54.1%
	31 to 45	143	35.1%
	46 to 65	44	10.8%
	Total	407	100.0%
Height categories (cm)	110 to 154	83	35.9%
	155 to 178	148	64.1%
	Total	231	100.0%
Weight categories (kg)	55 to 75	175	61.2%
	76 to 90	76	26.6%
	91 to 125	32	11.2%
	126 to 160	3	1.0%
	Total	286	100.0%
Marital status	Married	320	80.8%
	Single	55	13.9%
	Divorced	14	3.5%
	Separated	0	.0%
	Widowed	7	1.8%
	Total	396	100.0%
Number of children	1	62	19.7%
	2 to 3	120	38.2%
	4 to 5	63	20.1%
	6 to 13	69	22.0%
	Total	314	100.0%
Educational status	No formal education	25	6.2%
	Primary	49	12.1%
	Intermediate	56	13.9%
	Secondary	101	25.0%
	Diploma	73	18.1%
	University	97	24.0%
	Graduate	3	.7%
	Total	404	100.0%
Occupational status	Homemaker	208	53.1%
	Employed	142	36.2%
	Student	31	7.9%
	Retired	0	.0%
	Unemployed	11	2.8%
	Total	392	100.0%
Source of income	Personal	48	12.0%
	Husband or guardian	262	65.7%
	Both	89	22.3%
	Other	0	.0%
	Total	399	100.0%
Income (SR)	< 3,000	56	13.9%
	3,000 to 5,000	105	26.1%
	5,000 to 10,000	144	35.8%
	> 10,000	97	24.1%
	Total	402	100.0%

SR, Saudi riyals (U.S. \$1.00 = 3.75 SR)

Table 3.3 Self-reported Physical Health Measures and General Health

Variable	Category	N	Percent	Valid Percent	Total Percent	Valid N	Total N
Weight	Underweight	28	6.9%	7.8%	6.9%		
	Normal weight	178	43.7%	49.3%	43.7%		
	Over weight	155	38.1%	42.9%	38.1%		
	I don't know	44	10.8%	.0%	10.8%		
	Not answered	2	.5%	.0%	.5%		
	Total	407				361	407
Heart rate	Low	9	2.2%	2.5%	2.2%		
	Normal	326	80.5%	89.3%	80.1%		
	High	30	7.4%	8.2%	7.4%		
	I don't know	40	9.9%	.0%	9.8%		
	Total	405				365	407
Blood sugar	Low	2	.5%	.5%	.5%		
	Normal	360	89.1%	92.3%	88.5%		
	High	28	6.9%	7.2%	6.9%		
	I don't know	14	3.5%	.0%	3.4%		
	Total	404				390	407
Blood pressure	Low	16	4.0%	4.2%	3.9%		
	Normal	334	82.5%	87.0%	82.1%		
	High	34	8.4%	8.9%	8.4%		
	I don't know	21	5.2%	.0%	5.2%		
	Total	404				390	407
Health	Excellent	142	35.1%	35.1%	34.9%		
	Above Average	60	14.8%	14.8%	14.7%		
	Average	180	44.4%	44.4%	44.2%		
	Below Average	18	4.4%	4.4%	4.4%		
	Poor	5	1.2%	1.2%	1.2%		
	Total	405				405	407

Table 3.4 Self-reported Morbidity

Variable	No		Yes		Total	
	N	Percent	N	Percent	N	Percent
Heart disease	399	98.0%	8	2.0%	407	100.0%
Lung disease	400	98.3%	7	1.7%	407	100.0%
High blood pressure	373	91.6%	34	8.4%	407	100.0%
Stroke	407	100.0%	0	.0%	407	100.0%
Obese	351	86.2%	56	13.8%	407	100.0%
Diabetes	379	93.1%	28	6.9%	407	100.0%
Cancer	406	99.8%	1	.2%	407	100.0%
Rheumatoid arthritis	363	89.2%	44	10.8%	407	100.0%
Osteoarthritis	381	93.6%	26	6.4%	407	100.0%
Osteoporosis	402	98.8%	5	1.2%	407	100.0%
Anemia	328	80.6%	79	19.4%	407	100.0%
Multiple sclerosis	405	99.5%	2	.5%	407	100.0%
Parkinson's disease	407	100.0%	0	.0%	407	100.0%
Irritable bowel syndrome	326	80.1%	81	19.9%	407	100.0%
Ulcers	395	97.1%	12	2.9%	407	100.0%
Premenopausal	396	97.3%	11	2.7%	407	100.0%
Menstrual, irregular cycles	330	81.1%	77	18.9%	407	100.0%
Menopausal	391	96.1%	16	3.9%	407	100.0%
Other health conditions	342	84.0%	65	16.0%	407	100.0%

Table 3.5 Self-reported Other Morbidity

Variable	N	Percent
Bone diseases	13	21.7%
Asthma	5	8.3%
Migraine	3	5.0%
Blood pressure problems	2	3.3%
Gestational diabetes	3	5.0%
High cholesterol	3	5.0%
Systemic lupus eryth	1	1.6%
Urinary diseases	1	1.6%
Mental illnesses	1	1.6%
Gastro diseases	3	5.0%
Uterus diseases	2	3.3%
Eye diseases	2	3.3%
Nephritis	2	3.3%
Thyroid	1	1.6%
Clot	8	11.6%
Allergies	2	3.3%
Calcium deficiency	2	3.3%
Unclassified illnesses	6	10.0%

Table 3.6 Types of Physical Activity Participants Reported Performing

Variable	Yes		No		Total	
	N	Percent	N	Percent	N	Percent
Physical activity	395	98.3%	7	1.7%	402	100.0%
Strenuous physical activity	39	9.8%	360	90.2%	399	100.0%
Moderate physical activity	205	51.2%	195	48.8%	400	100.0%

Table 3.7 Amount of Time Participants Reported Spending to Performing Physical Activities of Various Difficulties

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Strenuous physical activities (days per week)	36	3.1	2.0	2.0	.3	1	7	2.41, 3.76
Strenuous physical activities (hours per day)	10	.9	1.0	.2	.1	1	1	0.75, 1.05
Strenuous physical activities (minutes per day)	28	22.7	30.0	12.9	2.4	10	60	17.69, 27.67
Moderate physical activities (days per week)	206	3.1	2.0	2.0	.1	1	7	2.85, 3.40
Moderate physical activities (hours per day)	82	1.5	1.0	.8	.1	1	5	1.29, 1.65
Moderate physical activities (minutes per day)	135	24.3	30.0	11.1	1.0	6	60	22.38, 26.15

Table 3.8 Average Weekly Consumption of Rice, Pasta, Bread and Cereals Reported by Participants

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Rice or pasta (times per week)	389	5.0	7.0	2.3	.1	1.0	7.0	4.80, 5.26
Bread and cereals (times per week)	400	6.2	7.0	1.7	.1	1.0	7.0	6.18, 6.01

Table 3.9 Times per Week Participants Reported Consuming Rice, Pasta, Bread and Cereals

Variable	1 to 2		3 to 5		6 to 7		Total	
	N	Percent	N	Percent	N	Percent	N	Percent
Rice or Pasta	87	22.5%	84	21.7%	216	55.8%	387	100.0%
Bread or Cereals	25	6.3%	57	14.3%	317	79.4%	399	100.0%

Table 3.10 Types of Bread Participants Reported Consuming

Variable	Category	N	Percent
Do you eat white bread?	Yes	330	81.1%
	No	77	18.9%
	Total	407	100.0%
Do you eat brown bread?	Yes	150	36.9%
	No	257	63.1%
	Total	407	100.0%

Highlights indicate poor nutrition

Table 3.11 Types of Soft Drinks Participants Reported Consuming

Variable	Category	N	Percent
Drink soft drinks	Yes	253	62.8%
	No	150	37.2%
	Total	403	100.0%
Types of soft drinks	Regular	213	84.5%
	Diet	28	11.1%
	Both	11	4.4%
	Total	252	100.0%

Highlights indicate poor nutrition

Table 3.12 Cans per Week of Soft Drinks Participants Reported Consuming

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Regular soft drinks (cans per week)	223	5.6	3.0	6.4	.4	1.0	48.0	4.71, 6.41
Diet soft drinks (cans per week)	37	5.6	2.0	7.0	1.1	1.0	28.0	3.24, 7.90
Highlights indicate poor nutrition								

Table 3.13 Types of Oil Participants Reported Consuming

Variable	Category	N	Percent
Vegetable oil	Yes	390	95.8%
	No	17	4.2%
Butter or margarine	Yes	60	14.7%
	No	347	85.3%
All types of oil	Yes	23	5.7%
	No	384	94.3%
Olive oil	Not at all	58	14.4%
	Rarely	63	15.6%
	Sometimes	161	40.0%
	Often	64	15.9%
	Very often	57	14.1%
	Total	403	100.0%

Table 3.14 Participants Reporting of Being on a Diet and Consuming of Sugar Substitutes

Variable	Category	N	Percent
Type of diet	I don't follow any diet	336	83.8%
	Drugs	4	1.0%
	Herbs	1	.2%
	Diet food	59	14.7%
	Follow more than one	1	.2%
	Total	401	100.0%
Diet prescribed by a specialist	Yes	22	32.8%
	No	45	67.2%
	Total	67	100.0%
Sugar (sweeteners) substitute	Not at all	353	88.3%
	Rarely	4	1.0%
	Sometimes	17	4.3%
	Often	10	2.5%
	Very often	16	4.0%
	Total	400	100.0%

Table 3.15 Average Consumption of Fruits, Vegetables and Dates Reported by Participants

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Fruit (times per week)	357	3.9	3.0	2.3	.1	1.0	7.0	3.69, 4.18
Fruit (servings per day)	357	2.2	2.0	1.0	.1	1.0	7.0	2.09, 2.31
Vegetables (times per week)	382	4.8	5.0	2.3	.1	1.0	7.0	4.62, 5.07
Vegetables (servings per day)	382	3.8	4.0	1.3	.1	1.0	8.0	3.69, 3.96
Dates (times per week)	338	5.3	7.0	2.3	.1	1.0	7.0	5.08, 5.56

Table 3.16 Times per Week Participants Reported Consuming Fruits, Vegetables and Dates

Variable	1 to 2		3 to 5		6 to 7		Total	
	N	Percent	N	Percent	N	Percent	N	Percent
Fresh Fruit	133	37.3%	107	30.0%	117	32.8%	357	100.0%
Fresh Vegetables	74	19.4%	121	31.7%	187	49.0%	382	100.0%
Dates	64	18.9%	66	19.5%	208	61.5%	338	100.0%
Highlights indicate poor nutrition								

Table 3.17 Number of Daily Servings Participants Reported Consuming Fruits and Vegetables

Variable	1 to 2		3 to 4		5 to 6		7 to 8		Total	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Fresh Fruit	228	65.1%	113	32.3%	8	2.3%	1	.3%	350	100.0%
Fresh Vegetables	70	18.4%	167	43.8%	139	36.5%	5	1.3%	381	100.0%

Table 3.18 Average Weekly Consumption of Meat, Poultry and Seafood Reported by Participants

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Beef or sheep	268	2.4	2.0	1.7	.1	1.0	7.0	2.24, 2.65
Meat products	187	2.1	2.0	1.7	.1	1.0	7.0	1.88, 2.36
Chicken	385	4.8	5.0	2.2	.1	1.0	7.0	4.55, 4.99
Fish	264	2.0	2.0	1.5	.1	.5	7.0	1.82, 2.18
Shrimp	134	1.6	1.0	1.1	.1	1.0	7.0	1.37, 1.76

Table 3.19 Times per Week Participants Reported Consuming Meat, Poultry and Seafood

Variable	1 to 2		3 to 5		6 to 7		Total	
	N	Percent	N	Percent	N	Percent	N	Percent
Beef or Sheep	181	67.5%	62	23.1%	25	9.3%	268	100.0%
Meat Products	141	75.4%	33	17.6%	13	7.0%	187	100.0%
Chicken	82	21.3%	125	32.5%	178	46.2%	385	100.0%
Fish	205	77.9%	43	16.3%	15	5.7%	263	100.0%
Shrimps	121	90.3%	10	7.5%	3	2.2%	134	100.0%

Table 3.20 Average Weekly Consumption of Eggs, Nuts and Legumes Reported by Participants

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Eggs	339	3.7	3.0	2.3	.1	1.0	7.0	3.46, 3.95
Nuts	199	3.1	2.0	2.4	.2	1.0	7.0	2.79, 3.45
Legumes	219	2.3	2.0	1.8	.1	1.0	7.0	2.11, 2.58

Table 3.21 Times per Week Participants Reported Consuming Eggs, Nuts and Legumes

Variable	1 to 2		3 to 5		6 to 7		Total	
	N	Percent	N	Percent	N	Percent	N	Percent
Eggs	141	41.7%	98	29.0%	99	29.3%	338	100.0%
Nuts	108	54.3%	44	22.1%	47	23.6%	199	100.0%
Legumes	153	70.2%	43	19.7%	22	10.1%	218	100.0%
Highlights indicate poor nutrition								

Table 3.22 Average Weekly Consumption of Milk and Dairy Reported by Participants

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Milk	311	1.7	2.0	.4	.0	1.0	2.0	1.69, 1.79
Dairy products	390	6.1	7.0	1.8	.1	1.0	7.0	5.95, 6.30

Table 3.23 Times per Week Participants Reported Consuming Milk and Dairy

Variable	1 to 2		3 to 5		6 to 7		Total	
	N	Percent	N	Percent	N	Percent	N	Percent
Milk	311	100.0%	0	.0%	0	.0%	311	100.0%
Dairy products	32	8.2%	53	13.6%	305	78.2%	390	100.0%

Table 3.24 Types of Milk and Dairy Participants Reported Consuming

Variable	Category	N	Percent
Milk	Full Fat	177	56.0%
	Low Fat	87	27.5%
	Full Fat and Low Fat	52	16.5%
	Total	316	100.0%
Dairy products	Full Fat	225	57.7%
	Low Fat	83	21.3%
	Full Fat and Low Fat	82	21.0%
	Total	390	100.0%

Table 3.25 Self-reported Behaviours of Smoking, Stress and Sleep

Variable	Category	N	Percent
Smoking	Cigarettes	2	.5%
	Shisha	7	1.8%
	Nargille	0	.0%
	Gadw	0	.0%
	I don't smoke	389	97.7%
	Total	398	100.0%
Stress level	High	126	31.7%
	Moderate	228	57.3%
	Low	44	11.1%
	Total	398	100.0%
Sleep	Soundly	243	60.9%
	I don't sleep well	156	39.1%
	Total	399	100.0%

Table 3.26 Average Number of Hours Participants Reported Sleeping

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Average hours of sleep	398	6.4	6.0	1.9	.1	2.0	16.0	6.21, 6.58

Table 3.27 Number of Hours Participants Reported Sleeping

Variable	2 to 3		4 to 5		6 to 8		9 to 10		11 to 16		Total	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Hours of sleep	18	4.5%	111	27.9%	234	58.8%	30	7.5%	5	1.3%	398	100.0%

Table 3.28 Participants' Beliefs in the Importance of Health Behaviours for the Overall Health

Variable	Category	N	Percent
Exercise	Disagree	3	.8%
	Not sure	0	.0%
	Agree	396	99.2%
	Total	399	100.0%
Nutrition	Disagree	0	.0%
	Not sure	1	.3%
	Agree	398	99.7%
	Total	399	100.0%
Smoking	Disagree	6	1.5%
	Not sure	0	.0%
	Agree	393	98.5%
	Total	399	100.0%
Stress	Disagree	5	1.3%
	Not sure	6	1.5%
	Agree	388	97.2%
	Total	399	100.0%

Table 3.29 Participants' Beliefs in the Importance of Health Behaviours for the Treatment and Management of Diabetes

Variable	Category	N	Percent
Exercise	Important	386	98.5%
	Not important	6	1.5%
	Total	392	100.0%
Nutrition	Important	394	99.7%
	Not important	1	.3%
	Total	395	100.0%
Non smoking	Important	369	93.9%
	Not important	24	6.1%
	Total	393	100.0%
Stress management	Important	380	97.7%
	Not important	9	2.3%
	Total	389	100.0%

Table 3.30 Hadith and Qur'anic Verses on Health in General Reported by Participants

Hadith and Qur'anic Verses	N
Hadith	
“There should be neither harming [darar] nor reciprocating harm [diraar]”(Imam Nawawi 32)	5
“The Muslims are like a body, if one part of the body hurts, rest of the body will also suffer”(Muslim)	1
“There are two blessings that many people are about to lose: health and free time”(Sahih Al-Bukhari 8.421)	2
“One third for his food, one third for his drink and one third for his breath”(Tirmidhi & Ibn Majah)	8
Total	16
Qur'an	
“Do not throw yourselves into destruction”(Al-Baqarah 1:195)	18
“And if you would count the graces of Allah, never could you be able to count them”(An-hl 16:18)	1
“And when I am ill, it is He who cures me”(Ash-Shu'ara' 26: 80)	2
“And proclaim the Grace of your Lord” (Ad-Duha 93:11)	1
“There comes forth from their bellies, a drink of varying colour wherein is healing for men” (An-hl 16:69)	2
Total	24

Table 3.31 Hadith and Qur'anic Verses on Nutrition Reported by Participants

Hadith and Qur'anic Verses	N
Hadith	
“We are a people who do not eat until we are hungry. And if we eat, we do not eat to our fill” (Burhan addeen alhalabi)	5
“No human ever filled a vessel worse than the stomach. Sufficient for any son of Aadam are some morsels to keep his back straight” (al-Tirmidhi --saheeh by al-Albaani)	5
“Do not drink (all water) once like camels, but drink twice and thrice and mention the Name of Allah before you drink, and praise Allah when you finish”(Tirmidhi)	1
“O young boy, say Bismillaah, eat with your right hand, and eat from what is directly in front of you” (al-Tirmidhi, 1858; Abu Dawood, 3767; Ibn Maajah, 3264; Saheeh Sunan Abi Dawood, 3202)	3
“A house without dates has no food”(Muslim)	1
Total	14
Qur'an	
“By the Fig, and the Olive”(At-Tin 95:1)	1
“And shake the trunk of date-palm towards you, it will let fall fresh ripe-dates upon you” (Maryam 19:25)	2
“Eat and drink but waste not by extravagance” (Al-A'raf 7:31)	12
“And fruit; that they may choose” (Al-Waqi'ah 56:20)	2
“And the flesh of fowls that they desire” (Al-Waqi'ah 56:21)	1
“We have made from water every living thing” (Al-Anbiyah' 21:30)	6
“He allows them as lawful <i>At-Taiyibat</i> [(i.e. all good and lawful) as regards things, deeds, beliefs, persons, foods, etc.], and prohibits them as unlawful <i>Al-Khaba'ith</i> ” (Al-A'raf 7:157)	2
“Eat of the lawful things that We have provided you with” (Al-Baqarah 2:172)	8
Total	34

Table 3.32 Hadith and Qur'anic Verses on Physical Activity Reported by Participants

Hadith and Qur'anic Verses	N
Hadith	
“The strong believer is better and more beloved to Allah than the weak believer” (Muslim)	3
“Teach your children swimming, archery and horse-riding” (Albahegi)	35
“Your body has right upon you” (Al-Bukhari 6134)	13
Total	51
Qur'an	
“And have made the day for livelihood” (An-Naba' 78:11)	20
“And (He has created) horses, mules and donkeys, for you to ride and as an adornment” (An-Nahl 16:8)	1
“Strive hard with your wealth and your lives in the Cause of Allah” (At-Taubah 9:41)	1
Total	22

Table 3.33 Hadith and Qur'anic Verses on Sleep Reported by Participants

Hadith and Qur'anic Verses	N
Hadith	
Prophet Mohammad encouraged us to take a nap, said: "Take a nap, for the devils [shayaateen] do not take naps" (al-Tabaraani. Al-Saheehah, 2647)	1
He replied: "Let her sister cover her with her garment" (Muslim)	1
Total	2
Qur'an	
"And it is He Who makes the night a covering for you, and the sleep (as) repose" (Al-Furqan 25:47)	36
"(Remember) when He covered you with a slumber as a security from Him" (Al-Anfal 8:11)	1
Total	37

Table 3.34 Qur'anic Verses on Stress Reported by Participants

Hadith and Qur'anic Verses	N
Qur'an	
"Allah burdens not a person beyond his scope" (Al-Baqarah 2:286)	1
Total	1

Table 3.35 Participants' Quotes of Health Priorities, the Implications of Islamic Teachings of Health Behaviours, Proverbs on Health, Health Advice, Social and Cultural Barriers to Health Behaviours; and a Reform to the Social Structure

Health Priorities

I wish to lose weight until I'm 55 kg

I wish to be less quick tempered, especially with my kids, as it causes my body to ache

I wish everyone good and long lasting health

Implications of Islamic Teachings on Health Behaviours

Islamic teachings pronounce times during the day for prayers and these prayers are like daily physical exercise

Proverbs

Eat lunch then relax eat dinner then walk

Go to bed early and wake up early, you will see how you feel

Health is like a crown above the head of the healthy

Fast and you become healthy

A healthy brain is in a healthy body

Being active is a blessing

The stomach is the house for disease and prevention is the essence of medicine

Health Advice

We can't increase our lifespan but we should adapt to healthy living

Women should undergo regular check-ups for breast cancer

Healthy behaviours, healthy diet, and good sleep are all important, but indolence is an obstacle

Healthy diet and going for walks regularly are both important

Excessive eating could make one less bright

Caring for one's health is very important

Caring for one's health and healthy eating are very important

Regular exercise is very important

Social and Cultural Reform and Women Health Needs

Recreation Centers

We need to have recreation centers, like the ones in Kuwait, in every neighborhood to go to with our kids for relaxing activities and healthy food choices

We need to have recreation centers

Recreation centers are very important for women's health

There should be recreation centers for women

We should have swimming pools for women

Table 3.35 Participants' Quotes of Health Priorities, the Implications of Islamic Teachings of Health Behaviours, Proverbs on Health, Health Advice, Social and Cultural Barriers to Health Behaviours; and a Reform to the Social Structure

We need to have recreation centers and swimming pools in every neighborhood, large and open to the fresh air
We should have gyms and swimming pools with affordable memberships and in every neighborhood
We need recreation centers in every neighborhood for free
There must be private walking areas for women only
Saudi society imposes limitations on women's physical activity. Women as a result stay mostly in their homes, physically inactive and become overweight. Women in Saudi are restricted from joining gyms sometimes by their husbands, their families or work demands. The Saudi culture limits spreading health awareness and motivating women to be physically active
There is no opportunity for women in Saudi to exercise, be physically active or even walk regularly
We need gyms for women. A woman wishes to have a slim figure. The fewer opportunities for women to go to gyms and spending most of their times in their homes eating, contribute to increasing overweight among Saudi women
We need to have gyms with trainers for women

Breaks between Working Hours

Women need breaks between working hours for exercise
I wish there are times between work hours for rest and exercise to help decrease stresses associated with work
Rest is important but we have no time for rest. We are busy almost all day with work then we're exhausted by the end of the day
Thursdays are the only days we have for rest and amusement; all other days we are exhausted with work
We need time for rest during work hours
I wish they (the ministry of health) would decrease our work hours

More Options for Healthy Food

We are not allowed to use a microwave at work therefore we eat from restaurants only. Restaurants with delivery service have no healthy options in their menus so we end up eating junk and unhealthy food. We are not allowed to have breaks for snacks

Dietary Education

We need dietary education to learn about healthy diets and cooking healthy meals for our families
There is a lack of awareness about healthy eating. Parents should educate their kids how to pick healthy snacks. People should learn how to prepare healthy food for social gatherings. Fast food consumption, very prevalent in our culture, causes colon diseases
Teaching girls about health beliefs and healthy behaviours at an early age, specifically during adolescence, will help to initiate healthy behaviours in our society
Health principle and healthy eating should be taught in elementary schools and added to their curricula
Healthy snacks should be sold in schools for students to eat during breaks

Table 3.35 Participants' Quotes of Health Priorities, the Implications of Islamic Teachings of Health Behaviours, Proverbs on Health, Health Advice, Social and Cultural Barriers to Health Behaviours; and a Reform to the Social Structure

More Focused Health Care for Women

Women, especially the older ones, need regular and full check-ups once to twice a year
Saudi women need different health care that addresses their social, physical and psychosocial needs
Women should be provided with more medical attention for hypertension and diabetes
There should be different health education for women above 43 years old

Driving Women

Saudi women should be allowed to drive to decrease their daily stresses that result from their inability to be mobile

Social Assistance and Pensions

There should be pensions for women over 40 years of age if they are unemployed, and social assistance for those who are unemployed (at least 200 SR)
The ministry of health should make the option of early retirement available for their female employees

Workshops on First Aid

There should be workshops on first aid everywhere and for everyone to attend

Smoking Cessation Campaigns

There should be more smoking cessation campaigns to prevent smoking

Health Education Campaigns

There should be health education centers to teach families how to adapt to healthy living and how to teach kids healthy behaviours
Families in Saudi need health educators to visit them in their homes and educate them about healthy lifestyles. Health education does not work via media alone
Saudi mothers need more help from health educator

4. STUDY TWO: EVALUATION OF AN EDUCATION PROGRAM RELATED TO TYPE 2 DIABETES MELLITUS FOR SAUDI WOMEN: A PILOT INVESTIGATION

4.1. Introduction

The incidence and prevalence of lifestyle-related conditions such as ischemic heart disease, smoking-related conditions, hypertension, type 2 diabetes mellitus (T2DM), and obesity continues to increase in Saudi Arabia (Al-Nozha et al., 2007; Al-Nozha et al., 2004b; Al-Nuaim et al., 1997; Al-Rajeh, Awada, Niazi, & Larbi, 1993). Saudi women have a higher prevalence of obesity than men, which increases their risk of lifestyle-related conditions such like T2DM (Al-Nuaim et al., 1997). T2DM and obesity have become prevalent in Saudi women constituting substantial social and economic burdens (Al-Nozha et al., 2007; Al-Nozha et al., 2004b; Al-Nuaim et al., 1997; Al-Rajeh, Awada, Niazi, & Larbi, 1993). Because Saudi women are restricted from public physical activities and they are expected to centre their roles at their homes, their health needs are distinct from those of men (Abahussain & El-Zubier, 2005). Overall, lifestyle-related conditions for women in Saudi Arabia are influenced by social, cultural, and religious factors however these factors are rarely addressed in literature in relation to health (Khatib, 2004; Al-Khaldi & Khan, 2000; Al-Hussein, 2008).

Health education programs that target lifestyles mostly emanate from western cultures thus could be less effective in improving the lifestyles of people living in Islamic cultures like Saudi Arabia. In the interest of raising attention to the impact of Islamic teachings on health, the World Health Organization has initiated an Islamic perspective on health promotion (World Health Organization, 1996). In this respect, health education strategies address the context of Islamic faith in disseminating health messages (Ide & Sanli, 1992;

World Health Organization, 1996). The impact of such a program in Saudi women is unknown.

4.2. Diabetes Prevention and Management

Most of the literature on approaches to the prevention and management of T2DM has emanated from research conducted in western countries such as Australia, the United Kingdom, and the United States. This research has provided the basis for current internationally recognized standards of care (Cockram, 2000; Alberti et al., 2007; Al-Faris, Amin, & Al-Rukban, 2006; Heitzer, Peterson, Thompson, & Fluder 2006; Uusitupa et al., 2000; Murphy, 2004; World Health Organization, 2004a, 2004b; Bjaras et al., 1997). International standards for the prevention and management of T2DM focus largely on self-management strategies such as avoiding smoking, optimal nutrition, healthy body weight, and increasing daily physical activity, in addition to medical intervention (World Health Organization, 2004a; Al-Faris et al., 2006; Heitzer et al., 2006; Uusitupa et al., 2000; Murphy, 2004; Bjaras et al., 1997).

Evidence suggests that diabetes education programs based on international standards are more effective when tailored to the cultures of targeted groups (Osuna et al., 2011; Goody & Drago, 2009; Hawthorne, Robles, Cannings-John, & Edwards, 2010; Song et al., 2010; Osborn et al., 2010). Moreover, the relationship between health and religion has been suggested as a promising mediator in health education programs (Ellison & Levin, 1998; Holt & McClure, 2006; Benjamins, Ellison, Krause, & Marcum, 2011; Kenneth, Maton, & Wells, 2010). For example, “expecting God to reward expressions of piety, devotion, observance, or obedience with health and well-being may be enough to account for positive health outcomes” in health education programs (Ellison & Levin, 1998, p.708). Scientific evidence suggests that the involvement in a religious community

and attendance of religious services can positively impact both the psychological and physical wellbeing of individuals (Ellison & Levin, 1998; Holt & McClure, 2006; Benjamins, Ellison, Krause, & Marcum, 2011). For instance, a study that examined the relationship between religious involvement in African American communities and health behaviours revealed that religious beliefs could lead to positive health behaviours (Holt, Roth, Clark, & Debnam, 2012).

To the best of our knowledge, up until the time of the development of our study, only four studies had addressed the cultural context in relation to lifestyle education programs related to T2DM. In the United States, African American women were targeted for a nutrition program for diabetes prevention. This study included a control group or Group 2 (n=196) and an intervention group or Group 1 (n=202), but the number of analyzed subjects in both groups for the reporting of the study was smaller (n=152) based on posttest assessment at 6 months (Williams et al., 2006). Results of this study indicate that participatory-based strategies can be effective in designing culturally appropriate education programs (Williams et al., 2006). In another study, Mexican Americans were selected for diabetes self-management education (n=256, 60% women in the intervention group) with posttest evaluations for 12 months. Cultural adaption in the Mexican American study included: language, diet, social emphasis, family participation, and incorporation of cultural health beliefs. Outcome variables in the Mexican Americans study which included metabolic control (HbA1c and fasting blood glucose), diabetes knowledge, and diabetes related health beliefs, demonstrate the effectiveness of culturally competent diabetes self-management education for the management of diabetes (Brown, Garcia, Kouzekanani, & Hanis, 2002). A study in Finland recruited 523 subjects (which

was decreased to 152 in the intervention group and 143 in the control group) with two years of lifestyle interventions and subsequent evaluations. The aim of the study was to assess the efficacy of a lifestyle intervention, which focused on physical activity and healthy diet for overweight men and women. The goal of the intervention was to prevent or delay the onset of T2DM in individuals with impaired glucose tolerance, and reduce risk factors for atherosclerotic and cardiovascular vascular diseases. Although no cultural adoptions are discussed, lifestyle interventions in the Finnish study confirm the efficacy of lifestyle programs in preventing and delaying T2DM (Usitupa et al., 2000). In Sweden, researchers followed up with 3200 subjects for 10 years. The lifestyle intervention program focused on risk factors related to physical inactivity, poor nutrition and obesity, and cigarettes smoking and aimed to promote healthy behaviours and healthy environment. Interventions in this study involved communities collaborating on political, administrative and economic levels, and its effectiveness was measured by reported changes in physical activities, weight, nutrition, and tobacco consumption (Bjaras et al., 1997). Because of the paucity of knowledge in this area, we were interested in studying the outcomes of a pilot intervention study of an education program related to T2DM adapted to the cultural and religious contexts of Saudi women.

4.3. Study Goals and Objectives

In the absence of existing data, the goal was to conduct a pilot intervention study to explore the outcomes of launching a T2DM education program, based on international standards and tailored to the cultural and religious contexts of Saudi women, compared with outcomes of usual care for diabetes in Saudi Arabia. Our primary research question was “What are the outcomes of a pilot intervention study of a T2DM education program based on international standards and adapted to the cultural and religious contexts of

Saudi women?” The primary objectives of the study were:

1. To explore whether a T2DM education program, based on international standards and adapted to the cultural and religious contexts of Saudi women, could impact health outcomes (e.g., physical measures, diabetes knowledge, life satisfaction and health-related quality of life) compared to outcomes of those who receive usual care for diabetes in Saudi Arabia
2. To use knowledge gained from conducting this pilot study to inform future studies related to the health needs of women in Saudi Arabia

4.4. Methodology

The research proposal was reviewed by the relevant institutional ethics boards, namely, the University of British Columbia and the Saudi Administration of Medical Research. After receipt of an ethical approval from the Saudi Administration of Medical Research in the Ministry of Health, the Ministry of Health forwarded its approval to the Directorate of Primary Health in the Eastern Province to inform the Directorate that the study would be taking place at the primary health centres in Dammam.

4.4.1. Theoretical Background

Participatory research, also known as community-based research and community-based participatory research, involves participatory collaboration of stakeholders in the decision making process to implement change (Stringer, Guhathakurta, Mwajuma, & Waddell, 2008; Stoecker, 2009). Community-based participatory research methods have been used for intervention studies when input from community members is used to reflect their social and cultural contexts to improve the outcomes of programs (Gullan, Feinberg, Freedman, Jawad, & Leff, 2009). Evidence suggests that participatory action research is ideally suited for community health studies (Minkler, 2000) particularly for those that are

related to diabetes prevention and management (Giachello et al., 2003).

We chose the principles of participatory research as a basis for our study to engage primary stakeholders, specifically Saudi women at risk of or diagnosed with T2DM, to participate in self-management of T2DM based on an internationally accepted and evidence-based health education. At present, diabetes education programs in Saudi Arabia tend to target people diagnosed with diabetes rather than including those at risk and aim to increase patients' awareness of diabetes care through medical instruction and care with less emphasis on lifestyle modification (Sharaf, 2010; El-Hazmi, Warsy, AR. Al-Swailem, AM. Al-Swailem, & Sulaimani, 1998). Our intention was to engage Saudi women as stakeholders in our pilot study to compare outcomes of a T2DM education program, based on international standards and tailored to the cultural and religious contexts of Saudi women, with outcomes of usual care for diabetes in Saudi Arabia.

Given that this is the first study of its kind, the study was a pilot intervention study to compare the outcomes of a T2DM program based on international standards and adapted to the cultural and religious contexts of Saudi women, with outcomes of usual care for diabetes in Saudi Arabia. The structured part of the program was six weeks, with outcome evaluation post program at six weeks. The outcomes of interest were evaluated in the Intervention and Usual Care Groups before and after the six-week period.

4.4.2. Trained Researcher

The primary researcher served as the research coordinator and conducted the education program. She is qualified in intercultural communication and health education with concentration in T2DM. She is Arabic speaking and originally from the Eastern province of Saudi Arabia, thus, is familiar with the local culture and customs. In conducting the pre and post measures, she was blind to other test values such as pre and

post exercise measures (Appendix 6), and body composition measures (Appendix 7) to minimize recorder bias. She was trained in conducting and administering the measures, which were selected for this study, objectively. The advantages of having a researcher with local knowledge of the Saudi bureaucracy were twofold: 1. she was able to liaise with the director of primary health in the Eastern province to schedule an appropriate space for conducting the education program; and 2. she was able to liaise with the administrations of the selected clinics for the recruitment of eligible participants. Having one individual participate in all levels of conducting the program was consistent with real-world contingencies of being a diabetes educator.

4.4.3. Sampling and Recruitment

The study was carried out in Dammam, the capital city of the Eastern province in Saudi Arabia. Potential participants were recruited from health centres that had agreed to participate. The primary researcher approached all women in the waiting areas or women working in health clinics, thus, providing a sample of convenience.

Inclusion criteria were women 17 to 70 years of age, at risk of or diagnosed with T2DM. Women who were pregnant were excluded. Participants were informed that if they became pregnant during the study they would not be excluded if cleared by their physicians. Our recruitment procedure was designed to simulate a real world situation in which women in the community are medically identified as being diagnosed with or identify themselves as being at risk of T2DM.

When one participant under 18 years of age expressed interest in participating in the study, the researcher asked her to provide a parental signature for her consent to participate. Most women who were approached by the researcher were interested in participating in the study; but twenty participants said they could not participate because

of transportation issues. Saudi women encounter challenges with transportation because women are prohibited from driving and the lack of public transportation in the country. For these reasons, we facilitated participation by launching the six-week education program in a primary health center that was located at a large residential compound. Participating women, thus, could get to the health center within a few minutes walking.

The intended sampling frame was partially compromised when some women from the selected clinic withdrew from the study, necessitating the recruitment of additional participants from two other primary health clinics in Dammam to increase the participant pool. These participants constituted the Usual Care Group. The primary researcher visited these clinics on days when women were scheduled for their check-ups with their doctors. Women in the waiting areas and those who were working at the clinic expressed interest in participating in the study when they learned that they were not required to attend education sessions; donating time for pre and post evaluations was the only requirement. Women who worked in the clinics referred some of their co-workers to the program who were diabetic, overweight, or had a family member diagnosed with diabetes.

4.4.4. Grouping Participants

Participants were assigned to one of two groups. Assigning participants to a group was based on their location and willingness and ability to attend the sessions of the six-week education program. Dividing the two groups based on their location assisted in preventing contamination of the study sample i.e. participants from both groups did not communicate with each other during the ongoing of the study. Participants who worked at the first primary health centre were all interested in attending the education sessions since the classroom was in the same health centre.

Intervention Group:

Fourteen women participated (including dropouts): those at risk of T2DM (n=8) and those diagnosed with T2DM (n=6) in a T2DM education program based on international standards and adapted to the cultural and religious contexts of Saudi women, they also continued with their usual care.

Usual Care Group:

Six women participated: Women at risk of T2DM (n=4) or diagnosed with T2DM (n=2) received the usual care for T2DM only.

The total number of recruited participants in our study was 35 with initial dropouts of 16 prior to the start of the program. Total number of participants before the six-week education program was then 19. Dropouts before the education program were mostly related to transportation issues (n=12) in addition to work schedule conflicting with the demands of participating in the study (n=4). Dropouts during the education program (n=5) were related to conflicting schedule. The total number of participants who completed the study in both groups was 14, 8 in the Intervention Group and 6 in the Usual Care Group. Number of participants and dropouts appear in Appendix 11.

4.4.5. Measurements and Psychometrics

For all participants, objective measures included random blood sugar based on finger-pricking device (mg/dl), the ratio of the circumference of the waist to hip measurements (WHR), weight (kg), height (cm), and body mass index (BMI) [weight (kg)/height (m²)] were repeated at baseline and at 6 weeks. Study design and pre and post measurements appear in Appendix 2.

The life satisfaction (LISAT), health-related Quality of life (SF12), diabetes knowledge test (DKT), and program satisfaction questionnaires were completed by

participants in the two groups at baseline (prior to the onset of the study), and at 6 weeks (at the end of the education program). The LISAT-9 item is designed to assess various aspects of life satisfaction. It is composed of one item to assess overall life satisfaction and eight other items that are domain-specific (i.e. self-care management, contact with friends, vocational life, family life, partner relationships, financial, leisure situations, and sex-life) (Rehab Measures, 2013). Because sex-life is bounded by marital relationship and considered a private matter in the Islamic culture of Saudi Arabia, we deleted the question of satisfaction with sex-life for the participants in our study. Answers of all eight questions were based on a 6-point Likert scale ranging from 1 'very dissatisfied' to 6 'very satisfied' (Rehab Measures, 2013). We used SPSSv.20 to compute the mean score of each item. Total LISAT score was computed from the mean of the 8-item scores.

SF12 is a shorter version of the SF-36. It is composed of 12 questions to measure quality of life based on functional health and wellbeing (QualityMetric, 2013). The first question is related to general health with answers on a 5-point Likert scale ranging from 'excellent' to 'poor'. The second question is dichotomous and is related to physical functioning with answers on a 3-point scale ranging from 'limit a lot' to 'no limit at all'. The third question is dichotomous and is related to role functioning (physical) with answers on a 5-point scale ranging from 'all of the time' to 'none of the time'. The fourth question is related to bodily pain with answers on a 5-point scale ranging from 'extremely' to 'not at all'. The fifth question is related to vitality with answers on a 5-point scale ranging from 'all of the time' to 'none of the time'. The sixth and seventh questions are dichotomous and are related to role functioning (emotional) and mental health, respectively, with answers on a 5-point scale ranging from 'all of the time' to 'none of

the time’. The eight question is related to social functioning with answers on a 5-point scale ranging from ‘all of the time’ to ‘none of the time’. The physical and mental health measures in the questionnaire are referred to as PCS-12 and MCS-12, respectively (SF-36.org, 2013). Average score of each question is 50 (SF-36.org, 2013). To score our data of SF12, we obtained a scoring license from QualityMetric. We used SPSSv.20 to compare the scoring results of SF12 of the two groups before and after the education program.

The diabetes knowledge test (DKT) is composed of 23 items developed by the Michigan Diabetes Research Training Center (MDRTC). The 23 items in this questionnaire are designed to test the general knowledge of diabetes (The Michigan Diabetes Research Training Center, 2013). The first 14 questions of the test are relevant to non-insulin users (The Michigan Diabetes Research Training Center, 2013). All 23 questions are relevant to insulin users (The Michigan Diabetes Research Training Center, 2013). For participants in our study, we removed items 5, 15, and 17, as these items are more appropriate to test the knowledge of health professionals and beyond the scope of knowledge we expected from our study participants. The psychometric properties of the DKT test appear in Appendix 5. The test was designed to be completed within 15 minutes. To score our data of this test, we computed the percentage of correct answers for each question.

4.4.6. Assessment and Re-evaluation

(a) Assessment Session 1 (30 minutes)

Each participant was assessed over two 30-minute sessions at baseline and re-evaluated at six weeks after the commencement of the study. The primary researcher scheduled these sessions at the participants’ convenience. Each participant completed the

survey questionnaires by interview, i.e., diabetes knowledge test (DKT) (Appendix 4), life satisfaction questionnaire (LISAT) (Appendix 7), and health-related quality of life (SF12) (Appendix 8). The survey questionnaire of lifestyle-related health beliefs and behaviours and related religious teachings (Appendix 1), which we used in Study One, was included for baseline assessment to confirm whether the results we gained from Study One applied to participants in Study Two or not.

(b) Assessment Session 2 (30 minutes)

Body composition measures were conducted with standard objective tools and procedures. Participants were requested to wear light and comfortable gym clothes and shoes but most of them preferred their working clothes. A standard clinical weight scale with a height feature was used to record weight and height from which body mass index (BMI) was calculated. Because of the association of the waist: hip ratio (WHR) and health risks (Yusuf, S. et al., 2005) waist and hip girths were measured in a standardized manner with a semi-flexible measuring tape.

The six-minute walk test (6MWT) was carried out to assess and evaluate the participants' functional status and walking capacity. The runway for the 6MWT varied among the three health centers where assessments and evaluations were conducted. Participants were tested at both times on the same runway to avoid measurement error. The data sheet for recoding the pre and post walk measures at baseline and subsequent time period included heart rate, blood pressure, blood glucose (blood sugar monitoring device) and subjective rating of perceived exertion (scale from 0-10 where 0 is nothing at all and 10 is maximum exertion).

4.4.7. Procedures

Within two weeks of the commencement of the study, participants in both groups

underwent baseline testing. At the end of six weeks, women in the Intervention Group were advised about continuing to practice what they had learned in the education program. Women in the two groups were scheduled for re-evaluation at six weeks, the duration of the education program for the Intervention Group. All participants had the baseline testing repeated. Testing was completed within two weeks.

(a) Tailoring the Harvard Special Health Reports on Diabetes to the Cultural and Religious Contexts of Saudi Women

Consistent with the World Health Organization's initiative, education programs related to type 2 diabetes mellitus (T2DM) based on international standards and adapted to the cultural and religious contexts of participants, will lead to better health outcomes than those that do not consider such contexts (World Health Organization, 2004a; Osuna et al., 2011; Goody & Drago, 2009; Hawthorne, Robles, Cannings-John, & Edwards, 2010; Song et al., 2010; Osborn et al., 2010). The Harvard Special Health Reports are based on up to date scientific knowledge for the management and treatment of T2DM. For the education program in the Intervention Group of our study, we selected five reports from the Harvard Health Publications that are related to T2DM lifestyle behaviours, particularly, weight reduction and physical activity, healthy eating for T2DM, and positive psychology (Harvard Health Publications, 2012a, b, c, d, 2011). This section presents the details of how the content of the Harvard Special Health Reports was tailored to the cultural and religious contexts of participants in the Intervention Group.

(b) Tailoring the Harvard Special Health Reports on Diabetes to the Saudi Islamic Culture

The Harvard special health reports are oriented primarily to western cultures. In contrast to the secular-based western cultures, religious traditions are tightly interwoven

with the culture of Muslims in Islamic countries (Norris & Inglehart, 2012). To address an Islamic perspective on health, the World Health Organization has convened the “Amman Declaration on Health Promotion” in 1989 (World Health Organization, 1996). The Amman Declaration was convened to help align the wisdom of the Qur’an and Hadith to contemporary health issues, e.g., smoking.

To tailor the content of the Harvard special health reports related to diabetes to the cultural and religious contexts of study participants, the researcher used religion-based quotes, recommended behaviours, and beliefs from the Saudi culture that matched with topics from the Harvard special health reports on diabetes.

(c) Adapting the Harvard Reports on Weight Reduction and Physical Activity to the Islamic Culture of Saudi Arabia

The Saudi culture has adopted a sedentary lifestyle that contributed to weight increase and reduced physical activity. According to the Harvard special health reports on diabetes (Harvard Health Publications, 2012a), factors that lead to weight increase are personal, environmental and social. Participants discussed these factors by reflecting on their lifestyles and the Saudi culture. Table 4.4 presents personal, environmental, and social factors which participants listed in their discussion of factors that contributed to weight-gain in Saudi Arabia.

In the Saudi Arabian culture, it is inappropriate for women to exercise in public or in their communities, which differs from the assumption on which the Harvard guidelines are based. For instance, it is not appropriate for women in Saudi Arabia to go outdoors for biking, jogging, or running. Women-only gyms in Saudi Arabia are available; however they are few and often small, unaffordable, or distant from where women live. Women in Saudi Arabia may experience challenges with mobility due to prohibiting

women from driving and the lacking of public transportation system in the country. In such circumstances, a woman who wants to join a gym is left with the only option of renting a driver with a car, which can be costly or unaffordable.

Walking is usually the most convenient exercise for women in Saudi Arabia. According to the Harvard Special Health Reports on weight management (Harvard Health Publications, 2012c), walking is a safe exercise for beginners and those with chronic health conditions like T2DM. Participants were advised to walk regularly throughout the week for a minimum of 10 minutes each time with a moderate increase of heart rate at each bout. As beginners, participants are recommended to “start out slowly, and increase the pace and duration” (Harvard Health Publications, 2012d, p.20) with the goal of maintaining at least 2½ hours of exercise per week. Walking exercise is however not without challenges for Saudi women. The Saudi clothing traditions limit women to a modest dress code, which restricts them from wearing light clothes and creates a barrier for them from benefitting fully during an exercise. Moreover, all participants in the Intervention Group veiled their faces with the traditional niqabs, which is another obstacle for them to benefit from the breathing techniques during the exercise (Alghadir, Aly, & Zafar, 2012). With the heat waves in Saudi summer (often exceeding 45°C), people avoid outdoors and walking becomes uncomfortable, particularly for women. Participants stated their preferences to go walking with a partner or as groups to maintain their safety and keep themselves motivated.

Altogether, outdoor physical activities and joining gyms are inappropriate, unaffordable or inconvenient for women in the Saudi culture. Participants were advised to increase their physical activities inside their homes and decrease their reliance on

housemaids for the household chores. Light activities that are mentioned in the Harvard Special Health Report on physical activity and suggested for participants included: climbing the stairs instead of taking the elevator, stretching and walking back and forth in the room instead of sitting down while watching television, standing up instead of sitting down, decreasing hours of watching television, rope jumping, and dancing. Some basic stretches were also introduced to participants and recommended for them during their working hours.

(d) Adapting the Harvard Reports on Healthy Eating for T2DM to the Islamic Culture of Saudi Arabia

Dieticians in Saudi Arabia are well trained in diabetes nutrition. To adapt the Harvard education guidelines on healthy eating for diabetes (Harvard Health Publications, 2012b) to the Saudi culture, the researcher recruited a volunteer dietician to teach a session on healthy eating to the participants, the content of which was based on the Harvard guidelines but modified to the local Saudi context. Because of cultural differences between foods consumed in Saudi Arabia and the western diet reflected in the Harvard guidelines, modifications were needed. During the session, participants learned: calculating calorie intake, low-diet food recipes, options for healthy meals during working hours, healthy snacks, shopping for healthy food, nutrition for T2DM, and the management of insulin intake during working hours.

(e) Adapting the Harvard Reports on Positive Psychology to the Islamic Culture of Saudi Arabia

The Harvard guidelines for meditation exercise are designed for people in secular, western cultures. These guidelines are different than the rituals of meditation and mindfulness that are practiced by Muslims daily during their performance of the Islamic

five prayers (Ali. & Liu, 2004). Participants were therefore unfamiliar with the Harvard meditation techniques when they were introduced and presented by the researcher. To tailor the Harvard meditation techniques to the Islamic teachings, the researcher matched the Harvard meditation exercise with the Islamic prayers that participants typically did five times a day. An example is *“During our daily five prayers, we are focusing on the moment, and what we are saying to pray; if you get distracted by thoughts of our worldly life, allow those thoughts to go without judgment and return back to the focus on your prayers and the connection to God.”*

When participants started to learn to meditate, they expressed dislike of the techniques and refused to follow the Harvard meditation exercise despite being adapted to the Islamic prayers. Some participants did not close their eyes while meditating and others interrupted the moments of silence with jokes and fun comments. When finished, they said meditating made them feel sleepy.

Nonetheless, by the following session, some participants reported taking the meditation exercise more seriously. One participant said, *“Yesterday my son and I were in the hospital for an appointment with the doctor. While I was waiting in the waiting room, I closed my eyes and started to meditate. I felt so relaxed.”*

In the subsequent education sessions, participants requested to practice the meditation exercise together with the researcher. As time went by, they became more familiar with the techniques and expressed their appreciation for the relaxed feelings they had during the exercise. Participants also learned other relaxation exercises such as belly breathing, deep breathing, and focusing on the body sensations.

Next, participants learned self-talk to help minimize unhealthy behaviours. One participant said, *“My problem is that whenever I feel stressed, sad, or angry, I cannot resist the temptation of craving sweets.”* The researcher commented as, *“whenever you feel that urge to eat sweets, talk to yourself and say: I’m feeling this because my brain wants me to do something that makes me happy. Instead of eating sugar and unhealthy food, I’ll do something that makes me happy and healthy.”*

(f) Other Examples that Elucidate the Tailoring of the Harvard Reports on Diabetes to the Islamic Culture of Saudi Arabia

Other tools the primary researcher employed to make the Harvard Special Health Reports relevant to the Saudi culture included: 1. positioning concepts from the Harvard report into the Saudi social structure; and 2. using cultural images to explain concepts from the Harvard reports. For example, motherhood is an honourable role for Muslim woman and participants live that role daily. To illustrate the point of self-compassion from the Harvard Special Health Report on positive psychology (Harvard Health Publications, 2011), the primary researcher linked the image of a loving and caring mother to her children to one becoming compassionate and forgiving of herself. Other examples are presented in Table 4.6.

(g) Classroom Setting

Participants in the Intervention Group received a six-week education program. The primary researcher facilitated the education sessions that were scheduled over six weeks and conducted these sessions for a minimum of twice a week to cover the content. Women were invited to tailor the delivery and format of the content and include more sessions as they believed were needed. They however gave no input except their suggestions of sessions’ times and location. During the first week of the program,

participants attended the sessions in the classroom. As most of the women worked at the clinic, participants suggested moving the sessions to a room which most of them were working at. This way, fewer participants were likely to miss sessions because of work duties.

(h) Educational Strategies

Education sessions were mostly based on interactive discussions. Participants were encouraged to interrupt the presenter for questions, comments, or reflections on their personal experiences. For more engagement with the topic of nutrition and the food pyramid (Moore et al., 2009), colouring was used during the session describing the healthy food pyramid. Participants picked different colours to fill in the components of the healthy food pyramid on sheets that were handed to them while discussing food options and benefits from each component of the pyramid. Videos, an interactive tool for diabetes education (Wheeler et al., 1985) from online-show airing exercise strategies by professional trainers, were presented to introduce participants to exercising for beginners. Handouts in Arabic and reading material based on the Harvard Special Health Reports for diabetes were organized in files and provided to all participants. All sessions referenced the Harvard reports except the first two sessions. Both sessions were planned in advance by the research team. Session One was designed to reintroduce participants to the six-week education program and the purpose and goal of the study. Participants learned how to calculate their body mass index(s) in Session Two. The content of the two sessions is detailed in Table 4.1.

(i) Topics Covered During the Six-week Education Program

All topics that were covered during the six-week education program appear in Table 4.2. Table 4.3 shows topics that were demonstrated with posters and pamphlets, which

were prepared and printed by other health institutions such as the Qatif Central Hospital and Dammam Central Hospital.

(j) Debriefing the Diabetes Knowledge Test

At baseline evaluation, participants were asked to complete the DKT. After the six-week education program, participants in the Intervention Group were interviewed in a group and handed sheets to mark their answers to the questions in the questionnaire. After selecting their answers to each question, the researcher discussed all possible answers and debriefed participants on the correct one. Participants in the Usual Care Group were interviewed individually and debriefed after they marked their answers to each question.

(k) Focus Group Discussion with the Intervention Group

To learn about participants' input on the six-week education program, the researcher had a recorded focus group discussion with the Intervention Group.

4.4.8. Deliverables

Participants were awarded one of two certificates. The standard certificate was awarded to participants in the Usual Care Group (Appendix 13), and the advanced certificate was awarded to those in the Intervention Group (Appendix 14).

4.4.9. Data Analysis

Focus group data: Atlas.ti® software was used to organize and code the qualitative data from the focus group discussion with the Intervention Group at the end of the education program in accordance with the thematic analysis approach (Braun & Clark, 2006). SPSSv.20 was used to analyze demographic data, body composition data, exercise data, questionnaires related to diabetes knowledge, program satisfaction, and life satisfaction before and after the education program in both groups.

Outcome measures: data were organized to provide descriptive statistics of participants' socio-demographic characteristics, their age, their health profiles, and their stress and sleep behaviours in both groups.

Descriptive statistics and frequency of occurrence for participants in both groups before (pre) and after (post) the education program were provided for the following variables: physical measurements including weight, BMI, WHR, blood sugar, and 6MWT distance, and score results of DKT, LISAT, and SF12. To detect tendencies in the variables after the six-week period of the education program in both groups, we calculated the differences (post-pre intervention) for the physical measurements, DKT, LISAT, and SF12.

To minimize type 1 error due to the small sample size, we used 95% confidence intervals to examine the pre/post differences of the sample means of physical measurements, DKT, LISAT, and SF12 in both groups. Significance of the difference in the two groups is determined by whether zero is in between the upper bound and lower bound of the confidence intervals or not, i.e. if there is no zero, the difference in the two groups is significant.

4.5. Results

In total, 8 participants completed the study in the Intervention Group and 6 in the Usual Care Group.

4.5.1. Participants' Discussion of their Health Behaviours after the Education Program

Findings from the focus group discussion with participants in the Intervention Group showed that participants had benefited from the six-week education program. Themes that emerged from the focus group were:

1. increased physical activity

2. improved nutritional behaviours
3. improved stress management behaviours
4. disseminating knowledge, which participants learned from the education program

(a) Increased Physical Activity

Participants reported increasing their physical activity in response to the education program. They reported walking as their preferred exercise. One participant said that she and her kids went walking and dancing together.

Participant A.M. talked about her stretching exercises. *“After the education program, I began to exercise as I learned in the education program. I was exercising in my room once and my mother came. She thought I was lying on the ground because I was injured so she panicked and said in panicking voice ‘Are you okay? What happened?’ I replied laughing hardly, ‘I’m okay. I’m just stretching’ ”.*

D.L. noted how she felt every morning after the education program. *“I feel more active now compared with the past. Before the education program, I used to be so sedentary. I used to wake up in the morning feeling lazy and not wanting to get out of bed. Now however, once I open my eyes to get up, I jump right out of bed; as if the fat I used to have in my body is now decreased.”*

A.M. began to attain a sense of independence despite arthritic pain and T2DM complications. *“I’m learning to be more independent by not asking others around me to help me with tasks I can do myself. For instance, I would not ask others to grab a glass of water for me. I would now get it myself.”*

D.L. said she joined the gym after the education program. Gyms for women are available in Saudi Arabia but are often small and expensive, she noted. Z.M. said, *“We*

need public and free of charge gyms. There should be gyms for us at least in hospitals and other health centers.”

(b) Improved Nutritional Behaviours

Participants noted improvement in their personal nutritional behaviours. D.L. mentioned that she had never liked eating fruits and vegetable until the education program. She said, *“I started eating garden salads and fruits, which is very contrary to how I was in the past. Before the education program, we had all kinds of fruit and vegetables in the fridge but I never liked fruit or craved it. Now however, I eat apples, oranges, carrots...etc.”*

Selecting low fat food became important for participants after the education program. Participant A.M. said, *“From the education program, I learned to select low fat food options only. My lunch yesterday was fat free. I now eat green salads and fruits. Yesterday I ate three dates the way the dietician suggested.”*

A.S. said she replaced white bread with whole wheat bread, full fat milk and dairy with low fat, and reduced the amount of food she eats in general. At work, participants used to eat white bread only until they learned about the health benefits of whole wheat bread. After the education program, they said they are gradually working on replacing their usual unhealthy breakfasts with healthy ones.

Participant R.A. enrolled in a diet program. She now pays more attention to the amount of sugar and salt in her food and what she eats at parties. She would eat only one dish from many selections offered at dinner parties. Participant S.A. said she increased the amount of water she drinks daily.

Participants D.L. and A.M. said they stopped napping after lunch. D.L. said, *“I now don’t eat until I am full and don’t take naps right after lunch. If I want to nap, I do so*

before eating and while I am hungry.” A.M. said, “I stopped taking naps right after lunch. I now wait an hour or two until the food is digested. I also learned to take my medication regularly. Yesterday I took my insulin at work unlike before the education program; I used to delay taking my insulin until I got home. After I took my insulin yesterday, I had a light snack to keep my blood sugar balanced. The dietician from the education program instructed me about taking my insulin regularly.”

Participant Z.M. trains her kids to drink fewer soft drinks. *“I’m trying to convince my kids to stop drinking Pepsi but sometimes they insist and I buy them diet Pepsi as an alternative to the regular one. I’m drinking fresh juices instead.”*

(c) Improved Stress Management Behaviours

Participants mentioned that they liked the education session on happiness and wellbeing. Participants A.S. and R.A. said they practice the relaxation exercises they learned regularly.

(d) Disseminating Knowledge, Which Participants Learned From the Education Program

Participants reported being more aware of obesity risk factors in their children after the education program. Z.M. mentioned that she applied the knowledge she learned by teaching her children healthy nutrition habits. She said, *“I now teach my kids to eat healthy with me. Now we get together to eat and I’m usually the one who serves everyone. If I serve them large amounts they say: ‘mum that is more than enough’. If one of them wants to eat more, his brother would say: ‘Stop it. You could be full already. More eating is not good for you.’ I usually resolve this by suggesting eating fruits together. I use plates identical in size to make each aware of the amount he eats. If I have the urge to eat more, I don’t eat; that is to teach my kids that one does not have to be full to stop eating.*

My younger son is becoming health conscious. He often consults with me on the food he eats and whether it is good for his diet or not.”

Participant Z.M. said she passed on the knowledge she learned from the education program to her diabetic mother. *“I taught my mother to add no sugar to her food. My sister is the one who cooks for my mother so I am teaching my sister healthy food preparations. For instance, I advised her to use canola oil and olive oil. I also instructed her about the less fat in chicken breasts than chicken legs thus it is better to use the chicken breasts for my mother’s soups. I know how beneficial fiber to health can be therefore I asked my sister to include fruit and vegetables in my mother’s food. The dietitian from the education program mentioned that the total calories that exist in three dates are equal to the calories in one pear so I told my mother she could skip eating a fruit if she wants to eat dates.”*

Z.M. said she passed the knowledge from the education program to others in her social network. *“Whenever I get together with other women, I discuss what I have learned from the education program with respect to healthy nutrition and physical activities.”*

4.5.2. Outcome Variables

(a) Socio-demographic Characteristics

In the Intervention Group, the baseline mean age for participants was 45.5 years. The baseline average height and weight were 156.1 cm and 84.6 kg respectively. Most participants (38.5%) were married, all but two had children, 53.9% had intermediate school and lower, 69.2% were employed, 53.8% were financially independent, and 38.5% were in the upper middle social class.

In the Usual Care Group, baseline mean age for participants was 39.3 years. Baseline average height and weight were 153.3 cm and 86.3 kg respectively. All participants were married, 83.3% had 3 to 10 children, 83.3% had high school diplomas and above, all were employed, none were financially independent, all were supported by their husbands in addition to their personal incomes, and their socioeconomic status was all above the upper middle category.

Table 4.7 shows the demographic characteristics of participants in both groups. Table 4.8 shows baseline age and height for participants in both groups.

(b) Participants' Health Conditions

In the Intervention Group, participants reported 10 health conditions whereas in the Usual Care Group, 8 health conditions were reported. Table 4.23 shows health conditions that were reported by participants in both groups.

(c) Pre/Post Differences after the Six-week Program

Our data show some tendencies toward improvement in physical measurements for participants in the Intervention Group compared with the Usual Care Group after the six-week education program. Pre/post differences in physical measurements for participants in both groups appear in Table 4.11.

The distance walked in the 6MWT tended to increase in both groups. The 95% CI of pre/post difference for the 6MWT distance was significant in the Intervention Group but not significant in the Usual Care Group. Measures of pre/post differences of blood sugar levels, on the other hand, reveal a minor decrease in the Intervention Group and a minor increase in the Usual Care Group with no significance in the Intervention Group or the Usual Care Group. Graph 4.7 shows pre-program and post-program 6MWTD in both groups.

The pre/post differences of DKT scores show that more participants in the Intervention Group (68.4%) gave correct answers after the six-week education program compared with (31.6%) of participants in the Usual Care Group. The 95% CI of pre/post differences of DKT scores in the Intervention Group and the Usual Care Group show that pre/post differences of DKT were significant in both groups. Table 4.19 shows pre/post difference in DKT among participants in both groups. Table 4.18 shows the percentage of participants who gave correct answers in the DKT. Figure 4.4 shows pre-program and post-program DKT scores in both groups.

Measurements of waist to hip ratio (WHR) show a minor decrease of WHR for participants in the Intervention Group and a minor increase of WHR in the Usual Care Group after the six-week education program. The 95% CI in both groups reveal that there was no significance for pre/post difference in WHR for participants in the Intervention Group or the Usual Care Group. Figure 4.6 shows pre-program and post-program WHR measurements in both groups.

Life satisfaction (LISAT) scores tended to decrease in both groups after the six-week education program as shown in Figure 4.5. The health-related quality of life (SF12) scores show a minor increase in the Intervention Group and a minor decrease in the Usual Care Group but with no significant difference in the two groups. Table 4.15 shows the 95% of CI of group comparison for pre/post differences in physical and mental components and Totals. Graphs 4.2 and 4.3 show pre-program and post-program SF12 sub-domains scores in both groups. The pre/post differences of the SF12 and LISAT scores in both groups appear in Tables 4.15 and 4.17 respectively. Figure 4.5 shows pre-program and post-program LISAT scores in both groups.

Pre/post measurements of BMI tended to increase in the Intervention Group and decrease in the Usual Care Group. Results of the 95% CI in the Intervention Group and Usual Care Group show that there was no significant difference in both groups. BMI categories for pre-program and post-program in both groups appear in Figure 4.1.

(d) Satisfaction of the Intervention Group with the Education Program

All participants in the Intervention Group reported satisfaction with the education program in their exit interviews. Of all participants, 50.0% reported they were extremely satisfied with the knowledge they had learned from the education program, 62.5% of them were very satisfied with the way they were treated by the primary researcher and the dietician during the education program, 87.5% were extremely satisfied with the number of sessions they received during the education program, 62.5% were extremely satisfied with the education program overall. Tables 5.24 and 5.25 show the reporting of participants in the Intervention Group's satisfaction with the education program.

4.6. Discussion

Under the following sections, we discuss our study findings in relation to the study objectives.

4.6.1. Objective One: Outcomes of a T2DM Education Program Adapted to the Cultural and Religious Contexts of Saudi Women

In this section, we discuss the outcomes of the T2DM education program, which were based on international standards and adapted to the cultural and religious contexts of Saudi women, compared with the outcomes of usual care for diabetes in Saudi Arabia. To present these, we first discuss the changes in outcome variables (BMI, WHR, 6MWT, DKT, LISAT, and SF12) after the six-week education program. Second, we discuss the Intervention Group focus group discussion of their experience with the education

program. Third, we discuss the satisfaction of the Intervention Group with the education program.

(a) Pre/Post Differences in Outcome Variables (BMI, WHR, 6MWT, DKT, LISAT, SF12) in the Intervention Group Compared with the Usual Care Group

Our findings of pre/post differences reveal tendencies toward improvement in the Intervention Group and a decrease in the Usual Care Group with respect to health-related quality of life. This corresponds with literature reports of short-term improvement in quality of life in response to diabetes education (Funnell et al. 2009; Steed, Cooke, & Newman, 2003). To the best of our knowledge, no data exist on Saudi women's life satisfaction or quality of life. Studies that examined life satisfaction and quality of life in women have reported menopausal age, diabetes, chronic illnesses, sedentary lifestyle, overweight and obesity as factors that negatively impacted their life satisfaction and quality of life (Nisar & Sohoo, 2010; Strine, Chapman, Balluz, Moriarty, & Mokdad, 2008; Kolotkin, Crosby, & Williams, 2002; Bacevičienė, Rėklaitienė, & Tamošiūnas, 2009; Ball, Crawford, & Kenardy, 2004; Hulens, Vansant, Claessens, Lysens, Muls, & Rzwenicki, 2002). Participants in both groups in our study had blood pressure problems, obesity, diabetes, rheumatoid arthritis, osteoarthritis, and anemia. In the Intervention Group, participants reported having additional health problems such as irritable bowel and menopausal conditions. Ongoing support has been suggested to improve the quality of life for women with diabetes (Tang, Brown, Funnell, & Anderson, 2008). Further, when exercise and diet are combined, quality of life for obese, older adults with arthritis improves (Rejeski, Focht, Messier, Morgan, Pahor, & Penninx, 2002).

Based on our findings, there was a tendency of further improvement in the 6MWT distance after the six-week education program in the Intervention Group compared with the Usual Care Group. No data exist on the performance of the 6MWT in healthy adults in Saudi Arabia. Findings from an American report show differences in women's performance of the 6MWT based on their BMI(s) and health status (Hergenroeder, Brach, Otto, Sparto, & Jakicic, 2011). The distance which women walk in the 6MWT is inversely related to their BMIs (Hergenroeder, Brach, Otto, Sparto, & Jakicic, 2011). To the best of our knowledge, the only study that documented the performance of the 6MWT distance in Saudi Arabia was based on 6MWT distance for patients with chronic obstructive pulmonary diseases (Al Moamary, 2009). Findings from this study indicated that the mean of the 6MWT distance for patients with chronic obstructive pulmonary diseases was between 117.1 and 218 (m) (Al Moamary, 2009).

Our results reveal tendencies of improvements with respect to blood sugar levels after the six-week education program in the Intervention Group but not so in the Usual Care Group. Random blood sugar testing, performed for participants in both groups, is normally used to measure blood glucose levels during the day regardless of the time of last eating (WebMed, 2013). Random blood sugar testing is a useful indicator of normal blood sugar levels in healthy people (WebMed, 2013). That is, in healthy people, blood glucose levels will stay normal regardless of when they last ate before undergoing the test (WebMed, 2013). Random blood sugar testing however cannot be used to diagnose diabetes (WebMed, 2013). Baseline average blood sugar level among participants in the Intervention Group was 154.1 mg dl and in the Usual Care Group was 99.3 mg dl. Since, these values were a result of random blood sugar testing; we could not use them to

confirm the onset of diabetes in study participants. Moreover, we did not know whether participants were fasting before the test or not and thus could not confirm whether the results were actually above normal or not. In the Intervention Group, the value 154.1 mg dl, if fasting, means that blood sugar was above normal. In the Usual Care Group, the value 99.3 mg dl, if fasting, was in the normal limits. Normal blood sugar ranges appear in Appendix 11.

Diabetic participants in the Intervention Group reported that they became more disciplined in monitoring their blood sugar, and taking their medicine and insulin if they were prescribed insulin. These behavioural changes, we suggest, could have reflected the decrease in blood sugar levels among participants in the Intervention Group after the six-week education. Studies show that self-monitoring of blood sugar is associated with significant glycemic control in diabetic patients who take pharmaceutical drugs for the treatment of their diabetes (Karter et al., 2001; Moreland et al., 2006).

Our findings indicate that results of diabetes knowledge test scores tended to further increase in the Intervention Group after the six-week education program compared with the Usual Care Group. Findings from a community-based diabetes education program have reported improvement in diabetes knowledge and self-reported behaviours (Chapman-Novakofski & Karduck, 2005). Results of a study that examined people's knowledge of diabetes showed that people in Saudi Arabia had a poor knowledge of diabetes risk factors and preventive measures (Aljouidi & Taha, 2009). Another recent study that examined diabetes knowledge, attitudes, and practices of women in the Qassim region of Saudi Arabia showed a modest level of diabetes knowledge (56.14%) but poor

attitudes and practices toward diabetes management (Saadia, Rushdi, Alsheha, Saeed, & Rajab, 2010).

Our findings noted no improvement in the body mass index (BMI) in the Intervention Group after the six-week education program. Minor improvement of BMI after the education program was noted in the Usual Care Group only. For all women in both groups, BMI was above 30 (kg/m^2), which is above the healthy weight according to the Canadian Guidelines for Body Weight Classification in Adults (Food and Nutrition, 2003). No guidelines officially exist for Saudis. Data based on BMI measures in the Eastern Mediterranean region reported a sharp increase in overweight and obesity across age groups for both men and women recently. In men, “overweight and obesity ($\text{BMI} \geq 25 \text{ kg/m}^2$) ranged from 30% to 60%, whereas among women it ranged from 35% to 75%” (Musaiger, 2004, p.790). An urban lifestyle and higher socioeconomic status, multiple pregnancies, and social and cultural barriers are associated with increased obesity among women in the Eastern Mediterranean region (Badran & Laher, 2012; Musaiger, 2004). Other factors associated with obesity include young age (30 to 50 years), more education, marriage, hot climate, employment, high income, watching television for more than 2 hours per day, consuming fresh fruit less than 3 times a week, and decreased physical activity (Badran & Laher, 2012; Musaiger, 2004). Studies suggested that Saudi women who do daily household chores might not find time to exercise (Midhet, Al Mohaimeed, & Sharaf, 2010).

In a recent study that examined the relationship between fast food consumption and BMI among female university students in Riyadh, 4.3%, 2.1%, and 1.4% of participants were in the 4th, 5th, and 6th obese groups, respectively (Alfawaz, 2012). In another study

conducted in Riyadh, the maximum BMI among female participants was reported to be 45 by kg/m² (Al-Eisa & Al-Sobayel, 2012). In the Qassim region of Saudi Arabia, on the other hand, 55.4% of female participants were reported to be obese (Mohieldein, Alzohairy, & Hasan, 2011). Our findings confirm Saudi women's tendency to be obese, which exposes them to a range of health risks.

With respect to waist to hip ratio (WHR) after the six-week education program, there was a minor decrease of WHR in the Intervention and a minor increase of WHR in the Usual Care Group. These minor differences contradict with the noted increase of BMI in the Intervention Group and the noted BMI decrease in the Usual Care Group. We therefore assume that the pre/post differences of WHR in both groups are due to measurement errors. Like BMI, baseline waist to hip ratio (WHR) in a critical range is likely to contribute to health risks (James, Leach, Kalamara, & Shayeghi, 2011). For the measurement of obesity, BMI is often used and obese people have larger WHR (Cashdan, 2008). In our study, mean WHR for participants in both groups was above 0.8 (minimum=0.8 and maximum=1.9). Compared with women in other countries, the BMI(s) of Saudi women are in the obese range and their WHR(s) are correspondingly high (Cashdan, 2008). WHR among women increases with age in response to cultural images of women's bodies. For example, in some cultures, men prefer to have overweight wives and obesity in others is a symbol of affluence (Cashdan, 2008). According to the World Health Organization, women who are WHR are more than 0.8, like in our study, are at greater health risks (World Health Organization, 2011a).

(b) Participants Personal Remarks about their Health Behaviours in Response to the Education Program

Four themes emerged from the focus group discussions with participants in the

Intervention Group of their experience with the education program at the end of the program: first, increased physical activity; second, improved nutritional behaviours; third, improved stress management behaviours; and fourth, disseminating knowledge, which participants learned from the education program.

i) Theme One: Increased Physical Activity

Evidence has noted ongoing support as a key for the persuasion of health behaviours in participants of diabetes education program (Funnell et al., 2009). Our study participants acknowledged the role of ongoing encouragement and motivation to their persuasion of healthy behaviours. They reported increasing their physical activity and walking as their preferred exercise in response to the education program. One participant said she had joined a gym. Another reported she and her children went walking and dancing together. Increased physical activity in response to diabetes education is confirmed in literature (Lindström et al., 2003).

Although the effectiveness of low-pace walking for the prevention and management of T2DM has not been confirmed (Jeaon, Lokken, Hu, & van Dam, 2007), participants' reporting of their efforts to increase their physical activity confirms the suggestion that knowledge, which participants acquire from diabetes education, leads to changes in their behaviours (Chapman-Novakofski & Karduck, 2005). In our study, when participants learned about the health benefits of physical activity, they became motivated to walk for 30 minutes before starting work in the morning. One morning they informed the researcher that they had been for a walk together early that day. Further to that, participants were eager to try using a pedometer to count their daily steps, as advocated by the Harvard guidelines, but were unable to find where they might purchase such items in their communities.

Another example that demonstrated participants' willingness to change their behaviours is when the primary researcher explained the objective of the six-minute walk test, which assesses participants' fitness, to them. Participants expressed their wishes to increase their physical activity after they had completed the six-minute walk test. For example, when participant N.A. was performing the test, she said, *"I maybe should do this exercise very often in my house and around the garden"*. S.A said, *"I wish if we could this six-minute walk test everyday"*.

For other participants like K.L., performing the six-minute walk test was a reminder of their health needs during their working hours. She said, *"There should be a health professional for us to advise us on occupational health and motivate us to do this kind of exercise between working hours"*. Participant M.D. reported that she would perform the six-minute exercise more often in her office. She said, *"Since I am on diet, I should do this exercise everyday in my office to burn some fat."*

ii) Theme Two: Improved Nutritional Behaviours

Our participants' reporting of improved nutritional behaviours is consistent with scientific evidence that diabetes education yields improvements in self-reported behaviours (Lindström et al., 2003; Chapman-Novakofski & Karduck, 2005). The Finish Diabetes Prevention study, for instance, has reported long-term improvements in nutritional behaviours and increased physical activity (Lindström et al., 2003).

During our study, participants enjoyed learning to calculate their BMIs but at the end of the session were disappointed to discover that their BMIs were above average. By the next session, most of them reported making attempts to change their health behaviours. For example, one participant reported starting a diet program to lose weight. Another said

she gave more attention to the amount and variety of fruit and vegetables she bought when she went to grocery shopping.

After the six-week education program, participants noted improvement in their personal nutritional behaviours. They reported increasing their consumption of fresh fruit and vegetables, decreasing the amount of fat in their diet, and replacing white bread with whole wheat bread.

iii) Theme Three: Improved Stress Management Behaviours

Scientific studies confirm psychosocial improvements in response to diabetes education (Funnell et al., 2009; Steed, Cooke, & Newman, 2003). Participants in our study reported that they liked the education session on happiness and wellbeing. One participant said she practiced the relaxation exercise regularly. Others reported adopting the meditation techniques, which they learned from the education program, in their daily lives.

Our findings are consistent with literature on mental health in Muslim cultures. Muslims' perceive the teachings of Islam regarding positive mental health as a foundation of psychological therapy (Haque, 2004). Participants in our study favoured the Harvard stress-management strategies when framed with the Islamic faith. During the session on positive psychology, for instance, there was a discussion on the role of psychology to overcome daily stresses and major life events. Being oriented to Islamic beliefs about the role of faith with respect to one's resilience and overcoming difficulties, participants agreed less with the Harvard suggestion on the impact of positive attitudes on successfully getting through stressful events. They believed that it is faith in God that helps one overcoming stressful events. One participant said, "*It does not matter how old*

the person is, it is the degree of one's faith that determines the ability to overcome difficulties."

Evidence-based studies of diabetes education have reported better improvements when education programs incorporating psychological approaches (Funnell et al., 2009). Moreover, such programs were reported as more effective when adapted to the culture of participants (Funnell et al., 2009). In short, whether participants' reporting of behavioural changes in response to the program is an outcome of integrating mental health into the education program, adapting mental health education to Islamic faith, or tailoring diabetes education to the culture of participants, warrants subsequent investigations.

iv) Theme Four: Disseminating Knowledge, Which Participants Learned from the Education Program

Since passing knowledge to others is among the teachings of Islam, participants during the education program were reminded of their roles in passing diabetes education to others. Participants perceived that role as a religious obligation and reported passing the knowledge they had from the education program to their families and friends.

Participants passing diabetes education into communities corresponds with the World Health Organization initiative of peer support programs in diabetes (World Health Organization, 2007). The impact of the role of our study participants in promoting healthy behaviours in their communities warrants further investigations. Studies to investigate the feasibility of conducting peer support diabetes education in Saudi women are also needed.

(c) The Intervention Group Satisfaction with the Education Program

At the end of the study, participants in the Intervention Group reported their overall satisfaction with the education program. Participants' satisfaction of the education

program, although a marking of the primary researcher's success as a diabetes educator, is not a measure of the effectiveness of the education program. The satisfaction questionnaire we used in our study was based on closed-ended questions at the end of the education program and this could have limited participants' responses. Future studies similar to ours would benefit from open-ended questions of a satisfaction questionnaire presented to participants for their responses at the end of each educational session (Griffin, Gilliland, Perez, Helitzer, & Carter, 1999). Such questionnaire will be a useful tool for the evaluation of the program delivery with participants' suggestions to improve it.

4.6.2. Objective Two: Informing Future Studies Related to the Health Needs of Women in Saudi Arabia

In the following sections, we discuss our suggestions for studies related to the health needs of women in Saudi Arabia. To present these we first discuss the challenges we encountered in launching our study. Second, we discuss practical obstacles that can be avoided for the launching of related studies. Third, we discuss extension studies using other participants, e.g. men. Fourth, we provide examples of future studies that are informed by our pilot findings and will assist in providing further information related to the health needs of women in Saudi Arabia.

(a) Challenging Factors

This pilot study is the first attempt to explore the outcomes of an intervention program of a six-week T2DM education, based on international standards and tailored to Saudi women's cultural and religious contexts, and compare outcomes of this program with outcomes of usual care for diabetes in Saudi Arabia.

Conducting our research in the Saudi Arabian culture was associated with multiple challenges. First, the research process is less familiar to the public compared with western countries, and often viewed with suspicion (Tessler & Jamal, 2006). To minimize this possibility in our study, the primary researcher employed strategies that helped assure participants' confidentiality. These strategies included presenting the ethical approval of the study to participants and informing them about their rights to withdraw anytime without providing explanation, should they decide to not disclose their reasons. Participants were also allowed to take a copy of the consent to discuss it with their families before making the decision to participate, should they choose to do so. Second, Saudi research ethics are different than the Canadian ones. In the case of our both studies, we needed to modify the study design to be consistent with the ethical guidelines from the Ministry of Health in Saudi Arabia. For instance, based on the Saudi research ethics, our study was to be launched in health centers only and was not permitted in other public settings in communities. Third, the Saudi culture has imposed societal restrictions on female researchers in Saudi Arabia. The primary researcher in our study was a woman working in the field by herself and as such she was exposed to societal restrictions that compromised her own safety. For example, because women in Saudi Arabia are not allowed to drive and no public transportation is available in the country, the primary researcher hired a male driver, whose identity could not be verified, to get to health centers in suburbs and isolated areas for the purpose of recruiting participants. Future research of studies similar to ours, we suggest, would benefit from including a team of male and female researchers to balance out the demands of the research process with minimum safety compromises.

i) Practical Barriers

Previously, we described the reasons why women dropped out of the study. Among these reasons was the transportation factor. Saudi women encounter challenges with transportation because women are prohibited from driving and the lack of public transportation in the country. For these reasons, we facilitated participation in this study by launching the six-week education program in a primary health centre that was located at a large residential compound. Participating women, thus, could get to the health centre within a few minutes walking. We assigned participants into two groups. Assigning participants to a group was based on their location (i.e. if they lived close to the classroom, they were assigned to the Intervention Group), and willingness and ability to attend the sessions of the six-week education program.

Future programs need to consider how women will be transported back and forth to the classes, what provision is being made for childcare, and what provision is being made for time away from work. The women in our Intervention Group appreciated, and we believed adhered to the program more so, because it was organized through their workplace.

The number of participants, who completed our study in the Intervention Group (8), although small, falls within a suggested range of (2 to 20) for a group size receiving health education (Tang, Funnell, & Anderson, 2006). An average of ten participants in a group, as suggested by Tang, Funnell, & Anderson (2006), will allow for interactions between members of a group. According with these, future studies should consider a minimum of ten participants for the sample size of participants in the Intervention Group. This number can be achieved by facilitating transportation for participating women.

ii) Future Replications

Replicating this study in other regions in Saudi Arabia will shed light on further social and cultural contexts that could be augmented to the content of a T2DM education program. Also, replicating this study in Saudi men of all age groups will provide insights regarding similar and different needs of men. Future studies, we suggest, should pay attention to the need of launching diabetes education in school children and university students.

iii) Potential Future Studies

Future studies can include:

1. A randomized controlled trial of a T2DM education program tailored to the cultural and religious contexts of Saudi women and compared with outcomes of usual care for diabetes in Saudi Arabia. These studies should have larger sample size, long-term follow-ups, and a control group in addition to the Intervention Group and Usual Care Group.
2. Research studies to adapt international standards of health education related to other lifestyle-conditions like hypertension to Islamic faith, as per the World Health Organization initiative, and examine the outcome of these programs in Saudi women.
3. Studies to examine the outcome of an evidence-based education related to nutrition only, which is modified to the Saudi culture, in Saudi women.
4. Studies to examine the outcomes of inside the home physical activities that are similar to the ones we recommended to participants in our study based on the Harvard suggestions to increase physical activity.

5. Studies to examine the outcomes of walking exercise in Saudi women who veil their faces with niqabs, given that face-veils may restrict breathing during physical activities such as walking (Alghadir, Aly, & Zafar, 2012).
6. Studies to examine the outcomes of stress-management techniques, which are based on international standards and adapted to the cultural and religious contexts of Saudi women.
7. Studies to assess the life satisfaction and health-related quality of life in Saudi women.
8. Studies to explore means of encouraging Saudi women to participate in the development and implementation of health education programs.

4.7. Strengths and Limitations

4.7.1. Strengths

This study was based on the findings of Study One that examined Saudi women lifestyle-related health beliefs and behaviours and their understanding of religious teachings in relation to health behaviours. To the best of our knowledge, this present study is the first intervention pilot study that explored the outcomes of a T2DM education program, based on international standards and adapted to the cultural and religious contexts of Saudi women, compared with outcomes of usual care for diabetes in Saudi Arabia. Our study provided detailed description of how international standards for a T2DM education program could be adapted to the culture and religion of women in Saudi Arabia. It demonstrated the outcomes of an intervention program of a six-week T2DM education, based on international standards and tailored to Saudi women's cultural and religious contexts, with pre and post measurements and evaluations. It sheds light on Saudi women's insights in response to their experience of participating in a six-week

T2DM education tailored to their cultural and religious contexts. Our findings provided a baseline description of Saudi women's life satisfaction and health-related quality of life, given that no previous studies examined life satisfaction or health-related quality of life for women in Saudi Arabia. Finally, the description of our findings is based on mixed methods of data analysis. Such broad base of data analysis, we think, will provide multiple avenues for future related research.

4.7.2. Limitations

This study has its limitations. First, the study was based on a short-term follow-up and thus provided short-term outcomes only; long-term benefits remain to be evaluated. Second, as a pilot study, the sample size of study participants was small which limited the scope of the statistical tests in the analysis. Third, sampling was based on non-random sampling, which minimized the potential generalizability of our findings. Fourth, we used random blood sugar testing based on home monitoring devices, which is not a reliable way to test for the presence of diabetes. Fifth, baseline scores of blood sugar testing were different in the two groups (above normal in the Intervention Group and normal in the Usual Care Group). This indicates that the two groups had different health needs in relation to T2DM to start with. Sixth, the paucity of knowledge about Saudi women's life satisfaction and quality of life precludes the use of comparative data. Seventh, the diabetes knowledge test we used, although validated for use in Arab cultures, was designed to evaluate the diabetes knowledge of health care professionals. Its use to evaluate the diabetes knowledge of research participants, in response to an intervention education, has not been previously reported to our knowledge.

4.8. Conclusion

Establishing culturally appropriate T2DM education programs could benefit women

in Saudi Arabia. Health education through religion could be a primary approach, given that Islamic teachings are consistent with healthy lifestyles. Findings from our pilot study support positive responses to a T2DM education program that was adapted to the cultural and religious contexts of Saudi women. Our findings have provided a framework for future replication and extension studies related to T2DM education programs not only for women but also for men in Saudi Arabia and other neighbouring countries.

4.9. Tables and Graphs

Table 4. 1 Content Covered in Sessions One and Two of the Type 2 Diabetes Mellitus Health Education Program
(Source: Harvard Health Publications: Diabetes: A Plan for Living)

Session One

Welcome and introduction

Purpose of the study (education program)

- T2DM is a serious life-threatening condition, so it is important to prevent it, reverse it which can be done in some cases, as well as control and manage it
- International standards in diabetes education have been established. This program provides education to you about your diabetes and how to control it, and either eliminate it or reduce its severity
- We want to demonstrate that 1) Saudi women may respond positively like other women to a six-week diabetes education program, and 2) Saudi women have the opportunity to modify the format of the program to suit their learning needs and wants

Think about definitions of health

Self-management construct

- T2DM is a lifestyle condition that affects metabolism which means your body's ability to function
- Your metabolism is essential to life and living healthily
- Abnormal metabolism associated with T2DM is mostly affected by dietary choices (sweets, fats, and refined foods), by inactivity, and there has been some relationship with smoking
- T2DM was a relatively rare condition in Saudi Arabia until the country became richer which enabled people to buy more sugar and sweets, fats, and meat (which meant people were eating less vegetables, fruit, and whole grains, and legumes)

Session Two

- What is BMI?
- How to calculate it?

Table 4. 2 Topics Covered from the Harvard Publications on Health

What is diabetes?

- Normal blood sugar levels
- Who is at risk for type 2 diabetes mellitus?
- Prevention is possible

Diagnosing diabetes

- The symptoms
- Guidelines for diabetes screening
- Dealing with the diagnosis

Managing your diabetes: An overview

- The ABC's of diabetes control
- A team approach

Weight-loss strategies for diabetes

- Lifestyle changes make a difference
- Eating strategies for weight loss
 - Seek support
 - Healthy eating guidelines
- Diabetes diet target
- The importance of exercise
- Tips for healthy eating away from home
- Types of exercise
- Caution for people with diabetes complications

Short-term complications

- Low blood sugar (hypoglycemia)
- Treating low blood sugar

Pregnancy and diabetes

Long-term complications

Lose Weight and Keep it Off

Overweight and obesity: What's behind the growing trend?

- Why people become overweight
- Genetic factors
- Environmental factors
- The food factor
 - Personal, environmental, and social factors that affect weight
- The exercise equation
- Stress, sleep, and other lifestyle issues
 - Everyday stress
 - Emotional backlash
 - Time pressures
 - Speed eating
 - Not enough ZZZ's
 - Friends and family
- What is binge eating disorder?
- How sleep loss may lead to weight gain?
- Other causes of obesity

Table 4. 2 Topics Covered from the Harvard Publications on Health

	<ul style="list-style-type: none"> ▪ The trouble with TV: Sedentary snacking
Weight-loss basics	<ul style="list-style-type: none"> • Counting calories: How many do you need? <ul style="list-style-type: none"> ▪ Meeting your calorie target • Physical activity: How much is enough? • How to burn about 150 calories • What determines your metabolic rate? <ul style="list-style-type: none"> ▪ The NEAT factor • Exercise prescription • Starting an exercise program
Choosing the diet that fits you best	<ul style="list-style-type: none"> • The diet studies • Low-fat: Doesn't taste great... and is less filling • Low carbohydrates: quick weight loss but long-term safety questions • Mediterranean-style: Healthy fats and carbs with a big side of fruits and vegetables
What to eat: a week of daily menus	<ul style="list-style-type: none"> • Restaurant meals: The dieter's downfall
10 habits to help you lose weight	<ul style="list-style-type: none"> • What is cognitive behavioural therapy? • Set small, specific, and realistic goals • Start self-monitoring <ul style="list-style-type: none"> ○ A sample of behaviour chain • Create a behaviour chain • Find a support network • Energize your exercise • Make sure you're getting enough sleep • Eat breakfast-slowly and mindfully every morning • Monitor and modify your screen time • Shop smarter • Reward yourself with (nonfood) pleasures
Healthy Eating for Type 2 Diabetes	
Understanding diabetes	<ul style="list-style-type: none"> • Blood sugar testing <ul style="list-style-type: none"> ○ A guide to blood pressure levels • The ABC's of diabetes control • Blood pressure targets • Cholesterol levels
The first-line treatment: Weight loss	<ul style="list-style-type: none"> • Weight-loss strategies <ul style="list-style-type: none"> ▪ Metformin: A diabetes standby • Calorie-cutting methods • Eating away from home • Exercise: The essential adjunct • Keeping the weight off <ul style="list-style-type: none"> ▪ Doing plenty of physical activity ▪ Eating a diet low in calories and fat

Table 4. 2 Topics Covered from the Harvard Publications on Health

- Eating breakfast
- Keeping tabs on how much they eat
- Stopping on the scale regularly
- Watching little television
- Eat s-l-o-w-l-y
- Get enough ZZZ's

The elements of a healthy diet

- Carbohydrates
 - Figure 3 Healthy eating pyramid
 - Glycemic index and glycemic load
 - Eating principles of low-glycemic eating
- Fiber
- Fats
 - The skinny on fats
 - Diet and your blood cholesterol
- Proteins
- Other dietary components
 - Calcium
 - Salt
 - Sugar and sugar substitutes
 - Natural and added sugars
 - Artificial sweeteners
- Vitamins and minerals

Meal-planning basics

- Meet with a registered dietician
- Calculate your caloric needs
- Choose a meal plan
 - The exchange system
 - Carbohydrate counting
- Handling hypoglycaemia

Exercise A program you can live with

The inside scoop: Exercise and your body

- Energy to burn

What can exercise do for you?

- Improves quality of life
 - Protects mobility and vitality
 - Wards off depression and anxiety
 - Sharpens wits
 - Improves sleep

The fundamentals: What you need to know to get started

- How much exercise do I need
 - Time
 - Calories
 - Calories, miles, and minutes: How long will it take?
- How often should I exercise?
- How long must my exercise sessions be?

Table 4. 2 Topics Covered from the Harvard Publications on Health

- How vigorously should I exercise?
- Gauging the intensity of your workout
- Building up

Creating a personal exercise plan

- Aerobic activities
 - How much
 - Get started
 - Find a safe place to walk
 - Buy a good pair of shoes
 - Dress for comfort and safety
 - Do a five minute warm-up and cool-down
 - Practice good techniques
- Step by step
- Stretching training

Exercising safely

- If you have health problems
 - Advice for people with arthritis
 - Advice for people with diabetes:
 - Before diving in
 - Once you have the go-ahead

Strength training exercises, 10 basic stretches

Positive psychology

A science of satisfaction

- History of positive psychology
- Positive emotions and the brain
- Maslow's "hierarchy of needs"

Defining and measuring happiness

- Is it genetic?
- Why pleasure fades
- Is happiness genetic
- The happiness/health connection
 - Better health
 - Have we evolved toward unhappiness?
- What makes you happy?
 - Things that make you happy
 - Feeling good
 - Engaging fully
 - Doing good
 - Things that won't make you happy
 - Money and material things
 - Youth
 - Children
 - Your strength and virtues
- Six virtues and their underlying strengths

Gratitude

Table 4. 2 Topics Covered from the Harvard Publications on Health

<ul style="list-style-type: none"> • Studying gratitude • Counting your blessings
<p>Savoring pleasure</p> <ul style="list-style-type: none"> • Single task • Celebrate • Slow down • Underscore • Simplify • Share the moment • Be active
<p>Flow: Becoming more engaged</p> <ul style="list-style-type: none"> • Flow at work • How to get in the flow <ul style="list-style-type: none"> ○ High skill + high challenge = flow
<p>Mindfulness</p> <ul style="list-style-type: none"> ○ Mindfulness techniques • Learning mindfulness • A mindfulness exercise to try: a meditation exercise • Practicing awareness in daily life
<p>Self-compassion</p> <ul style="list-style-type: none"> • What is self-compassion? <ul style="list-style-type: none"> ▪ How to develop self-compassion: <ul style="list-style-type: none"> Comfort your body Write a letter to yourself Give yourself encouragement Practice mindfulness
<p>The meaningful life</p> <p>Do unto others</p>

Table 4.3 Posters and Pamphlets

<ul style="list-style-type: none"> • Calculating the risk factors for type 2 diabetes mellitus • Obesity and how to avoid it • How to measure the body mass index • Recommended exercise for diabetic patients • Healthy food pyramid • Diabetes • Woman and obesity

Table 4.4 Discussion Topics: Personal, Environmental, and Social Factors that Affect Weight

Personal factors

- Sitting most of the day to work on a computer
- Stress
- Eating fast food during working hours

Community, social, and social norms and values factors

- Hospitality to guests by serving them big amounts of food and expecting them to eat most of it if not all
- Social gatherings are usually provided with a variety of food options including sweets, junk, and fatty food
- No gyms for women
- No walking areas for women
- No public transportation and women are not allowed to drive
- Fast food is the most convenient option to eat during working hours
- Kids prefer to eat from fast food restaurants
- On Wednesdays (last day of the week), families prefer to eat in restaurants
- Media Advertisements for the deals of combo size meals
- Kids spend most of their days watching television
- Kids eat junk food while watching television
- Few available options for entertainment that include eating in restaurants or going shopping in malls
- Cultural images for ideal body type of a female. Men like their wives to look average weight or overweight
- Kids have nowhere to go and play other than inside the homes
- Menus in restaurants are not provided with calories counting for each served meal

Table 4.5 Tailoring the Harvard Education for Positive Psychology with Religious Quotes

Topic	Quote
Science of satisfaction	The saying: “satisfaction is an infinite treasure”
Maslow’s “hierarchy of needs”	Hadith: “one third for yourself, one third for your food, one third for your drink”
Things that won’t make you happy	Qura’nic verse: “money and children are accessories of the worldly life”
Temperance and self control	Hadith: “don’t be angry”
Transcendence and appreciation of beauty	Hadith: “Allah is beautiful, loves beauty” The saying: “be beautiful you would see the world beautiful”
Spirituality	Qura’nic verse “Remember me, I remember you
Gratitude	Qura’nic verse: “always talk about your God’s gifts to you” Hadith: “don’t look to those whom above you, look at those who are below you”
Counting your blessings	Qura’nic verse: “if you count God’s gifts, you would find them countless”
Hope	Qura’nic verse: “be optimistic, you would find the good” Qura’nic verse: “don’t fall into despair of Allah’s help”
Matching your skill level	Qura’nic verse: “Allah doesn’t make a soul to carry more than it can”
The meaningful life	Hadith: “treat people the way you like them to treat you” Hadith: “the way Muslims compassionate, supportive, and corporate with each other is like one body”
Altruism	Hadith: “Love for your brother what you love for yourself”

Table 4.6 Other Examples of Tailoring Health Education to the Saudi Culture

Harvard Concept	Fitting the Concept to the Saudi Culture
Self-Compassion	“Treat yourself the way you treat your kids”
Positive relationships	“Encourage your teens to do something meaningful for their communities like volunteering in a mosque”
Flow experiences to do together	“Make a small monthly donation for charity” “Collaborate on cooking” “Pray or attend services” “Practice meditation” “Go for walks”

Table 4.7 Participant Characteristics by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Marital status	Married	5	38.5%	6	100.0%
	Single	1	7.7%	---	---
	Divorced	2	15.4%	---	---
	Separated	1	7.7%	---	---
	Widowed	4	30.8%	---	---
	Total	13	100.0%	6	100.0%
Number of children	0-2	3	27.3%	1	16.7%
	3-10	8	72.7%	5	83.3%
	Total	11	100.0%	6	100.0%
Educational status	No formal education	1	7.7%	---	---
	Primary	1	7.7%	---	---
	Intermediate	5	38.5%	---	---
	Secondary	4	30.8%	1	16.7%
	Diploma	1	7.7%	3	50.0%
	University	1	7.7%	2	33.3%
	Graduate	---	---	---	---
	Total	13	100.0%	6	100.0%
Occupational status	Homemaker	3	23.1%	---	---
	Employed	9	69.2%	6	100.0%
	Student	1	7.7%	---	---
	Retired	---	---	---	---
	Total	13	100.0%	6	100.0%
Source of income	Personal	7	53.8%	---	---
	Husband or guardian	3	23.1%	---	---
	Both	2	15.4%	6	100.0%
	Other	1	7.7%	---	---
	Total	13	100.0%	6	100.0%
Income (SR)	< 3,000	2	15.4%	---	---
	>=3,000 to <5,000	4	30.8%	---	---
	>=5,000 to <=10,000	5	38.5%	1	16.7%
	> 10,000	2	15.4%	5	83.3%
	Total	13	100.0%	6	100.0%
SR, Saudi Riyals (U.S. \$1.00 = 3.75 SR)					

Table 4.8 Physical Measurements, Pre-Program (Baseline) and Post-Program by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
PRE-PROGRAM (BASELINE)									
Age (beginning of study)	Intervention	13	45.5	47.0	11.3	3.1	17.0	66.0	38.72, 52.36
	Usual Care	6	39.3	41.0	7.1	2.9	26.0	46.0	31.86, 46.80
Height (cm)	Intervention	9	156.1	159.0	8.0	2.7	145.0	165.0	149.97, 162.25
	Usual Care	6	153.3	153.5	3.4	1.4	149.0	158.0	153.33, 149.72
Weight (kg)	Intervention	10	84.6	87.0	9.4	3.0	65.5	96.0	77.93, 91.37
	Usual Care	6	86.3	87.0	14.3	5.8	67.0	105.0	71.35, 101.32
Waist circumference (cm)	Intervention	10	49.6	45.5	14.6	4.6	39.0	89.0	39.17, 60.03
	Usual Care	5	41.7	42.0	4.8	2.2	34.0	47.0	35.72, 47.68
Hip circumference (cm)	Intervention	10	47.3	47.5	3.4	1.1	40.0	52.0	44.84, 49.66
	Usual Care	5	48.7	51.0	6.4	2.9	40.0	55.0	40.71, 56.69
BMI (kg/m ²)	Intervention	9	36.0	35.0	6.1	2.0	29.0	45.7	31.32, 40.75
	Usual Care	6	36.8	36.2	6.7	2.7	29.6	46.7	29.81, 43.80
Waist to hip ratio	Intervention	10	1.1	1.0	.3	.1	.8	1.9	0.83, 1.27
	Usual Care	5	.9	.8	.1	.1	.8	1.0	0.72, 1.01
Blood sugar (mg/dl)	Intervention	8	154.1	112.0	84.5	29.9	74.0	302.0	83.50, 224.75
	Usual Care	4	99.3	100.5	14.9	7.4	82.0	114.0	75.60, 122.90
Six minute walking test (m)	Intervention	10	92.6	89.3	9.8	3.1	80.5	110.3	85.59, 99.61
	Usual Care	5	119.1	121.5	24.7	11.0	87.5	151.0	88.39, 149.71
POST-PROGRAM									
Weight (kg)	Intervention	10	85.5	86.8	8.1	2.6	69.0	98.0	79.66, 91.24
	Usual Care	5	81.9	85.0	10.9	4.9	66.0	92.0	68.40, 95.41
Waist circumference (cm)	Intervention	10	43.9	46.0	4.1	1.3	36.0	48.5	41.01, 46.89
	Usual Care	5	43.5	44.0	2.8	1.2	39.5	46.0	40.04, 46.96
Hip circumference (cm)	Intervention	10	47.2	47.3	2.4	.8	43.0	50.0	45.41, 48.89
	Usual Care	5	47.7	50.0	6.1	2.7	40.0	53.0	40.11, 55.25

Table 4.8 Physical Measurements, Pre-Program (Baseline) and Post-Program by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
BMI (kg/m2)	Intervention	9	36.2	34.8	5.5	1.8	28.8	46.6	31.92, 40.44
	Usual Care	5	34.5	34.9	4.4	1.9	29.7	39.3	29.11, 39.92
Waist to hip ratio	Intervention	10	.9	.9	.1	.0	.8	1.1	0.87, 0.99
	Usual Care	5	.9	.9	.1	.0	.8	1.1	0.82, 1.02
Blood sugar (mg/dl)	Intervention	6	144.2	125.5	57.1	23.3	110.0	260.0	84.25, 204.08
	Usual Care	5	119.0	106.0	40.5	18.1	74.0	170.0	68.72, 169.28
Six minute walking test (m)	Intervention	9	111.7	114.8	19.5	6.5	74.3	135.0	96.67, 126.72
	Usual Care	3	100.3	94.5	31.2	18.0	72.5	134.0	22.92, 177.74

Table 4.9 BMI Categories, Pre-Program (Baseline) and Post-Program by Group

Group	25.0 to 29.9		30.0 to 34.9		35.0 to 39.9		≥ 40.0		Total	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
PRE-PROGRAM (BASELINE)										
Intervention	2	22.2%	2	22.2%	3	33.3%	2	22.2%	9	100.0%
Usual Care	1	16.7%	2	33.3%	1	16.7%	2	33.3%	6	100.0%
POST-PROGRAM										
Intervention	1	11.1%	4	44.4%	2	22.2%	2	22.2%	9	100.0%
Usual Care	1	20.0%	2	40.0%	2	40.0%	0	.0%	5	100.0%

Table 4.10 Waist-to-Hip Ratio Categories, Pre-Program (Baseline) and Post-Program by Group

Group	≤ 0.80		> 0.80		Total	
	N	Percent	N	Percent	N	Percent
PRE-PROGRAM (BASELINE)						
Intervention	0	.0%	10	100.0%	10	100.0%
Usual Care	3	60.0%	2	40.0%	5	100.0%
POST-PROGRAM						
Intervention	1	10.0%	9	90.0%	10	100.0%
Usual Care	0	.0%	5	100.0%	5	100.0%

Table 4.11 Physical Measurements, Pre-Program (Baseline) / Post-Program Difference by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
BMI Pre-Post Difference	Intervention	9	.1	-.2	1.6	.5	-2.4	3.8	-1.10, 1.39
	Usual Care	5	-.3	.0	1.4	.6	-2.6	.8	-2.00, 1.36
Weight Pre-Post Difference	Intervention	9	.5	-.5	4.0	1.3	-5.0	10.0	-2.58, 3.58
	Usual Care	5	-.7	.0	3.2	1.4	-6.0	2.0	-4.67, 3.27
Waist Pre-Post Difference	Intervention	9	-6.9	-.5	17.5	5.8	-53.0	2.0	-20.35, 6.57
	Usual Care	4	2.5	2.0	2.1	1.1	.5	5.5	-0.88, 5.88
Hip Pre-Post Difference	Intervention	9	-.9	-1.0	1.1	.4	-2.5	1.0	-1.76, -0.01
	Usual Care	4	-1.0	-1.1	.9	.5	-2.0	.0	-2.51, 0.46
WHR Pre-Post Difference	Intervention	9	-.1	.0	.4	.1	-1.1	.1	-0.42, 0.17
	Usual Care	4	.1	.1	.1	.0	.0	.2	-0.03, 0.17
Blood Sugar Pre-Post Difference	Intervention	4	-42.8	-23.0	98.0	49.0	-176.0	51.0	-198.61, 113.11
	Usual Care	3	9.0	-3.0	25.2	14.6	-8.0	38.0	-53.70, 71.70
Six Minute Exercise Pre-Post Difference	Intervention	8	18.2	20.4	16.0	5.6	-11.5	45.8	4.87, 31.56
	Usual Care	2	18.9	18.9	39.1	27.6	-8.8	46.5	-332.13, 369.88

Table 4.12 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) and Post-Program by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
PRE-PROGRAM (BASELINE)								
Physical Functioning	Intervention	11	31.8	50.0	22.6	6.8	.0	50.0
	Usual Care	3	41.7	50.0	14.4	8.3	25.0	50.0
Role Physical	Intervention	11	12.5	12.5	11.2	3.4	.0	25.0
	Usual Care	3	25.0	25.0	.0	.0	25.0	25.0
Bodily pain	Intervention	11	52.3	50.0	34.4	10.4	.0	100.0
	Usual Care	3	100.0	100.0	.0	.0	100.0	100.0
General health	Intervention	11	80.0	85.0	21.0	6.3	25.0	100.0
	Usual Care	3	90.0	85.0	8.7	5.0	85.0	100.0
Vitality	Intervention	11	40.9	25.0	30.2	9.1	.0	75.0
	Usual Care	3	33.3	25.0	38.2	22.0	.0	75.0
Social functioning	Intervention	11	75.0	100.0	35.4	10.7	.0	100.0
	Usual Care	3	83.3	75.0	14.4	8.3	75.0	100.0
Role Emotional	Intervention	11	20.5	25.0	8.4	2.5	.0	25.0
	Usual Care	3	25.0	25.0	.0	.0	25.0	25.0
Mental Health	Intervention	11	48.9	50.0	24.7	7.4	.0	87.5
	Usual Care	3	62.5	62.5	12.5	7.2	50.0	75.0
Physical Component	Intervention	11	41.6	41.6	7.3	2.2	29.6	53.0
	Usual Care	3	49.0	48.3	1.5	.9	48.0	50.8
Mental Component	Intervention	11	39.2	38.1	7.7	2.3	23.1	49.9
	Usual Care	3	40.1	38.5	3.7	2.1	37.6	44.3
Total	Intervention	11	410.7	417.8	96.3	29.0	184.7	530.7
	Usual Care	3	508.3	498.4	42.7	24.7	471.5	555.1
POST-PROGRAM								
Physical Functioning	Intervention	11	27.3	25.0	20.8	6.3	.0	50.0
	Usual Care	6	25.0	25.0	22.4	9.1	.0	50.0
Role Physical	Intervention	11	15.9	25.0	11.3	3.4	.0	25.0
	Usual Care	6	20.8	25.0	10.2	4.2	.0	25.0
Bodily pain	Intervention	11	77.3	100.0	39.5	11.9	.0	100.0
	Usual Care	6	83.3	100.0	25.8	10.5	50.0	100.0
General health	Intervention	11	81.4	85.0	21.8	6.6	25.0	100.0
	Usual Care	6	83.3	85.0	12.9	5.3	60.0	100.0
Vitality	Intervention	11	27.3	25.0	28.4	8.6	.0	75.0
	Usual Care	6	37.5	25.0	30.6	12.5	25.0	100.0
Social functioning	Intervention	11	56.8	75.0	46.2	13.9	.0	100.0
	Usual Care	6	75.0	87.5	38.7	15.8	.0	100.0
Role Emotional	Intervention	11	14.8	25.0	12.3	3.7	.0	25.0
	Usual Care	6	18.8	25.0	10.5	4.3	.0	25.0
Mental Health	Intervention	11	62.5	50.0	20.2	6.1	37.5	87.5
	Usual Care	6	45.8	50.0	30.3	12.4	12.5	87.5
Physical Component	Intervention	11	43.4	44.6	7.4	2.2	29.4	53.1
	Usual Care	6	46.0	48.0	6.0	2.4	37.1	52.3
Mental Component	Intervention	11	37.5	34.9	9.2	2.8	26.2	51.7
	Usual Care	6	36.9	37.8	6.4	2.6	28.4	45.8
Physical Component	Intervention	9	1.6	1.0	6.2	2.1	-8.4	10.6
	Usual Care	3	-2.5	1.6	7.5	4.4	-11.2	2.2
Mental Component	Intervention	9	.8	.6	9.3	3.1	-10.5	16.8
	Usual Care	3	-3.2	-1.9	5.4	3.1	-9.2	1.4

Table 4.12 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) and Post-Program by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
Total	Intervention	11	416.7	469.3	133.9	40.4	161.0	581.6
	Usual Care	6	447.4	470.2	62.4	25.5	331.3	499.2

Table 4.13 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) and Post-Program

Variable	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
PRE-PROGRAM (BASELINE)							
Physical Functioning	14	33.9	50.0	21.0	5.6	.0	50.0
Role Physical	14	15.2	18.8	11.2	3.0	.0	25.0
Bodily pain	14	62.5	50.0	36.4	9.7	.0	100.0
General health	14	82.1	85.0	19.2	5.1	25.0	100.0
Vitality	14	39.3	25.0	30.6	8.2	.0	75.0
Social functioning	14	76.8	87.5	31.7	8.5	.0	100.0
Role Emotional	14	21.4	25.0	7.6	2.0	.0	25.0
Mental Health	14	51.8	50.0	22.9	6.1	.0	87.5
Physical Component	14	43.2	44.0	7.1	1.9	29.6	53.0
Mental Component	14	39.4	38.3	6.9	1.8	23.1	49.9
SF12 Total	14	431.7	458.1	95.6	25.5	184.7	555.1
POST-PROGRAM							
Physical Functioning	17	26.5	25.0	20.7	5.0	.0	50.0
Role Physical	17	17.6	25.0	10.9	2.6	.0	25.0
Bodily pain	17	79.4	100.0	34.5	8.4	.0	100.0
General health	17	82.1	85.0	18.7	4.5	25.0	100.0
Vitality	17	30.9	25.0	28.7	7.0	.0	100.0
Social functioning	17	63.2	75.0	43.4	10.5	.0	100.0
Role Emotional	17	16.2	25.0	11.5	2.8	.0	25.0
Mental Health	17	56.6	50.0	24.7	6.0	12.5	87.5
Physical Component	17	44.3	45.3	6.8	1.7	29.4	53.1
Mental Component	17	37.3	36.5	8.1	2.0	26.2	51.7
SF12 Total	17	427.6	469.3	112.5	27.3	161.0	581.6

Table 4.14 SF12 Sub-Domain Scores (0 to 100) and Totals, Pre-Program (Baseline) / Post-Program Difference by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
Role Physical Pre-Post Difference	Intervention	9	6.9	12.5	15.5	5.2	-25.0	25.0
	Usual Care	3	.0	.0	.0	.0	.0	.0
Bodily pain Pre-Post Difference	Intervention	9	33.3	50.0	33.1	11.0	.0	75.0
	Usual Care	3	-16.7	.0	28.9	16.7	-50.0	.0
General health Pre-Post Difference	Intervention	9	.0	.0	7.5	2.5	-15.0	15.0
	Usual Care	3	.0	.0	15.0	8.7	-15.0	15.0
Vitality Pre-Post Difference	Intervention	9	-19.4	.0	44.7	14.9	-75.0	50.0
	Usual Care	3	16.7	25.0	62.9	36.3	-50.0	75.0
Social functioning Pre-Post Difference	Intervention	9	-11.1	.0	51.7	17.2	-100.0	75.0
	Usual Care	3	-16.7	25.0	72.2	41.7	-100.0	25.0
Role Emotional Pre-Post Difference	Intervention	9	-1.4	.0	7.5	2.5	-12.5	12.5
	Usual Care	3	.0	.0	.0	.0	.0	.0
Mental Health Pre-Post Difference	Intervention	9	22.2	25.0	19.5	6.5	-12.5	50.0
	Usual Care	3	-25.0	-37.5	21.7	12.5	-37.5	.0
Physical Component Pre-Post Difference	Intervention	9	1.6	1.0	6.2	2.1	-8.4	10.6
	Usual Care	3	-2.5	1.6	7.5	4.4	-11.2	2.2
Mental Component Pre-Post Difference	Intervention	9	.8	.6	9.3	3.1	-10.5	16.8
	Usual Care	3	-3.2	-1.9	5.4	3.1	-9.2	1.4
SF12 Total Pre-Post Difference	Intervention	9	32.9	38.8	55.5	18.5	-41.8	122.2
	Usual Care	3	-47.4	-70.1	66.7	38.5	-99.8	27.7

Table 4.15 SF12, Pre/ Post Differences for Combined Groups

Variable	Valid N	Mean Difference	Std. Error Difference	95% CI of the Difference
Physical Component	12	4.06	4.32	-5.57, 13.68
Mental Component	12	4.01	5.76	-8.83, 16.85
SF12 Total	12	80.29	38.61	-5.73, 166.31

Table 4.16 Life Satisfaction, Pre-Program (Baseline) and Post-Program by Group

		Intervention		Usual Care	
Variable	Category	N	Percent	N	Percent
PRE-PROGRAM (BASELINE)					
My life as a whole	Very satisfying	3	27.3%	0	.0%
	Satisfying	5	45.5%	4	80.0%
	Rather satisfying	3	27.3%	0	.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	1	20.0%
	Total	11	100.0%	5	100.0%
Vocational life	Very satisfying	2	20.0%	0	.0%
	Satisfying	7	70.0%	4	80.0%
	Rather satisfying	1	10.0%	0	.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	1	20.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	5	100.0%
Leisure situation	Very satisfying	1	9.1%	0	.0%
	Satisfying	6	54.5%	1	20.0%
	Rather satisfying	3	27.3%	0	.0%
	Rather dissatisfying	1	9.1%	2	40.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	2	40.0%
	Total	11	100.0%	5	100.0%
Contact with friends and acquaintances	Very satisfying	3	27.3%	1	20.0%
	Satisfying	6	54.5%	3	60.0%
	Rather satisfying	0	.0%	0	.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	2	18.2%	1	20.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	11	100.0%	5	100.0%
Ability to manage self-care	Very satisfying	6	54.5%	1	20.0%
	Satisfying	3	27.3%	3	60.0%
	Rather satisfying	2	18.2%	0	.0%
	Rather dissatisfying	0	.0%	1	20.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	11	100.0%	5	100.0%

Table 4.16 Life Satisfaction, Pre-Program (Baseline) and Post-Program by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Family life	Very satisfying	1	9.1%	1	20.0%
	Satisfying	8	72.7%	2	40.0%
	Rather satisfying	2	18.2%	2	40.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	11	100.0%	5	100.0%
Psychological health	Very satisfying	2	18.2%	0	.0%
	Satisfying	6	54.5%	3	60.0%
	Rather satisfying	2	18.2%	0	.0%
	Rather dissatisfying	0	.0%	1	20.0%
	Dissatisfying	1	9.1%	0	.0%
	Very dissatisfying	0	.0%	1	20.0%
	Total	11	100.0%	5	100.0%
POST-PROGRAM					
My life as a whole	Very satisfying	0	.0%	0	.0%
	Satisfying	10	100.0%	3	75.0%
	Rather satisfying	0	.0%	1	25.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%
Vocational life	Very satisfying	0	.0%	1	25.0%
	Satisfying	9	90.0%	2	50.0%
	Rather satisfying	1	10.0%	1	25.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%
Leisure situation	Very satisfying	0	.0%	1	25.0%
	Satisfying	6	60.0%	1	25.0%
	Rather satisfying	3	30.0%	2	50.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	1	10.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%
Contact with friends and acquaintances	Very satisfying	1	10.0%	0	.0%
	Satisfying	8	80.0%	3	75.0%
	Rather satisfying	1	10.0%	1	25.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%

Table 4.16 Life Satisfaction, Pre-Program (Baseline) and Post-Program by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Ability to manage self-care	Very satisfying	1	10.0%	1	25.0%
	Satisfying	6	60.0%	2	50.0%
	Rather satisfying	3	30.0%	1	25.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%
Family life	Very satisfying	2	20.0%	0	.0%
	Satisfying	6	60.0%	3	75.0%
	Rather satisfying	2	20.0%	1	25.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%
Psychological health	Very satisfying	1	10.0%	0	.0%
	Satisfying	8	80.0%	3	75.0%
	Rather satisfying	1	10.0%	1	25.0%
	Rather dissatisfying	0	.0%	0	.0%
	Dissatisfying	0	.0%	0	.0%
	Very dissatisfying	0	.0%	0	.0%
	Total	10	100.0%	4	100.0%

Table 4.17 Life Satisfaction, Pre-Program (Baseline) and Post-Program Totals, and Pre/Post Difference by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Life Satisfaction Questionnaire Total Pre-Program	Intervention	11	2.2	2.1	.6	.2	1.3	3.4	1.83, 2.58
	Usual Care	5	2.8	2.4	1.0	.4	1.8	4.4	1.57, 4.03
Life Satisfaction Questionnaire Total Post-Program	Intervention	10	2.2	2.2	.2	.1	1.9	2.4	2.04, 2.31
	Usual Care	4	2.3	2.2	.2	.1	2.1	2.6	1.87, 2.63
Life Satisfaction Questionnaire, Pre / Post-Program Difference	Intervention	8	-.1	-.1	.4	.1	-1.0	.2	-0.43, 0.21
	Usual Care	3	-.6	-.3	1.1	.6	-1.8	.3	-3.29, 2.09

Table 4.18 Diabetes Knowledge Test, Number and Percent Correct, Pre-Program (Baseline) and Post-Program by Group

Variable	Pre-Program				Post-Program			
	Intervention		Usual Care		Intervention		Usual Care	
	N	Percent	N	Percent	N	Percent	N	Percent
Diabetic diet	6	46.2%	4	66.7%	1	16.7%	5	83.3%
Highest in carbohydrate	2	15.4%	3	50.0%	5	83.3%	1	16.7%
Highest in fat	5	38.5%	0	.0%	5	83.3%	1	16.7%
Best method to test blood glucose	6	46.2%	1	16.7%	4	66.7%	2	33.3%
Effect of unsweetened fruit juice on blood glucose	2	15.4%	0	.0%	6	100.0%	0	.0%
NOT to be used to treat low blood glucose	9	69.2%	4	66.7%	4	66.7%	2	33.3%
Effect of exercise on blood glucose	11	84.6%	4	66.7%	2	33.3%	4	66.7%
Infection is likely to cause	7	53.8%	4	66.7%	1	16.7%	5	83.3%
Best way to care for your feet	10	76.9%	5	83.3%	2	33.3%	4	66.7%
Food low in fat decreases which risk	10	76.9%	4	66.7%	1	16.7%	5	83.3%
Numbness and tingling may be symptoms of	9	69.2%	3	50.0%	1	16.7%	5	83.3%
Which is NOT associated with diabetes	7	53.8%	3	50.0%	4	66.7%	2	33.3%
Changes you should make if you have flu	5	38.5%	4	66.7%	1	16.7%	5	83.3%
What to do if just before lunch realized you forgot to take Pre-breakfast insulin	3	23.1%	2	33.3%	2	33.3%	4	66.7%
If you are beginning to have an insulin reaction, you should	4	30.8%	0	.0%	2	33.3%	4	66.7%
Possible cause of low blood glucose	5	38.5%	3	50.0%	3	50.0%	3	50.0%
Took morning insulin & skipped breakfast; blood glucose level will	5	38.5%	3	50.0%	1	16.7%	5	83.3%
Possible cause of high blood glucose	6	46.2%	3	50.0%	1	16.7%	5	83.3%
Most likely cause of an insulin reaction	3	23.1%	1	16.7%	4	66.7%	2	33.3%

Table 4.19 Diabetes Knowledge Test, Pre-Program (Baseline) and Post-Program Totals, and Pre/Post Difference by Group

Variable		Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Pre-Program	Intervention	11	10.5	10.0	2.5	.8	6	14	8.72, 12.84
	Usual Care	5	10.2	10.0	1.3	.6	9	12	8.45, 12.55
Post-Program	Intervention	10	14.3	14.5	3.0	1.0	10	19	11.70, 16.52
	Usual Care	5	12.8	13.0	1.5	.7	11	15	10.03, 15.47
Pre / Post Program Difference	Intervention	9	3.3	4.0	3.1	1.0	-3	6	0.96, 5.70
	Usual Care	4	2.3	2.0	.5	.3	2	3	1.45, 3.05

Table 4.20 Types of Physical Activity Participants Reported Performing, Pre-Program (Baseline) by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Physical activity	Yes/No	8/3	72.7%/27.3%	5/1	83.3%/16.7%
Moderate physical activity	Yes/No	3/8	27.3%/72.7%	4/2	66.7%/33.3%
Strenuous physical activity	Yes/No	2/9	18.2%/81.8%	0/5	0.0%/100.0%

Table 4.21 Amount of Time Participants Reported Performing Physical Activities of Various Difficulties, Pre-Program (Baseline) by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Strenuous physical activity (days/week)	Intervention	2	4.5	4.5	3.5	2.5	2	7	-27.27, 36.27
	Usual Care	0	.	.	.	.	.	.	.
Strenuous physical activity (hours/day)	Intervention	0	.	.	.	.	.	.	.
	Usual Care	0	.	.	.	.	.	.	.
Strenuous physical activity (minutes/day)	Intervention	2	20.0	20.0	14.1	10.0	10	30	-107.1, 147.1
	Usual Care	0	.	.	.	.	.	.	.
Moderate physical activity (days/week)	Intervention	3	3.7	4.0	1.5	.9	2	5	.
	Usual Care	4	2.3	2.5	1.0	.5	1	3	.
Moderate physical activity (hours/day)	Intervention	1	2.0	2.0	.	.	2	2	.
	Usual Care	1	1.0	1.0	.	.	1	1	.
Moderate physical activity (minutes/day)	Intervention	2	22.5	22.5	10.6	7.5	15	30	.
	Usual Care	3	22.3	30.0	13.3	7.7	7	30	.

Table 4.22 Self-reported Physical Health Measures and General Health, Pre-Program (Baseline)
by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Weight	Underweight	0	.0%	0	.0%
	Normal weight	3	23.1%	1	16.7%
	Over weight	10	76.9%	5	83.3%
	I don't know	0	.0%	0	.0%
	Total	13	100.0%	6	100.0%
Heart rate	Low	1	7.7%	0	.0%
	Normal	9	69.2%	3	50.0%
	High	2	15.4%	3	50.0%
	I don't know	1	7.7%	0	.0%
	Total	13	100.0%	6	100.0%
Blood sugar	Low	1	7.7%	0	.0%
	Normal	8	61.5%	4	66.7%
	High	4	30.8%	2	33.3%
	I don't know	0	.0%	0	.0%
	Total	13	100.0%	6	100.0%
Blood pressure	Low	1	7.7%	0	.0%
	Normal	5	38.5%	3	50.0%
	High	7	53.8%	3	50.0%
	I don't know	0	.0%	0	.0%
	Total	13	100.0%	6	100.0%
Health	Excellent	2	15.4%	1	16.7%
	Above Average	4	30.8%	0	.0%
	Average	6	46.2%	5	83.3%
	Below Average	0	.0%	0	.0%
	Poor	1	7.7%	0	.0%
	Total	13	100.0%	6	100.0%

Table 4.23 Self-reported Morbidity, Pre-Program (Baseline) by Group

Variable	N/Percent	Intervention		Usual Care	
		Yes	No	Yes	No
Lung disease	N	0	13	0	6
	Percent	.0%	100.0%	.0%	100.0%
High blood Pressure	N	8	5	3	3
	Percent	61.5%	38.5%	50.0%	50.0%
Stroke	N	0	13	0	6
	Percent	.0%	100.0%	.0%	100.0%
Obese	N	7	6	2	4
	Percent	53.8%	46.2%	33.3%	66.7%
Diabetes	N	5	8	2	4
	Percent	38.5%	61.5%	33.3%	66.7%
Cancer	N	0	13	1	5
	Percent	.0%	100.0%	16.7%	83.3%
Osteoporosis	N	1	12	0	6
	Percent	7.7%	92.3%	.0%	100.0%
Anemia	N	3	10	1	5
	Percent	23.1%	76.9%	16.7%	83.3%
Multiple sclerosis	N	0	13	0	6
	Percent	.0%	100.0%	.0%	100.0%
Irritable bowel syndrome	N	4	9	3	3
	Percent	30.8%	69.2%	50.0%	50.0%
Ulcers	N	0	13	0	6
	Percent	.0%	100.0%	.0%	100.0%
Premenopausal	N	1	12	0	6
	Percent	7.7%	92.3%	.0%	100.0%
Menstrual, irregular cycles	N	0	13	0	6
	Percent	.0%	100.0%	.0%	100.0%
Menopausal	N	4	9	0	6
	Percent	30.8%	69.2%	.0%	100.0%
Other health problems	N	4	9	3	3
	Percent	30.8%	69.2%	50.0%	50.0%

Table 4.24 Average Weekly Consumption of Rice or Pasta, Bread and Cereals, Meat, Poultry, Seafood, Eggs, Nuts, Legumes, and Milk and Dairy Reported by Participants, Pre-Program (Baseline) by Group

Variable	Category	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
Rice or pasta (times/week)	Intervention	10	4.6	4.5	2.0	.6	2.0	7.0
	Usual Care	5	4.6	4.0	2.3	1.0	2.0	7.0
Bread and cereals (times/week)	Intervention	11	6.8	7.0	.6	.2	5.0	7.0
	Usual Care	6	4.7	4.5	2.1	.8	2.0	7.0
Beef or sheep (times/week)	Intervention	9	2.2	2.0	1.1	.4	1.0	4.0
	Usual Care	4	2.0	2.0	.0	.0	2.0	2.0
Meat products (times/week)	Intervention	3	1.3	1.0	.6	.3	1.0	2.0
	Usual Care	1	2.0	2.0	.	.	2.0	2.0
Chicken (times/week)	Intervention	10	3.3	3.0	1.7	.5	1.0	7.0
	Usual Care	4	3.8	3.5	1.0	.5	3.0	5.0
Fish (times/week)	Intervention	8	2.5	2.0	1.6	.6	1.0	6.0
	Usual Care	3	1.0	1.0	.0	.0	1.0	1.0
Shrimp (times/week)	Intervention	2	1.0	1.0	.0	.0	1.0	1.0
	Usual Care	1	1.0	1.0	.	.	1.0	1.0
Eggs (times/week)	Intervention	11	1.6	1.0	.8	.2	1.0	3.0
	Usual Care	4	1.8	1.5	1.0	.5	1.0	3.0
Nuts (times/week)	Intervention	8	2.0	2.0	1.1	.4	1.0	4.0
	Usual Care	5	1.4	1.0	.9	.4	1.0	3.0
Legumes (times/week)	Intervention	8	2.3	2.0	1.5	.5	1.0	5.0
	Usual Care	3	1.7	1.0	1.2	.7	1.0	3.0
Milk	Intervention	11	5.5	7.0	2.2	.7	2.0	7.0
	Usual Care	4	5.8	6.0	1.5	.8	4.0	7.0
Dairy products	Intervention	11	6.3	7.0	1.3	.4	3.0	7.0
	Usual Care	6	5.0	5.5	2.3	.9	2.0	7.0
Highlights indicate poor nutrition								

Table 4.25 Average Consumption of Fresh Fruits, Vegetables, and Dates Reported by Participants, Pre-Program (Baseline) by Group

Variable	Category	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
Fresh fruit (days/week)	Intervention	10	4.1	3.0	2.2	.7	1.0	7.0
	Usual Care	5	3.6	3.0	2.1	.9	2.0	7.0
Fresh fruit or juice (servings/day)	Intervention	11	2.2	2.0	1.0	.3	1.0	4.0
	Usual Care	5	2.2	2.0	.8	.4	1.0	3.0
Fresh vegetables (times/week)	Intervention	10	4.6	5.0	2.6	.8	1.0	7.0
	Usual Care	5	4.4	4.0	2.5	1.1	2.0	7.0
Fresh vegetables (servings/day)	Intervention	10	3.0	3.0	1.3	.4	1.0	5.0
	Usual Care	5	3.8	4.0	.8	.4	3.0	5.0
Dates (times/week)	Intervention	8	5.1	7.0	2.6	.9	1.0	7.0
	Usual Care	3	3.3	2.0	3.2	1.9	1.0	7.0

Highlights indicate poor nutrition

Table 4.26 Average Consumption of Soft Drinks Participants Reported, Pre-Program (Baseline) by Group

Variable	Category	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum
Regular soft drinks (times/week)	Intervention	3	1.3	1.0	.6	.3	1.0	2.0
	Usual Care	2	1.0	1.0	.0	.0	1.0	1.0
Regular soft drinks (cans/week)	Intervention	2	1.5	1.5	.7	.5	1.0	2.0
	Usual Care	2	1.8	1.8	1.8	1.3	.5	3.0
Diet soft drinks (times/week)	Intervention	0	.	.	.	.	.	.
	Usual Care	1	1.0	1.0	.	.	1.0	1.0
Diet soft drinks (cans/week)	Intervention	0	.	.	.	.	.	.
	Usual Care	1	3.0	3.0	.	.	3.0	3.0

Table 4.27 Types of Soft Drinks, Bread, and Oil Participants Reported Consuming, Pre-Program (Baseline) by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Drink soft drinks	Yes	3	27.3%	3	50.0%
	No	8	72.7%	3	50.0%
	Total	11	100.0%	6	100.0%
Types of soft drinks	Regular	3	100.0%	2	66.7%
	Diet	0	.0%	1	33.3%
	Both	0	.0%	0	.0%
	Total	3	100.0%	3	100.0%
White bread	Yes	6	54.5%	5	83.3%
	No	5	45.5%	1	16.7%
Brown bread	Yes	9	81.8%	4	66.7%
	No	2	18.2%	2	33.3%
Vegetable oil	Yes	10	90.9%	5	83.3%
	No	1	9.1%	1	16.7%
Butter or margarine	Yes	4	36.4%	3	50.0%
	No	7	63.6%	3	50.0%
Olive oil	Not at all	1	9.1%	0	.0%
	Rarely	0	.0%	1	16.7%
	Sometimes	7	63.6%	2	33.3%
	Often	1	9.1%	0	.0%
	Very often	2	18.2%	3	50.0%
	Total	11	100.0%	6	100.0%

Table 4.28 Participants Reporting of Being on a Diet and Consumption of Sugar Substitutes, Pre-Program (Baseline) by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Type of diet	I don't follow any diet	10	90.9%	4	66.7%
	Drugs	0	.0%	0	.0%
	Herbs	0	.0%	0	.0%
	Diet food	1	9.1%	2	33.3%
	Follow more than one diet	0	.0%	0	.0%
	Total	11	100.0%	6	100.0%
Diet Prescribed by a specialist	Yes	0	.0%	1	50.0%
	No	1	100.0%	1	50.0%
	Total	1	100.0%	2	100.0%
Sugar substitutes	Not at all	7	63.6%	3	50.0%
	Rarely	0	.0%	0	.0%
	Sometimes	2	18.2%	2	33.3%
	Often	0	.0%	0	.0%
	Very often	2	18.2%	1	16.7%
	Total	11	100.0%	6	100.0%

Table 4.29 Self-Reported Behaviours of Smoking, Stress and Sleep, Pre-Program (Baseline) by Group

Variable	Category	Intervention		Usual Care	
		N	Percent	N	Percent
Do you smoke	Cigarettes	0	.0%	0	.0%
	Shisha	0	.0%	0	.0%
	Nargille	0	.0%	0	.0%
	Gadw	0	.0%	0	.0%
	I don't smoke	11	100.0%	6	100.0%
Rate the stress in your life	High	4	36.4%	4	66.7%
	Moderate	7	63.6%	2	33.3%
	Low	0	.0%	0	.0%
How do you sleep?	Soundly	6	54.5%	2	33.3%
	I don't sleep well	5	45.5%	4	66.7%
Do you smoke	Cigarettes	0	.0%	0	.0%
	Shisha	0	.0%	0	.0%
	Nargille	0	.0%	0	.0%
	Gadw	0	.0%	0	.0%
	I don't smoke	2	100.0%	0	.0%

Table 4.30 Average Hours of Sleep Participants Reported, Pre-Program (Baseline) by Group

Variable	Group	Valid N	Mean	Median	Standard Deviation	Standard Error	Minimum	Maximum	95% CI
Average number of hours of sleep	Intervention	11	6.5	6.0	2.3	.7	4.0	12.0	4.94, 7.97
	Usual Care	6	5.3	5.0	1.9	.8	3.0	8.0	3.38, 7.29

Table 4.31 Exit Interview for Program Satisfaction, Post-Program with the Intervention Group

Variable	N/Percent	Extremely satisfied	Very satisfied	Satisfied	Dissatisfied	Extremely dissatisfied	Total
Your satisfaction with your knowledge of diabetes in the past 6 weeks.	N	3	4	1	0	0	8
	Percent	37.5%	50.0%	12.5%	.0%	.0%	100.0%
Satisfaction with how the program staff treated you	N	2	5	1	0	0	8
	Percent	25.0%	62.5%	12.5%	.0%	.0%	100.0%
Satisfaction with the frequency program staff talked with you	N	7	1	0	0	0	8
	Percent	87.5%	12.5%	.0%	.0%	.0%	100.0%
Overall satisfaction with the education program	N	5	2	1	0	0	8
	Percent	62.5%	25.0%	12.5%	.0%	.0%	100.0%
Helpfulness of the information to care for your diabetes	N	2	2	3	1	0	8
	Percent	25.0%	25.0%	37.5%	12.5%	.0%	100.0%

Table 4.32 Exit Interview for Recommending Program, Post-Program with the Intervention Group

Variable	N/Percent	Yes	No	Total
Would recommend the program to someone with diabetes	N	8	0	8
	Percent	100.0%	.0%	100.0%

Figure 4.1 BMI Categories, Pre-Program (Baseline) and Post-Program by Group

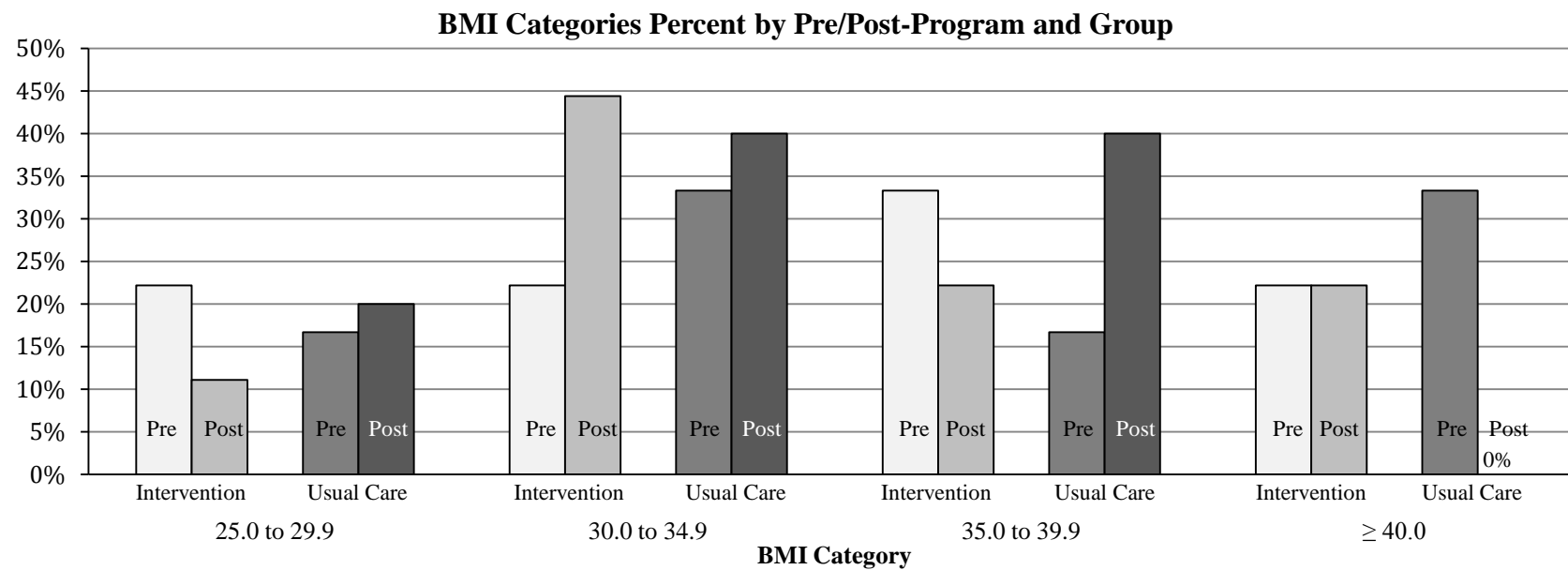


Figure 4.2 SF12, Physical Functioning to Vitality, Pre-Program (Baseline) and Post-Program by Group

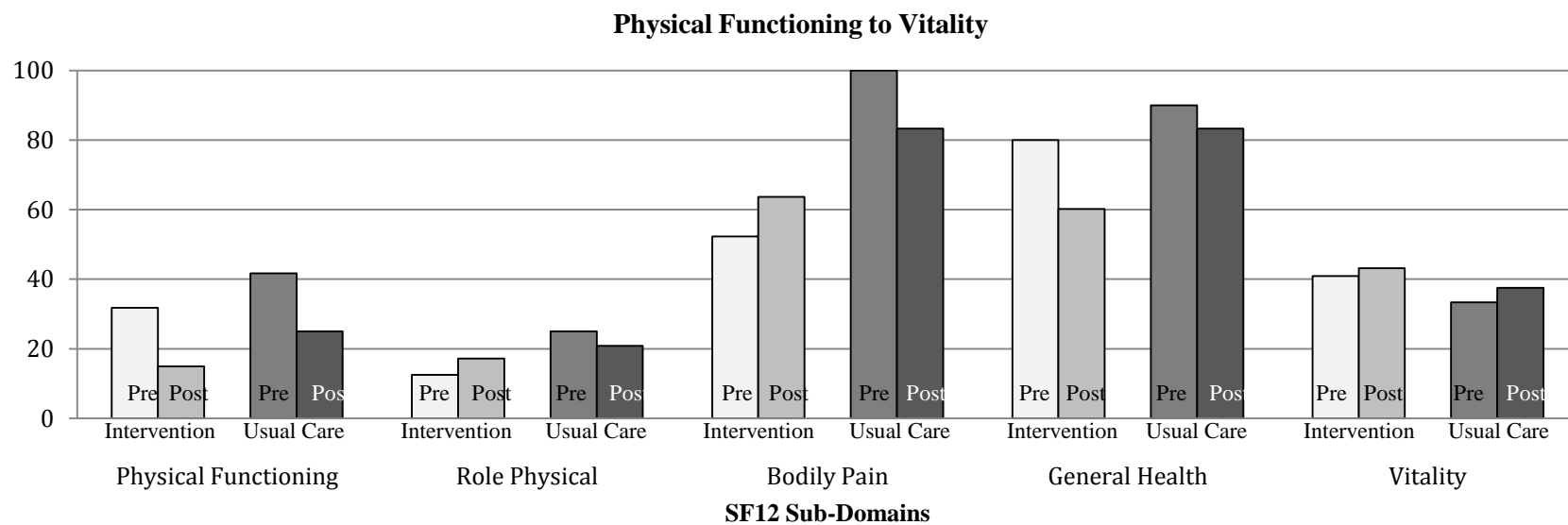


Figure 4.3 SF12, Social Functioning to Mental Component, Pre-Program (Baseline) and Post-Program by Group

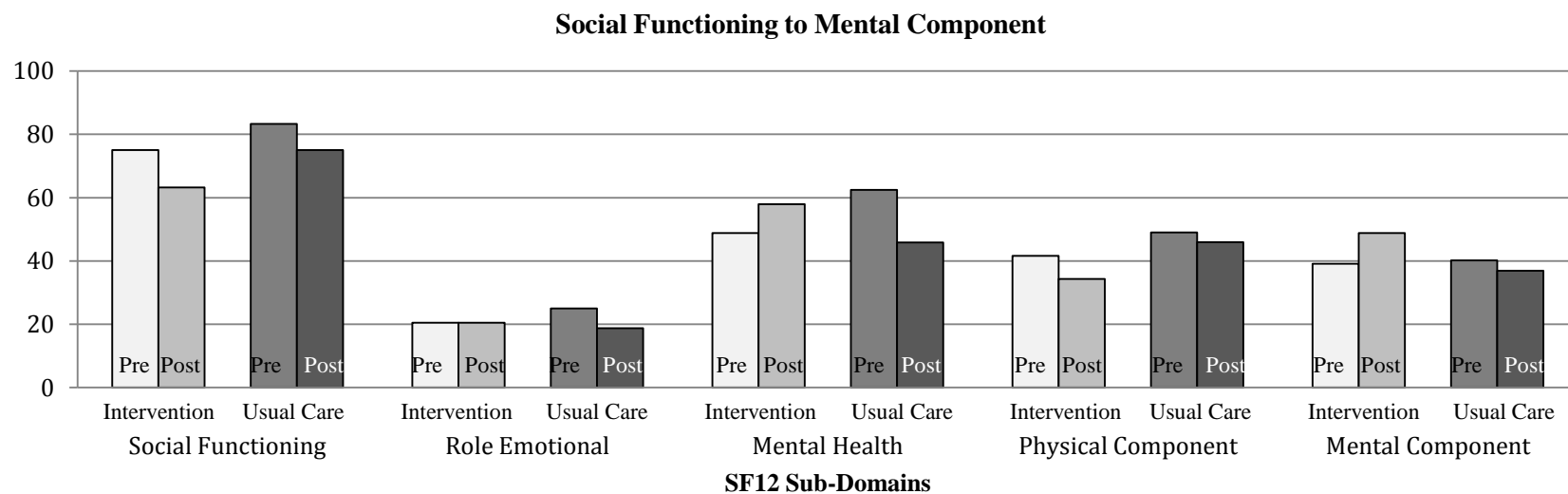


Figure 4.4 Diabetes Knowledge Test, Pre-Program (Baseline) and Post-Program by Group

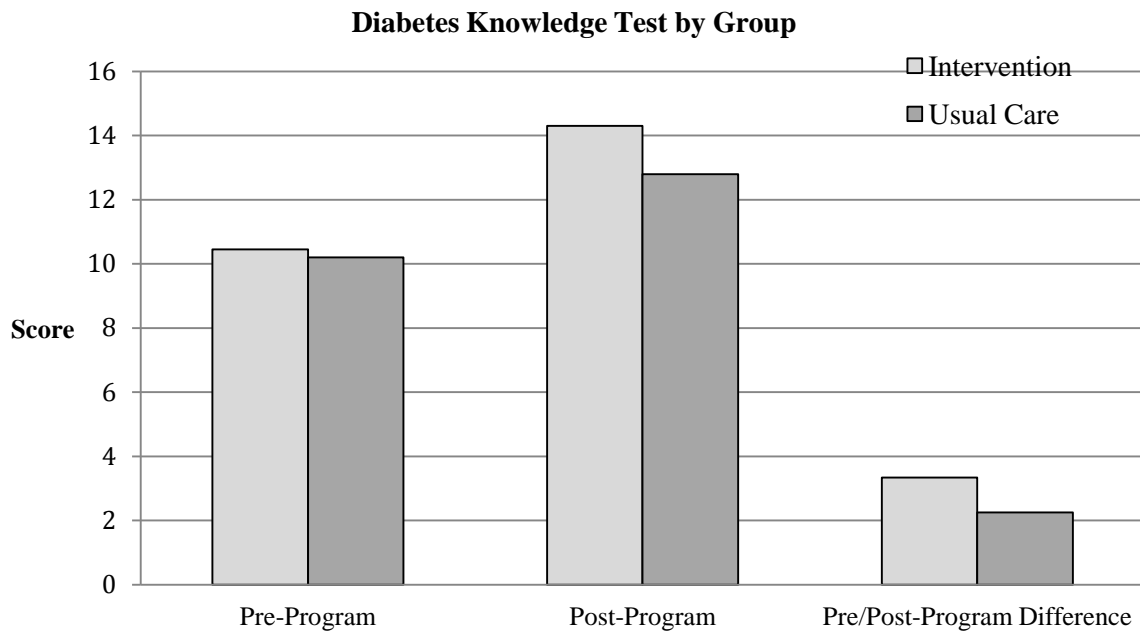


Figure 4.5 Life Satisfaction, Pre-Program (Baseline) and Post-Program by Group

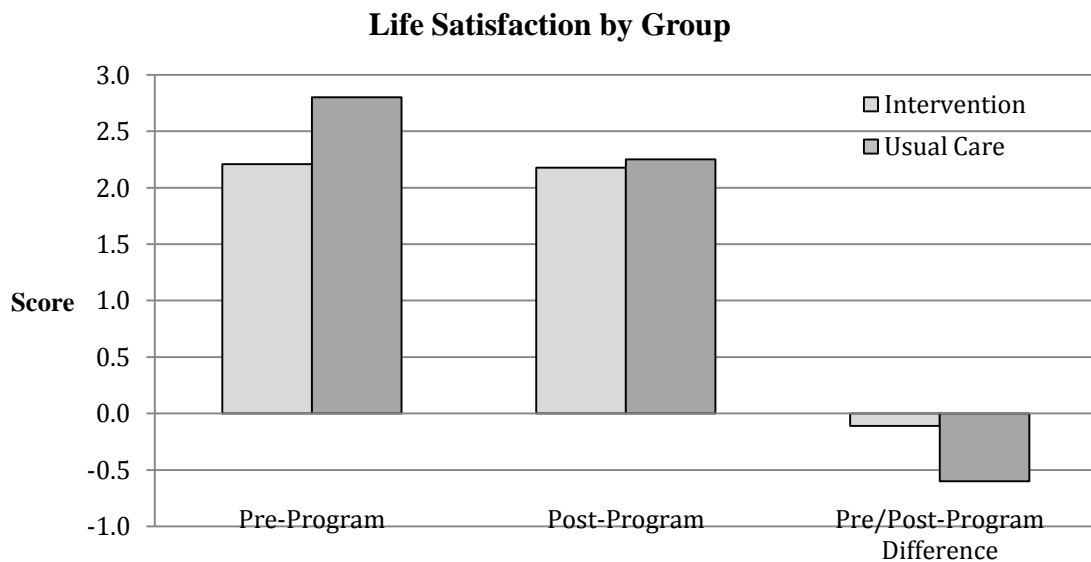


Figure 4.6 Waist to Hip Ratio, Pre-Program (Baseline), Post-Program, and Pre/Post Difference by Group

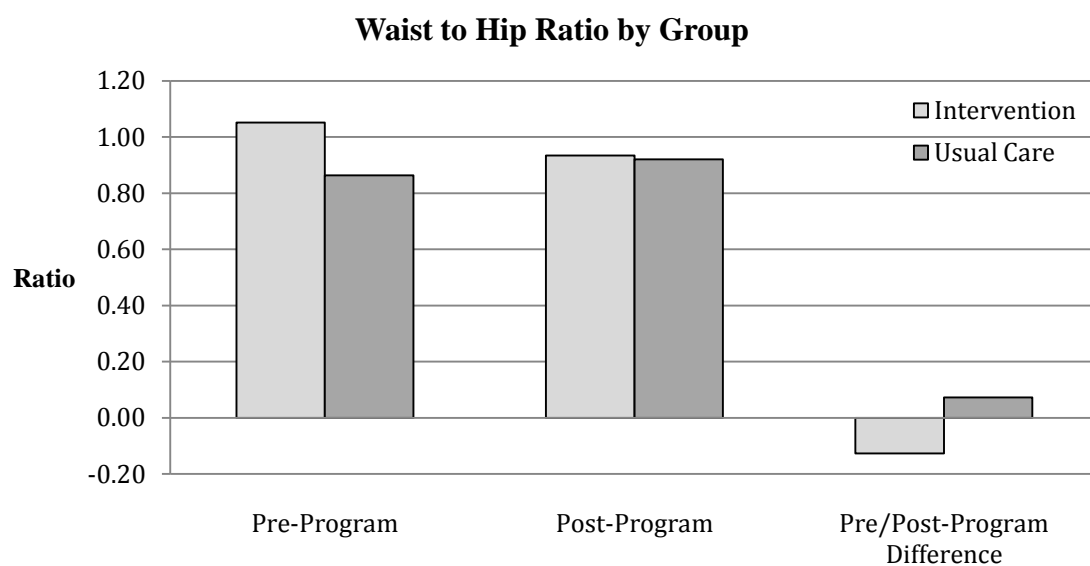
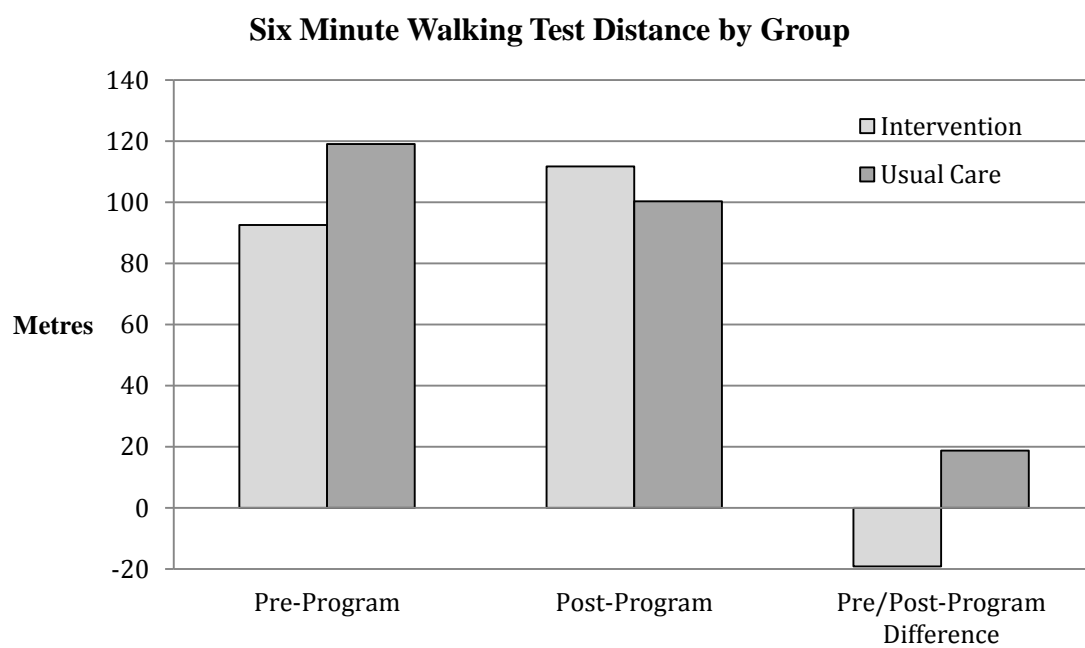


Figure 4.7 Six Minute Walking Test Distance, Pre-Program (Baseline), Post-Program, and Pre/Post Difference by Group



BIBLIOGRAPHY

- Abahussain, N.A., & El-Zubier, A.G. (2005). Diabetes knowledge among self reported diabetic female teachers: Al-Khobar, Saudi Arabia. *Journal of Family and Community Medicine*, 12(1), 43-48.
- Abdel-Fattah, M., Asal, A., Hifnawy, T., & Makhlouf, M. (2008). Depression and body image disturbances among females seeking treatment for obesity in Saudi Arabia. *Europe's Journal of Psychology*, 4(3). Retrieved on June 16, 2013 from: <http://ejop.psychopen.eu/article/view/433>
- Abdel-Megeid, F., Abdelkarem, H., & El-Fetouh, A. (2011). Unhealthy nutritional habits in university students are risk factor for cardiovascular diseases. *Saudi Medical Journal*, 32(6), 621-627.
- Aftab, R. (2007, May). *Diabetes mellitus: burden of disease*. Paper presented at the National Conference on Recent Advances and Future Trends in Diabetes Care, Buraidah, K.S.A.
- Akbar, D.H. (2001). Is hypertension common in hospitalized type 2 diabetic patients? *Saudi Medical Journal*, 22(2), 139-141.
- Akbar, D., & Al-Ghamdi, A. (2000). Common causes of admission in diabetics. *Saudi Medical Journal*, 21(6), 539-542.
- Alameri, H., Al-Majed, S., & Al-Howaikan, A. (2009). Six-min walk test in a healthy adult Arab population. *Respiratory Medicine*, 103(7), 1041-1046.
- Al-Arfaj, A., Alballae, S., Al-Saleh, S., Al-Dalaan, A., Bahabrye, S., Mousa, M., & Al-Sekeit, M. (2002). Knee osteoarthritis in Al-Qaseem, Saudi Arabia. *Saudi Medical Journal*, (3), 291-293.
- Al-Baghli, N., Al-Turki, K., Al-Ghamdi, A., El-Zubaier, A., Al-Ameer, M., & Al-Baghli, F. (2010). Control of diabetes mellitus in the Eastern province of Saudi Arabia: results of screening campaign. *Eastern Mediterranean Health Journal*, 6(6), 621-629.
- AlDabal, L., & BaHammam, A. (2011). Metabolic, endocrine, and immune consequences of sleep deprivation. *The Open Respiratory Medical Journal*, 5, 31-43.
- Al-Dawood, K.M. (2000). Patterns of smoking among parents of schoolboys. *Saudi Medical Journal*, 21(8), 735-739.
- Al-Gelban, K., Al-Amri, H., & A Mostafa, O. (2009). Prevalence of depression, anxiety and stress as measured by the depression, anxiety, and stress scale (DASS-42) among secondary school girls in Abha, Saudi Arabia. *Sultan Qaboos University Medical Journal*, 9(2), 140-147.
- Alghadir, A.H., Aly, F., & Zafar, H. (2011). Effect of face veil on ventilatory function among Saudi adult females. *Pakistan Journal of Medical Sciences*, 28(1), 71-74.

- Al-Elq, A.H. (2009). Current practice in the management of patients with type 2 diabetes mellitus in Saudi Arabia. *Saudi Medical Journal*, 30(12), 1551-1556.
- Al-Eisa, E. (2010). Indicators of adherence to physiotherapy attendance among Saudi female patients with mechanical low back pain: a clinical audit. *BMC Musculoskeletal Disorders*, 11(124). Retrieved on June 16, 2013 from: <http://www.biomedcentral.com/1471-2474/11/124>
- Al-Eisa, E., & Al-Sobayel, H. (2012). Physical activity and health beliefs among Saudi women. *Journal of Nutrition and Metabolism*, 2012. Retrieved on June 16, 2013 from: <http://www.hindawi.com/journals/jnume/2012/642187/>
- Al-Faris, E.A., Amin, H.S., & Al-Rukban, M.O. (2006). Outpatient management of type 2 diabetic patients: a review of evidence based literature. *Journal of Family and Community Medicine*, 13(1), 3-12.
- Alfawaz, H. (2012). The Relationship between fast food consumption and BMI among university Female students. *Pakistan Journal of Nutrition*, 11(5), 406-410.
- Alfadley, S., Al-Mazeedi, S., Bodner, M.E., & Dean, E. (In preparation). A Pilot investigation of the lifestyle-related beliefs and behaviors of the people of Kuwait: implications for health care planning, practice and research.
- Al-Gelban, K. Al-Amri, H., & Mostafa, O. (2009). Prevalence of depression, anxiety and stress as measured by the depression, anxiety, and stress scale (DASS-42) among secondary school girls in Abha, Saudi Arabia. *Sultan Qaboos University Medical Journal*, 9(2), 140-147.
- Al-Haqwi, A., Tamim, H., & Asery, A. (2010). Knowledge, attitude and practice of tobacco smoking by medical students in Riyadh, Saudi Arabia. *Annals of Thoracic Medicine*, 5(3): 145-148.
- Alhemoud, A. (2011). An ordered probit regression model for estimating the effects of demographic factors on rice consumption in Saudi Arabia. *International Journal of Business and Globalisation*, 6(1), 92-103.
- Al-Hussein, F.A. (2008). Diabetes control in a primary care setting: a retrospective study of 651 patients. *Annals of Saudi Medicine*, 28(4), 267, 271.
- Alissa, E., Qadi, S., Alhujaili, N., Alshehri, A., & Ferns, G. (2011). Effect of diet and lifestyle factors on bone health in postmenopausal women. *Journal of Bone and Mineral Metabolism*, 29(6), 725-735.
- Ali, S.R., & Liu, W.M. (2004). Islam 101: understand the religion and therapy implication. *Professional Psychology: Research and Practice*, 35(6): 635-642.

Al-Khaldi, Y., & Khan, M.Y. (2000). Audit of a diabetic health education program at a large Primary Health Care Center in Asir region. *Saudi Medical Journal*, 21(9), 838-842.

Al Khayat, M.H. (1997). Health an Islamic perspective. *The right path to health: health education through religion*. Retrieved on June 16, 2013 from: <http://applications.emro.who.int/dsaf/dsa113.pdf>

Al-Krenawi, A., & Graham, J. (2000). Culturally sensitive social work practice with Arab clients in mental health settings. *National Association of Social Workers*, 25(1), 9-22.

Allegranzi, B., Memish, Z.A., Donaldson, L. & Pittet, D. (2009). Religion and culture : potential undercurrents influencing hand hygiene promotion in health care. *American Journal of Infection Control*, 37(1), 28-34.

Al-Malki, J.S., Al-Jaser, M.H., & Warsy, A.S. (2003). Overweight and obesity in Saudi females of childbearing age. *International Journal of Obesity*, 27, 134–139.

Almalki, M., Fitzgerald, G., & Clark, M. (2011). Health care system in Saudi Arabia : an overview. *Eastern Mediterranean Health Journal*, 17(10), 784-793.

Al Moamary, M. (2009). Health care utilization among chronic obstructive pulmonary disease patients and the effect of pulmonary rehabilitation. *Medical Principles and Practice*, 19(5), 373-378.

Mobaraki, A.E.H., & Söderfeldt, B. (2010). Gender inequality in Saudi Arabia and its role in public health. *Eastern Mediterranean Health Journal*, 16(1), 113-118.

Al-Nozha, M.M., Abdullah, M., Arafah, M.R., Khalil, M.Z., Khan, N.B., Al-Mazrou, Y.Y....Al-Mobeireek, A. (2007). Hypertension in Saudi Arabia. *Saudi Medical Journal*, 28(1), 77-84.

Al-Nozha, M.M., Al-Maatouq, M.A., Al-Mazrou, Y.Y., Al-Harthi, S.S., Arafah, M.R., Khalil, M....Al-Mobeireek, A. (2004a). Diabetes mellitus In Saudi Arabia. *Saudi Medical Journal*, 25, 1603-1610.

Al-Nozha, M.M., Arafah, M.R., Al-Mazrou, Y.Y., Al-Maatouq, M.A., Khan, N.B., Khalil, M.Z....Al-Mobeireek. (2004b). A coronary artery disease in Saudi Arabia. *Saudi Medical Journal*, 25(9), 1165-1171.

Al-Nozha, M.M., Al-Hazzaa, H.M., Arafah, M.R., Al-Khadra, A., Al-Mazrou, Y.Y., Al-Maatouq, M.A....Shahid, M.S. (2006). Prevalence of physical activity and inactivity among Saudis aged 30-70 years. A population-based cross-sectional study. *Saudi Medical Journal*, 28(4), 559-568.

Al-Nuaim, A.R. (1997). Prevalence of glucose intolerance in urban and rural communities in Saudi Arabia. *Diabetic Medicine*, 14, 595–602.

- Al-Nuaim, A.R., Bamgboye, E. A., Al-Rubeaan, K. A., & Al-Mazrou, Y. (1997). Overweight and obesity in Saudi Arabian adult population, role of sociodemographic variables. *Journal of Community Health*, 22(3), 211-223.
- Al-Nuaim, L. (2011). The impact of obesity on reproduction in women. *Saudi Medical Journal*, 32(10), 993-1002.
- Al Otaibi, H. (2011). Influence of stage of change, self-efficacy and socio-economic factor on dietary intake behavior among Saudi women. *Pakistan Journal of Nutrition*, 10 (5), 443-450.
- Al-Othaimeen, A.L., Al-Nozha, M., & Osman, A.K. (2007). Obesity: an emerging problem in Saudi Arabia: analysis of data from the national nutrition survey. *Eastern Mediterranean Health Journal*, 13(2), 441.
- Aljouidi, A. & Taha, A. (2009). Knowledge of diabetes risk factors and preventive measures among attendees of a primary care center in eastern Saudi Arabia. *Annals of Saudi Medicine*, 29(1), 15–19.
- Alqahtani, M., & Salmon, P. (2008). Prevalence of somatisation and minor psychiatric morbidity in primary health care in Saudi Arabia: a preliminary study in Asir region. *Journal of Family and Community Medicine*, 15(1), 27-33.
- AL Qauhiz, N. (2012). Obesity among Saudi female university students: dietary habits and health behaviors. *The Journal of the Egyptian Public Health Associations*, 85(1, 2), 45-59.
- AlQuaiz, A., & Tayel, S. (2009). Barriers to a healthy lifestyle among patients attending primary care clinics at a university hospital in Riyadh. *Annals of Saudi Medicine*, 29(1), 30–35.
- AlQuaiz, J., Abdulghani, H., Khawaja, R., & Shaffi-Ahamed, S. (2012). Accuracy of various iron parameters in the prediction of iron deficiency anemia among healthy women of child bearing age, Saudi Arabia. *Iranian Red Crescent Medical Journal*, 14(7), 397-401.
- Alqurashi, K., Aljabri, K., & Bokhari, S. (2011). Prevalence of diabetes mellitus in a Saudi community. *Annals of Saudi Medicine*, 31(1), 19-23.
- Al-Rajeh, S., Awada, A., Niazi, G., & Larbi, E. (1993). Stroke in Saudi Arabian national guard community: analysis of 500 consecutive cases from a population-based hospital. *Saudi Medical Journal*, 24, 1635-1639.
- Al-Rethaiaa, A., Fahmy, A., & Al-Shwaiyat, N. (2010). Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutrition Journal*, 9(39). Retrieved on June 16, 2013 from: <http://www.nutritionj.com/content/9/1/39>
- Al-Shahrani, A.M. & Al-Khaldi, Y. M. (2011). Experience of the health promotion clinics in Aseer region, Saudi Arabia. *Journal of Family and Community Medicine*, 18(3), 130-134.
- Al-Shahri, M. (2002). Culturally sensitive caring for Saudi patients. *Journal of Transcultural Nursing*, 13(2), 133-138.

AlShawaf, T., Akeil, A., Mograby, S.A. (1998). Gestational diabetes and impaired glucose tolerance in Riyadh. *British Journal of Obstetrics and Gynecology*, (1), 84-90.

American Heart Association. (2012). Statistical fact sheet 2012 update. Retrieved on June 16, 2013 from: <http://circ.ahajournals.org/content/125/1/e2.full.pdf+html>

Anderson, R.M., Funnell, M.M., Nowankwo, R., Gillard, M.L., Oh, M., & Fitzgerald, J.T. (2005). Evaluating a problem based empowerment program for African Americans with diabetes: results of a randomized controlled trial. *Ethnicity and Disease*, 15, 671-678.

Aneas, M., & Sandin. M. (2009). Intercultural and cross-communication research: some reflections about culture and qualitative methods. *Forum: Qualitative Social Research*, 10(1), 51-70.

Ardawi, M., Qari, M., Rouzi, A., Maimani, A., & Raddadi, R. (2011). Vitamin D status in relation to obesity, bone mineral density, bone turnover markers and vitamin D receptor genotypes in healthy Saudi pre- and postmenopausal women. *Osteoporosis International*, 22, 463-475.

Asokan, G., Hussain, M., Ali, E., Awate, R., Khadem, Z., & Al-Safwan, Z. (2011). Osteoarthritis among women in Bahrain: a public health audit. *Oman Medical Journal*, 26(6), 426-30.

Attar, S., & Al-Ghamdi, A. (2009). Radiological changes in rheumatoid arthritis patient at a teaching hospital in Saudi Arabia. *Eastern Mediterranean Health Journal*, 16(9), 953-957.

Bacevičienė, M., Rėklaitienė, R., & Tamošiūnas, A. (2009). Effect of excess body weight on quality of life and satisfaction with body image among middle-aged Lithuanian inhabitants of Kaunas city. *Medicina (Kaunas)*, 45(7), 565-573.

Badran, M., & Laher, I. (2012). Type II diabetes mellitus in Arabic-speaking countries. *International Journal of Endocrinology*. Retrieved on June 16, 2013 from: <http://www.hindawi.com/journals/ije/2012/902873/>

BaHammam, A. (2011a). Sleep medicine in Saudi Arabia: current problems and future challenges. *Annals of Thoracic Medicine*, 6(1), 3-10.

BaHammam, A. (2011b). Sleep from an Islamic perspective. *Annals of Thoracic Medicine*, 6(4), 187-192.

Bakhotmah, B. (2012). Nutritional knowledge and desire to change of food Preferences among Saudi women in Jeddah, Saudi Arabia. *Ecology of Food and Nutrition*, 51(4), 313-328.

Baki, R. (2004). Gender-segregated education in Saudi Arabia: its impact on social norms and the Saudi labour market. *Education Policy Analysis Archives*, 12(28), 1-15.

Ball, K., Crawford, D., & Kenardy, J. (2004). Longitudinal relationships among overweight, life satisfaction, and aspirations in young women. *Obesity Research*, 12(6), 1019-1030.

Baird, J.D. (2007). Diabetes mellitus and obesity. *Proceedings of the Nutrition Society*, 32, 199-204.

Barata, P., Gucciardi, E., Ahmad, F., & Stewart, D. (2006). Cross-cultural perspectives on research participation and informed consent. *Social Sciences & Medicine*, 62(2), 479-490.

Barrett-Connor, E., Cohn, B., Wingard, D., & Edelstein, S. (1991). Why is diabetes mellitus a stronger risk factor for fatal ischemic heart disease in women than in men? the Rancho Bernardo study. *The Journal of the American Medical Association*, 5(265), 627-631.

Becker, S. (2004). Detection of somatization and depression in primary care in Saudi Arabia. *Social Psychiatry and Psychiatric Epidemiology*, 39(12), 962-966.

Becker, S., Al Zaid, K., & Al Faris, A. (2002). Screening for somatization and depression in Saudi Arabia: a validation study of the PHQ in primary care. *International Journal of Psychiatry in Medicine*, 32(3), 271-283.

Benjamins, M., Ellison, C., Krause, N., & Marcum, J. (2011). Religion and preventive service use: do congregational support and religious beliefs explain the relationship between attendance and utilization? *Journal of Behavioral Medicine*, 34, 462-476.

Bjaras, G., Ahlbom, A., Alvarsson, M., Burstrom, B., Diderichsen, F., Eeendic, S....Ostenson, C-G. (1997). Strategies and methods for implementing a community-based diabetes primary prevention program in Sweden. *Health Promotion International*, 12, 151-160.

Boddington, P., & Raisanen, U. (2009). Theoretical and practical issues in the definition of health: insights from aboriginal Australia. *Journal of Medicine and Philosophy*, 34(1), 49-67.

Bochner, S., & Hesketh, B. (1994). Power distance, individualism/collectivism, and job-related attitudes in a culturally diverse work group. *Journal of Cross-Cultural Psychology*, 25(2), 233-257.

Bradby, H. (2003). Describing ethnicity in health research. *Ethnicity and Health*, 8(1), 5-13.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.

Brown, S., Garcia, A.A., Kouzekanai, K., & Hanis, C.L. (2002). Culturally competent diabetes self-management education for Mexican Americans. *Diabetes Care*, 25(2), 259-268.

Cashdan, E. (2008). Waist-to-hip ratio across cultures: trade-offs between Androgen- and Estrogen-dependent traits. *Current Anthropology*, 49(6), 1099-1107.

Central Department of Statistics & Information. (2004). Detailed results population and housing census 1425 H. *Kingdom of Saudi Arabia, Ministry of Economy and Planning*. Retrieved on June 16, 2013 from:

http://www.cdsi.gov.sa/english/index.php?option=com_docman&task=doc_download&gid=338&Itemid=113

- Chapman-Novakofski, K., & Karduck, J. (2005). Improvement in knowledge, social cognitive theory variables, and movement through stages of change after a community-based diabetes education program. *Journal of American Diabetes Association*, 105(10), 1613–1616.
- Cheney, G., Christensen, L., Zorn, J.T., & Ganesh, S. (2004). Organizational communication in an age of globalization: issues, reflections, practices. Illinois: Waveland Press, Inc.
- Clarke, I. (2001). Extreme response style in cross-cultural research. *International Marketing Review*, 18(3), 301-324.
- Cockram, C.S. (2000). The epidemiology of diabetes mellitus in the Asia-Pacific region. *Hong Kong Medical Journal*, 6(1), 43-52.
- Cohen, R. (1978). Ethnicity: problem and focus in anthropology. *Annual Review of Anthropology*, 1978(7), 379- 403.
- Dean, E. (2008). The crisis of lifestyle conditions in the middle east with special attention to Kuwait: an unequivocal evidence-based call to action. *Kuwait Medical Journal*, 40(3), 184-190.
- Dean, E., Al-ObaidI, S., Dornelas de Andrade, A., Gosselink, R., Umerah, G., Al-Abdelwahab, S.... Pong Wong, W. (2011). The first physical therapy summit on global health: implications and recommendations for the 21st century. *Physiotherapy Theory and Practice*, 27(8), 531-547.
- Dekmejian, H. (1994). The rise of political imperialism in Saudi Arabia. *The Middle East Journal*, 48(4), 627-643.
- Eckersley, R. (2007). Culture. In Galea, S. (eds), *Macrosocial determinants of population health*, Springer, New York, NY, pp. 193-209.
- El-Akkad, S.M., Amer, M.H., Lin, G.S., Sabbah, R.S., & Godwin, J.T. (1986). Pattern of cancer in Saudi Arabs referred to king Faisal specialist hospital. *Cancer*, 58, 1172-1178.
- Elhadd, T.A., Al-Amoudi, A.A., & Alzahrani, A.S. (2007). Epidemiology, clinical and complications profile of diabetes in Saudi Arabia: a review. *Annals Saudi Medicine*, 27(4), 241-250.
- El-Hazmi, M.A.F., Warsy, A.S., Al-Swailem, A.R., Al-Swailem, A.M., & Sulaimani, R. (1998). Diabetes mellitus as a health problem in Saudi Arabia. *Eastern Mediterranean Health Journal*, 4(1), 58-67.
- Ellison, C.G., & Levin, J. S. (1998). The religion-health connection: evidence, theory, and future directios. *Health Education & Behavior*, 25(6), 700-720.
- Ember, M., & Outterbein, K. (1991). Sampling in cross-cultural research. *Behavior Science Research*, 25 (1, 4), 217-233.
- Farag, Y., & Gaballa, R. (2011). Diabesity: an overview of a rising epidemic. *Nephrology Dialysis Transplantation*, 26(1), 28-35.

- Fargues, P. (2011). Immigration without inclusion: non-nationals in nation-building in the gulf states. *Asian and Pacific Migration Journal*, 20 (3, 4), 273-292.
- Fink, A. (2009). Toward a new definition of health disparity a concept analysis. *Journal of Transcultural Nursing*, 20(4), 349-357.
- Fischer, R. (2004). Standardization to account for cross-cultural response bias: a classification of score adjustment procedures and review of research in JCCP. *Journal of Cross-Cultural Psychology*, 35(3), 263-282.
- Fisher E. B., Brownson, C.A., O'Toole, M.L., Shetty, G., Anwuri, & V.V., Glasgow, R.E. (2005). Ecologic approaches to self-management: the case of diabetes. *American Journal of Public Health*, 95(9), 1523–1535.
- Food and Nutrition. (2003). Canadian Guidelines for Body Weight Classification in Adults. Retrieved on June 16, 2013 from: http://www.hc-sc.gc.ca/fn-an/nutrition/weights-poids/guide-ld-adult/weight_book_tc-livres_des_poids_tm-eng.php
- Funnell, M.M., Brown, T.L., Childs, B.P., Haas, L., Hosey, G.M., Jansen, B.... Weiss, M.A. (2009). National standards for diabetes self-management education. *Diabetes Care*, 3(1), S87-S94.
- Galil, A., Carmel, A., Lubetzky, H., Vered, S., & Heiman, N. (2001). Compliance with home rehabilitation therapy by parents of children with disabilities in Jews and Bedouin in Israel. *Developmental Medicine & Child Neurology*, 43(4), 261-268.
- Gearing, R., Schwalbe, C., MacKenzie, M., Brewer, K., Ibrahim, R., Olimat, H... Al-Krenawi, A. (2012). Adaptation and translation of mental health interventions in Middle Eastern Arab countries: A systematic review of barriers to and strategies for effective treatment implementation. *The International Journal of Social Psychiatry*, 0(0), 1-10.
- Geertz, C. (1973). The interpretation of cultures: selected essays. New York: Basic Books.
- Giachello, A.L., Orrom, J.O., Davis, M., Sayad, J.V., Ramierz, D., Nandi, C., & Ramos, C. (2003). Reducing diabetes health disparities through community-based participatory action research: the Chicago southeast diabetes community action coalition. *Public Health Reports*, 118 (4), 309-323.
- Glanz, K., Rimer, B.K., & Viswanath, K. (Eds.). (2008). *Health behavior and health education theory, research, and practice*. San Francisco, CA: Jossey-Bass A Wiley Imprint.
- Glasgow, R. E., & Emmons, K. M. (2007). How can we increase translation of research into practice? types of evidence needed. *Annual Review of Public Health*, 28, 413–433.
- Glass, T. A., & McAtee, M. J. (2006). Behavioral science at the crossroads in public health: extending horizons, envisioning the Future. *Social Science and Medicine*, 62, 1650–1671.

- Goody, C., & Drago, L. (2009). Using cultural competence constructs to understand food practices and provide diabetes care and education. *Diabetes Spectrum*, 22(1), 43-47.
- Gochman, D. S. (Eds.). (1997). *Handbook of health behavior research*. New York: Plenum Press.
- Gochman, D. S. (1982). Labels, systems, and motives: some perspectives on future research. *Health Education Quarterly*, 1982(9), 167-174.
- Green, L. W., Kreuter, M. W., Deeds, S., & Partridge, K. (1980). *Health education planning: a diagnostic approach*. Mountain View, Calif.: Mayfield.
- Green, M., & Elliott, M. (2010). Religion, Health, and Psychological well-being. *Journal of Religion and Health*, 49, 149-163.
- Griffin, J., Gilliland, S., Perez, G., Helitzer, D., & Carter, J. (1999). Participant satisfaction with a culturally appropriate diabetes education program: the native American diabetes project. *The Diabetes Educator*, 25(3), 351- 363.
- Griffiths, W. (1972). Health education definitions, problems, and philosophies. *Health Education Monographs*, 31, 12-14.
- Gullan, R.L., Feinberg, B.E., Freedman, M.A., Jawad, A., & Leff, S.S. (2009). Using participatory action research to design and intervention integrity system in the urban schools. *School Mental Health*, 1, 180-130.
- Hamdan, A. (2009). Mental health needs of Arab women. *Health Care for Women International*, 30(7), 593-611.
- Hamdan, A., Hawamdeh, S., & Hussein, A. (2008). The prevalence and correlates of depressive symptoms among Arab women in a primary health care setting. *International Journal of Psychiatry in Medicine*, 38(4), 453-67.
- Haque, A. (2004). Religion and mental health: the case of American Muslims. *Journal of Religion and Health*, 43(1), 45-58.
- Harakati, M., Shaheen, F., Tamim, H., Taher, S., Al Qublan, A. & Al Sayyari, A. (2011). Saudi patients and health care providers: divergent perceptions of illnesses and their symptoms. *Anthropology of the Middle East*, 6(1), 35-46.
- Harris, J., Gleason, P., Sheean, P., Boushey, C., Beto, J., & Bruemmer, B. (2009). An introduction to qualitative research for food and nutrition professionals. *Journal of the American Dietetic Association*, 109(1), 80-90.
- Harvard Health Publications. (2012a). *Diabetes: a plan for living*. Massachusetts, Boston: David M. Nathan & Linda Delahanty.

Harvard Health Publications. (2012b). Healthy Eating for Type 2 Diabetes, Boston: David M. Nathan & Linda Delahanty.

Harvard Health Publications. (2012c). Lose weight and keep it off. Massachusetts, Boston: Miquel Alonso-Alonso, Beth Israel Deaconess & and Kathy McManus.

Harvard Health Publications. (2012d). Exercise: a program you can live with. Massachusetts, Boston: Howard Hartley & I-Min Lee.

Harvard Health Publications. (2011). Positive Psychology: harnessing the power of happiness, personal strength, and mindfulness. Massachusetts, Boston: Ronald D. Siegel & Steven M. Allison.

Hassellund, S., Flaa, A., Sandvik, L., Kjeldsen, S., & Rostrup, M. (2011). Effects of anthocyanins on blood pressure and stress reactivity: a double-blind randomized placebo-controlled crossover study. *Journal of Human Hypertension*, 26(2012), 396-404.

Hawthorne, K., Robles, Y., Cannings, John R., & Edwards, A.G.K. (2010). Culturally appropriate health education for type 2 diabetes mellitus in ethnic minority groups. *Diabetic Medicine*, 27, 613-623.

Hergenroeder, A.I., Brach, J.S., Otto, A.D., Sparto, P.J., & Jakicic, J.M. (2011). The influence of body mass index on self-report and performance-based measures of physical function in adult women. *Cardiopulmonary Physical Therapy Journal*, 22(3), 11-20.

Heitzer, D., Peterson, A.B., Thompson, J., & Fluder, S. (2006). Development of a planning and evaluation methodology for assessing the contribution of theory to a diabetes prevention lifestyle intervention. *Health Promotion Practice*, 9(4), 404-414.

Hofstede, G. (1981). Culture and organization. *International Studies of Management & Organization*, 10(4), 15-41.

Hofstede, G. (1984). The cultural relativity of the quality of life concept. *The Academy of Management Review*, 9(3), 389-398.

Holt, C., & McClure, S. (2006). Perceptions of the religion-health connection among African American church members. *Qualitative Health Research*, 16(2), 268-281.

Holt, C., Roth, D., Clark, E., & Debnam, K. (2012). Positive self-perceptions as a mediator of religious involvement and health behaviors in a national sample of African Americans. *Journal of Behavioral Medicine*, 1-11.

Hubert, H., Snider, J., & Winkleby, M. (2005). Health status, health behaviours, and acculturation factors associated with overweight and obesity in Latinos from a community and agricultural labor camp survey. *Preventive Medicine*, 40(2005), 642-651.

Humaida, I. (2012). Relationship between stress and psychosomatic complaints among nurses in Tabarjal hospital. *Open Journal of Medical Psychology*, 1(3), 15-19.

- Hulens, M., Vansant, G., Claessens, A., Lysens, R., Muls, E., & Rzewnicki, R. (2002). Health-related quality of life in physically active and sedentary obese women. *American Journal of Human Biology*, 14(6), 777-785.
- Humphreys, S. (1979). Islam and political values in Saudi Arabia, Egypt, and Syria. *The Middle East Journal*, 33(1), 1-19.
- Hunter, A. (1975). The loss of community: an empirical test through replication. *American Sociology Review*, 40(5), 537-552.
- Ide, B.A., & Snali, T. (1992). Health beliefs and behaviors of Saudi women. *Women & Health*, 19(1), 97-113.
- Isaacs, H. (1975). *Idols of the tribe: group identity and political change*. New York: Harper & Row.
- Jalambo, M., Hamad, A., & Abed, Y. (2012). Anemia and risk factors among female secondary students in the Gaza strip. *Journal of Public Health*, 163-166.
- James, P., Leach, R., Kalamara, E., & Shayeghi, M. (2011). The worldwide obesity epidemic. *Obesity Research*, 4(9), 228S-233S.
- Jarallah, J.S., Al-Rubeaan, K.L., Al-Nuaim, A.R., Al-Ruhaily, A.A., & Kalantan, K.A. (1999). Prevalence and determinants of smoking in three regions of Saudi Arabia. *Tobacco Control*, 8, 53-56.
- Jastaniah, W. (2011). Epidemiology of sickle cell disease in Saudi Arabia. *Annals of Saudi Medicine*, 13(3), 289-293.
- Jeon, C.Y., Lokken, R.P., Hu, F.B., & van Dam, R.M. (2007). Physical activity of moderate intensity and risk of type 2 diabetes: a systematic review. *Diabetes Care*, 30(3), 744-52.
- Jradi, H., Zaidan, A., & Al Shehri, A. M. (2013). Public health nursing education in Saudi Arabia. *Journal of Infection and Public Health*, 6, 63-68.
- Kanan, R., Al Saleh, Y., Fakhoury, H., Adham, M., Aljaser, S., & Tamimi, W. (2012). Year-round vitamin D deficiency among Saudi female outpatients. *Public Health Nutrition*, 16(3), 544-548.
- Kanno, T., Iijima, K., Abe, Y., Koike, T., Shimada, N., Hoshi, T... Shimosegawa, T. (2012). Peptic ulcers after the great east Japan earthquake and tsunami: possible existence of psychosocial stress ulcers in humans. *Journal of Gastroenterology*, 1-8.
- Kalantan, K.A., Mohammed, A.G., Al-Taweel, A.A., & Abdul Ghani, H.M. (2001). Hypertension among attendants of primary health care centers in Al-Qassim region, Saudi Arabia. *Saudi Medical Journal*, 22(11), 960-963.

- Karter, A., Ackerson, L., Darbinian, J., D'Agostino, R., Ferrara, A., Liu, J., & Selby, J. (2001). Self-monitoring of blood glucose levels and glycemic control: the northern California Kaiser Permanente diabetes registry. *The American Journal of Medicine*, 111(1), 1-9.
- Kasl, S. V., & Cobb, S. (1966). Health behavior, illness behavior, and sick-role behavior: I. health and illness behavior. *Archives of Environmental Health*, 12, 246-266.
- Kasl, S. V., & Cobb, S. (1966). Health behavior, illness behavior, and sick-role behavior: II. sick-role behavior. *Archives of Environmental Health*, 12, 531-541.
- Kathrotia, R., Rao, P., Paralikar, S., Shah, C., & Oommen, E. (2010). Late sleeping affects sleep duration and body mass index in adolescents. *Iran Journal of Medical Sciences*, 35(1), 57-60.
- Kenneth, I., Maton, U., & Wells, E. (2010). Religion as a community resource for well-being: prevention, healing, and empowerment pathways. *Journal of Social Issues*, 51(2), 177-193.
- Khatib, O. (2004). Noncommunicable diseases: risk factors and regional strategies for prevention and care. *Eastern Mediterranean Health Journal*, 10(6), 778-788.
- Khawja, S.S., AlSuleiman, S.A., & al-Sibai, M.H. (1989). Screening for gestational diabetes in a teaching hospital in Saudi Arabia. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 29(3prt 1), 209-211.
- Kim, A. (1993). The absence of pan-Canadian civil religion: plurality, duality, and conflict in symbols of Canadian culture. *Sociology of Religion*, 54(3), 257-275.
- Kolotkin, R., Crosby, R., & Williams, G. (2002). Health-related quality of life varies among obese subgroups. *Obesity Research*, 10(8), 748-756.
- Landis, D., Bennett, J., & Bennett, M. (2004). The handbook of intercultural training. 3rd ed. Thousand Oaks: SAGE Publication Inc.
- LeCompte, M., & Goetz, P. (1982). Problems of reliability and validity in ethnographic research. *Review of Educational Research*, 52(1), 31-60.
- Levy, S., Plaks, J., & Hong, Y. (2001). Static versus dynamic theories and the perception of groups: different routes to different destinations. *Personality and Social Psychology Review*, 5(2), 156-168.
- Li, Z., Peng, W., Bodner, M.E., & Dean, E. (In preparation). Health beliefs and behaviors of mainland Chinese: Implications for health planning.
- Lindström, J., Louheranta, A., Merja, M., Rastas, M., Salminen, V., Eriksson, J., ... Tuomilehto, J. (2003). the Finnish diabetes prevention study group (DPS) lifestyle intervention and 3-year results on diet and physical activity. *Diabetes Care*, 26(12), 3230-3236.
- Linné, Y. (2004). Effects of obesity on women's reproduction and complications during pregnancy. *Obesity Reviews*, 5(2004), 137-143.

- Lonner, W., & Berry, J. (1986). Field methods in cross-cultural research. Beverly Hills, CA: Sage Publications Inc.
- Marin, G. (1993) Defining culturally appropriate community interventions: Hispanics as a case study. *Journal of Community Psychology*, 21(2), 149-161.
- Martin, J., & Nakayama, T. (2010). Intercultural communication in contexts. New York: McGraw-Hill Companies, Inc.
- Matsumoto, D. (1994). Cultural influences on research methods and statistics. CA: Brooks/Cole Pub Co.
- Maxwell, C. & Wood, R. (2011). Update on vitamin D and type 2 diabetes. *Nutrition Reviews*, 69(5), 291–295.
- McGorry, S. (2000). Measurement in a cross-cultural environment: survey translation issues. *Qualitative Market Research: An International Journal*, 3(2), 74-81.
- McLeroy, K. R., Bibeau, D., Steckler, A., and Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, 15, 351–377.
- Mensing, C., Boucher, J., Cypress, M., Weinger, K., Mulcahy, K., Barta, P....Adams, C. (2003). National standards for diabetes self-management education. *Diabetes Care*, 26(1), S149-S156.
- Midhet, F., Al Mohaimeed, A., & Sharaf, F. (2010). Dietary practices, physical activity and health education in Qassim region of Saudi Arabia. *International Journal of Health Sciences*, 4(1), 3-10.
- Midhet, F., & Sharaf, F. (2011). Impact of health education on lifestyles in central Saudi Arabia. *Saudi Medical Journal*, 1(32), 71-76.
- Millat, W., & Florey, C.D. (1992). Perinatal mortality in Jeddah, Saudi Arabia. *International Journal of Epidemiology*, 21(1), 82–90.
- Minkler, M. (2000). Using participatory action research to build healthy communities. *Public Health Reports*, 115(2-3), 191-197.
- Mohieldein, A. Alzohairy, M., & Hasan, M. (2011). Risk estimation of type 2 diabetes and dietary habits among adult Saudi non-diabetics in central Saudi Arabia. *Global Journal of Health Science*, 3(2), 123-133.
- Moreland, E., Volkening, L., Lawlor, M., Chalmers, K., Anderson, B., & Laffel, L. (2006). Use of a blood glucose monitoring manual to enhance monitoring adherence in adults with diabetes a randomized controlled trial. *Journal of the American Medical Association Internal Medicine*, 166(6), 689-695.

- Moore, J.B., Pawloski, L.R., Goldberg, P., Kyeung, M.O., Stoehr, A., & Baghi, H.(2009). Childhood obesity study: a pilot study of the effect of the nutrition education program color my pyramid. *The Journal of School Nursing*, 25(3), 230-239.
- Morris, M., Leung, K., Ames, D., & Lickel, B. (1999). Views from inside and outside: integrating emic and etic insights about culture and justice judgment. *Academy of Management Review*, 24(4), 781-796.
- Murphy, D. (2004). Moving diabetes care from science to practice: the evolution of the national diabetes prevention and control program. *Annals of Internal Medicine*, 140(11), 978-984.
- Mwambingen, F.T., Al Meshari, A.A., & Akeil, A. (1988). The problem of grand multi parity in current obstetric practice. *International Journal of Obstetrics Gynaecology*, 26(3), 355-359.
- Musaiger, A. (2004). Overweight and obesity in the Eastern Mediterranean region: can we control it? *Eastern Mediterranean Health Journal*, 10(6), 789-793.
- Musaiger, A. (2011). Overweight and obesity in Eastern Mediterranean region: prevalence and possible causes. *Journal of Obesity*, Retrieved on June 16, 2013 from: <http://www.hindawi.com/journals/jobes/2011/407237/>
- Musaiger, A. (2012). The food dome; dietary guidelines for Arab countries. *Nutricion Hospitalaria*, 27(1), 109-115.
- Musaiger, A., Takruri, H., Hassan, A., & Abu-Tarboush, H. (2012). Food-based dietary guidelines for the Arab gulf countries. *Journal of Nutrition and Metabolism*, Retrieved on June 16, 2013 from: <http://www.hindawi.com/journals/jnume/2012/905303/>
- Nisar, N. & Sohoo, N. (2010). Severity of menopausal symptoms and the quality of life at different status of menopause: a community based survey from rural Sindh, Pakistan. *International Journal of Collaborative Research on Internal Medicine & Public Health*, 2(5), 118-130.
- Noonan, V., & Dean, E. (2000). Submaximal exercise testing: clinical application and interpretation. *Physical Therapy*, 8(8), 782-807.
- Norris, P., & Inglehart, R. (2012). Muslim integration into western cultures: between origins and destinations. *Political Studies*, 2(60), 228–251.
- Nuwayhid, I.M., Yamout, B., Azar, G., Al Kouatly, & Kambris, M.A. (1998). Narghile (Hubble-bubble) smoking, low birth weight, and other pregnancy outcomes. *American Journal of Epidemiology*, 148(4), 375-383.
- Osborn, C., Amico, K., Cruz, N., O'Connell, A., Perez-Escamilla, R., Kalichman, S.,...Fisher, J. (2010). A brief culturally tailored intervention for Puerto Ricans with type 2 diabetes. *Health Education Behavior*, 37(6), 849–862.

Osuna, D., Barrera, M., Strycker, Li., Toobert, D., Glasgow, R., Geno, C.....Doty, A. (2011). Methods for the cultural adaptation of a diabetes lifestyle intervention for Latinas: an Illustrative project. *Health Promotion Practice*, 12(3), 341-348.

Painter, J., Rah, J., & Lee, Y. (2002). Comparison of international food guide pictorial representation, *Journal of the American Dietetic Association*, 102(4), 483-489.

Patterson, R. (Eds.). (2001). *Changing patient behavior: improving outcomes in health and disease management*. San Francisco: Jossey-Bass.

Pay Scale. (2013). *Salary for country: Saudi Arabia*. Retrieved on June 16, 2013: from http://www.payscale.com/research/SA/Country=Saudi_Arabia/Salary#by_Job

Parkerson, G. R., Connis, J.R., Broadhead, W.E., Patrick, D.L., Taylor, T.R., & Tse, C.K. (1993). Disease-specific versus generic measurement of health-related quality of life in insulin dependent diabetic patients. *Medical Care*, 31(7), 629-637.

Pereira, D., Peleteiro, B., Araújoyza, J., Brancosa, J., Santoska, R., & Ramosyza, E. (2011). The effect of osteoarthritis definition on prevalence and incidence estimates: a systematic review. *Osteoarthritis and Cartilage*, 19, 1270-1285.

Philipsen, G. (1992). *Speaking culturally: Explorations in social communication*. Albany: State University of New York Press.

Prokop, M. (2003). Saudi Arabia: the politics of education. *International Affairs*, 79(1), 77-89.

Purnell, Larry, D. (2009). *Guide to culturally competent health care*. Philadelphia: F.A.Davis Company.

Purnel, L.D., & Paulanka, B.J. (2008). *Transcultural health care a culturally competent approach*. Philadelphia: F.A.Davis Company.

QualityMetrics. (2013). SF health surveys. Retrieved on June 16, 2013 from: <http://www.qualitymetric.com/WhatWeDo/GenericHealthSurveys/tabid/184/Default.aspx>

Rasheed, P. (1998). Perception of body weight and self-reported eating and exercise behaviour among obese and non-obese women in Saudi Arabia. *Public Health*, 112(6), 409-414.

Ratner C., & El-Badwi, S. (2011). A cultural psychological theory of mental illness, supported by research in Saudi Arabia. *Journal of Social Distress and The Homeless*, 4(3), 217-274.

Rehab Measure. (2013). *Life satisfaction questionnaire 9*. Retrieved on June 16, 2013 from: <http://www.rehabmeasures.org/lists/rehabmeasures/disppform.aspx?id=958>

Rejeski, W.J., Focht, B.C., Messier, S.P., Morgan, T., Pahor, M., & Penninx, B. (2002). Obese, older adults with knee osteoarthritis: weight loss, exercise, and quality of life. *Health Psychology*, 21(5), 419-26.

- Ridley, C., Mendoza, D., Kanitz, B., Angermeier, L., & Zenk, R. (1994). Cultural sensitivity in multicultural counselling: a perceptual schema model. *Journal of Counselling Psychology*, 41(2), 125-136.
- Rosenthal, F. (1963). Gifts and bribes: the Muslim view. *Proceeding of the American Philosophical Society*, 2(108), 135-144.
- Rouzi, A., Al-Sibiani, S., Al-Senani, N., Radaddi, R., & Ardawi, M. (2011). Independent predictors of all osteoporosis-related fractures among healthy Saudi postmenopausal women: the CEOR Study. *Bone*, 50(3), 713-722.
- Royal Embassy of Saudi Arabia Washington, DC. (2013). *About Saudi Arabia*. Retrieved on June 16, 2013 from: <http://www.saudiembassy.net/about/>
- Rugh, W. (1973). Emergence of a new middle class in Saudi Arabia. *The Middle East Journal*, 27(1), 7-20.
- Saadia, Z., Rushdi, S., Alsheha, M., Saeed, H., & Rajab, M. (2010). A study of knowledge attitude and practices of Saudi women toward diabetes mellitus: a (KAP) study in Al-Qassim region. *The International Journal of Health*, 11(2).
- Salary Explorer. (2012). *Salary survey in Saudi Arabia*. Retrieved on June 16, 2013 from: <http://www.salaryexplorer.com/salary-survey.php?loc=191&loctype=1>
- Saudi Gazette. (2011). Shisha worse than cigarettes. Retrieved on June 16, 2013 from: <http://www.saudigazette.com.sa/index.cfm?method=home.regcon&contentid=20111219114062>
- Saylor, C. (2004). The circle of health a health definition model. *Journal of Holistic Nursing*, 22(2), 98-115.
- Sayar, K., & Kose, S. (2012). Psychopathology and depression in the Middle East. *Journal of Mood Disorders*, 2(1), 21-7.
- Schaffer, B., & Riordan, C. (2003). A review of cross-cultural methodologies for organizational research: a best practices approach. *Organizational Research Methods*, 6(2), 169-215.
- Schenck-Gustafsson, A. (2012). Type 2 diabetes and cardiovascular disease in women. *Diabetologia*, 2013(56), 1-9.
- Schwarz, P.E., Schwarz, J., Schuppenies, A., Bornstein, S.R., & Schulze, J. (2007). Development of a diabetes prevention management program for clinical practice. *Public Health Reports*, 122, 258-263.
- Senthilvel, E., Auckley, D., & Dasarathy, J. (2011). Evaluation of sleep disorders in the primary care setting: history taking compared to questionnaires. *Journal of Clinical Sleep Medicine*, 7(1), 41-48.

Sharaf, F. (2010). Impact of health education on compliance among patients of chronic diseases in Al Qassim, Saudi Arabia. *International Journal of Health Sciences*, 4(2), 139-148.

Sivakumar, K., & Nakata, C. (2001). The stampede toward Hofstede's framework: avoiding the sample design pit in cross-cultural research. *Journal of International Business Studies*, 32(3), 555-574.

Sekaran, U. (1983). Methodological and theoretical issues and advancements in cross-cultural research. *Journal of International Business Studies*, 14(2), 61-74.

Schnall, E., Wassertheil-Smoller, S., Swencionis, C., Zemon, V., Tinker, L., O'Sullivan, M. Goodwin, M. (2010). The relationship between religion and cardiovascular outcomes and all-cause mortality in the women's health initiative observational study. *Psychology and Health*, 25(2), 249-263.

SF-36.org. (2013). *The SF-12®: an even shorter health survey*. Retrieved on June 16, 2013 from: <http://www.sf-36.org/tools/sf12.shtml>

Siddiqui, S., Ogbeide, D.O., Karim, A., & Al Khalifa, I. (2001). Hypertension control in a community health care at Riyadh, Saudi Arabia. *Saudi Medical Journal*, 22(1), 49-52.

Steed, L., Cooke, D., & Newman, S. (2003). A systematic review of psychosocial outcomes following education, self-management and psychological interventions in diabetes mellitus. *Patient Education and Counseling*, 51(1), 5-15.

Stoecker, R. (2009). Are we talking the walk of community-based research?. *Action Research*, 7(4), 385-404.

Stokols, D., Grzywacz, J. G., McMahan, S., & Phillips, K. (2003). Increasing the Health Promotive capacity of human environments. *American Journal of Health Promotion*, 18(1), 4-13.

Skok, W., & Tahir, S. (2010). Developing a knowledge management strategy for the Arab world. *The Electronic Journal of Information Systems in Developing Countries*, 41(7), 1-11.

Song, H.J., Han, H.R, Lee, J.E, Kim, J., Kim K.B., Nguyen, T., & Kim, M.T. (2010). Translating current dietary guidelines into a culturally tailored nutrition education program for Korean American immigrants with type 2 diabetes. *The Diabetes Educator*, 36(5), 752-761.

Sperber, A., Devellis, R., & Boehilecke, B. (1994) Cross-cultural translation methodology and validation. *Journal of Cross-Cultural Psychology*, 25(4), 501-524.

Sotoudeh, G., Khosravi, S., Khosravi, S., Karbakhsh, M., Khajehnasiri, F., & Khalkhali, H. (2008). What women think about their husbands' opinions might influence women's body image: an explorative study. *Indian Journal of Medical Sciences*, 62(3), 98-104.

Strine, T., Chapman, D., Balluz, L., Moriarty, D., & Mokdad, A. (2008). The associations between life satisfaction and health related quality of life, chronic illness, and health behaviors among U.S. community-dwelling adults. *Journal of Community Health*, 33, 40-50.

Stringer, E., Guhathakurta, M., Mwajuma, M., & Waddell, S. (2008). Guest's editor commentary: action research and development. *Action Research*, 6(2), 123-127.

Tang, T., Funnell, M., Anderson, R. (2006). Group education Strategies for diabetes self-management. *Diabetes Spectrum*, 19(2), 99-105.

Tang, T., Brown, M., Funnell, M., & Anderson, R. (2008). Social Support, quality of life, and self-care behaviors among African Americans with type 2 diabetes. *The Diabetes Educator*, 34, 266-276.

Qur'an. Taqi-ud-Din Al-Hilali, M., & Khan, M.M. Interpretation of the meanings of the noble quran. Retrieved on June 16, 2013 from:
<http://www.dar-us-salam.com/TheNobleQuran/index.html>

Tessler, M., & Jamal, A. (2006). Political attitude research in the Arab world: emerging opportunities. *Political Science & Politics*, 39(3), 433-437.

The Michigan Diabetes Research Training Center. (2013). *Survey instruments*. Retrieved on June 16, 2013 from: <http://www.med.umich.edu/mdrtc/profs/survey.html>

Tretli, S., & Gaard, M. (1996). Lifestyle changes during adolescence and risk of breast cancer: an ecologic study of the effect of world war II in Norway. *Cancer Causes and Control*, 7, 507-512.

Triandis, H. (2004). The many dimensions of culture. *Academy of Management*, 18(1), 88-93.

Trimble, J. (1990). Ethnic specification, validation, prospects, and the future of drug use research. *The International Journal of the Addictions*, 25(2A), 149-170.

Tripp-Reimer, T., Choi, E., Kelley, S., & Enslein, J.C. (2001). Cultural barriers to care: inverting the problem. *Diabetes Spectrum*, 14(1), 13-22.

U.S. Department of Health and Human Services. (2000). Healthy people 2010: understanding and improving health. Retrieved on June 16, 2013 from:
<http://www.healthy.arkansas.gov/programsServices/healthStatistics/Brfss/Documents/2010uih.pdf>

Uusitupa, M., Louheranta, A., Lindstrom, J., Valle, T., Sundvall, J., Ericsson, J., & Tuomilehto, J. (2000). The Finish diabetes prevention study. *British Journal of Nutrition*, 83(1), S137-S142.

Veugeliers, P., Yip, A., & Kephart, G. (2001). Proximate and contextual socioeconomic determinants of mortality: multilevel approaches in a setting with universal health care coverage. *American Journal of Epidemiology*, 154 (8), 725-732.

Wang, C., Yi, W., Tao, Z., & Carovano, K. (1998). Photovoice as a participatory health promotion strategy. *Health Promotion International*, 13(1), 75-86.

Waxler-Morrison, N., Anderson, J., Richardson, E., & Chambers, N. (2005). Cross-cultural caring: a handbook for health professionals. Vancouver: UBC Press.

WebMed. (2013). Diabetes health center.

Retrieved on June 16, 2013 from: <http://diabetes.webmd.com/blood-glucose>

Wheeler, L.A., Wheeler, M., Ours, P., & Swider, C. (1985). Evaluation of computer-based diet education in persons with diabetes mellitus and limited educational background. *Diabetes Care*, 8(6), 537-544.

Williams, J.H., Auslander, W.F., de Groot, M., Robinson, A.D., Houston, C., & Haire-Joshu, D. (2006). Cultural relevancy of diabetes prevention nutrition program for African American women. *Health Promotion Practice*, 7(1), 56-67.

Winter, S., King, A., Stafford, R., Winkleby, M., Haskell, W., & Farquhar, J. (2012). Promoting culturally targeted chronic disease prevention research through an adapted participatory research approach: The Qassim-Stanford Universities project. *Translational Behavioral Medicine*, 289-298.

WMA declaration of Helsinki-ethical principles for medical research involving human subjects [online]. Retrieved on June 16, 2013 from:

<http://www.wma.net/en/30publications/10policies/b3/index.html>

Wong, W.P., Yeung, M., Loh, S., Lee, M., Ghazali, F., Chan, C.J., Dean, E. (Accepted for publication). Stroke-related knowledge, lifestyle behaviours and health beliefs in Singaporean Chinese: Implications for health education. *Health Education Journal*.

World Health Organization. (1996). Health promotion through Islamic lifestyles: the Amman declaration. *The Right Path to Health: Health Education through Religion*, (5). Retrieved on June 16, 2013 from:

<http://www.emro.who.int/Publications/HealthEdReligion/AmmanDeclaration/Chapter3.htm>

World Health Organization. (1986). Ottawa charter for health promotion. Retrieved on June 16, 2013 from: http://www.euro.who.int/__data/assets/pdf_file/0004/129532/Ottawa_Charter.pdf

World Health Organization. (2003). Framework convention on tobacco control. Retrieved on June 16, 2013 from:

http://www.who.int/tobacco/framework/WHO_FCTC_english.pdf

World Health Organization. (2004). Global strategy on diet, physical activity, and health.

Retrieved on June 16, 2013 from: http://www.who.int/gb/ebwha/pdf_files/WHA57/A57_R17-en.pdf

World Health Organization. (2004a). Diabetes action now: an initiative of the world health organization and the international diabetes federation. *WHO Library Cataloguing-in-Publication Data*. Retrieved on June 16, 2013 from: <http://www.who.int/diabetes/actionnow/en/DANbooklet.pdf>

World Health Organization. (2004b). Diabetes action now. *Diabetes Voice*, 49(2).

World Health Organization. *The worldwide rise of chronic noncommunicable diseases: a slow-motion catastrophe* [online]. Retrieved on June 16, 2013 from: http://www.who.int/dg/speeches/2011/ministerial_conf_ncd_20110428/en/

World Health Organization. (2007). Peer support programmes in diabetes [online]. Retrieved on June 16, 2013 from: http://www.who.int/diabetes/publications/Diabetes_final_13_6.pdf

World Health Organization, (2008). Commission on social determinants of health. Retrieved on June 16, 2013 from: http://apps.who.int/gb/ebwha/pdf_files/EB124/B124_9-en.pdf

World Health Organization. (2011a). Waist circumference and wait-hip ratio [online]. Retrieved on June 16, 2013 from: http://whqlibdoc.who.int/publications/2011/9789241501491_eng.pdf

World Health Organization. (2011b). International classification of functioning, disability and health. Retrieved on June 16, 2013 from: <http://rehabmalaysia.org/wp-content/uploads/2011/12/4-International-Classification-of-Functioning-Disability-and-Health.pdf>

World Health Organization (2006). Constitution of the world health organization [online]. Retrieved on June 16, 2013 from: http://www.who.int/governance/eb/who_constitution_en.pdf

Yehia, H. (2002). *Translation, culture, and censorship in Saudi Arabia (1988-2006) and Iraq (1979-2005)*. Thesis (MA). University of Massachusetts Amherst.

Yusuf, S., Hawken, S., Ôunpuu, S., Bautista, L., Franzosi, M., Commerford, P., & Anand, S. (2005). Obesity and the risk of myocardial infarction in 27 000 participants from 52 countries: a case-control study. *Lancet*, 366(9497), 1640-9.

APPENDICES

Appendix 1: Lifestyle-related Health Beliefs and Behaviours Survey Questionnaire

SECTION 1

Personal Data

Subject Name		Height (cm)	
Phone Number		Weight (kg)	
Sex	Skip	Marital Status	
Age (yrs)		Number of children	

Level of education

☐ No formal education ☐ Primary ☐ Intermediate ☐ Secondary ☐ Diploma ☐ University D ☐ Graduate D

Occupation

☐ Homemaker ☐ Employed ☐ Student ☐ Retired

Other.....

Source of income

☐ Personal ☐ Husband or guardian

Income

☐ < SR 3, 000 ☐ SR 3, 000 to SR 5, 000

☐ SR 5, 001 to SR 10, 000 ☐ >SR 10, 000

SECTION 2

Health Status

I am	<input type="checkbox"/> underweight <input type="checkbox"/> normal weight <input type="checkbox"/> over weight. <input type="checkbox"/> I don't know
My heart rate is generally	<input type="checkbox"/> low <input type="checkbox"/> normal <input type="checkbox"/> high <input type="checkbox"/> I don't know
My blood pressure is	<input type="checkbox"/> low <input type="checkbox"/> normal <input type="checkbox"/> high <input type="checkbox"/> I don't know
My blood sugar is	<input type="checkbox"/> low <input type="checkbox"/> normal <input type="checkbox"/> high <input type="checkbox"/> I don't know

How would you rate *your* health?

☐ Excellent ☐ Above average ☐ Average ☐ Below average ☐ Poor

Do you have any of the following conditions?

Disease name	Yes	No
Heart disease		
Lung disease		
High blood pressure		
Stroke		
Obesity		
Diabetes		
Cancer		
Rheumatoid arthritis		
Osteoarthritis		
Osteoporosis		
Anemia		
Multiple sclerosis		
Parkinson's syndrome		
Irritable bowel syndrome		
Ulcers		
Premenopausal		
Menstrual irregularities		
Menopausal		
Other		

SECTION 3
Lifestyle behaviours

A. Physical Activity and Exercise: Personal Behaviours

1. Do you do any physical activity for more than 10 minutes each time?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Do you do hard physical activities, such as running or carrying heavy objects for 10 minutes at least?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. If yes, how many days in a typical week do you do hard physical activities?	.....days
4. On a typical day, how much time you spend for this hard work?	.....hours/.....minutes
5. Do you do moderate activities, such as brisk walking or riding a bike or carrying of objects of light weight for 10 minutes at least?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. If the answer is yes, how many days per week do you do moderate activities	.....days
7. How many hours or minutes do you usually take to complete moderate physical activity in a typical day of the week?	.....hours/.....minutes

B. Diet and Nutrition: Personal Behaviours

1. How many times a week usually eat rice or pasta?	.....Times a week
2. How many times a week, you eat bread and cereals (corn flakes)?	.....Times a week
3. What type of bread you usually eat?	<input type="checkbox"/> White <input type="checkbox"/> Brown <input type="checkbox"/> Other.....
4. What kind of oil or ghee, which you use mostly in food preparation?	<input type="checkbox"/> Vegetable oil <input type="checkbox"/> Butter or margarine <input type="checkbox"/> Other..... <input type="checkbox"/> No specific oil <input type="checkbox"/> Don't use any type
5. Do you use olive oil in food preparation?	<input type="checkbox"/> Not at all <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/> Very often
6. Do you have any type of diet?	<input type="checkbox"/> Don't follow any diet <input type="checkbox"/> Drugs <input type="checkbox"/> Herbs <input type="checkbox"/> Diet food <input type="checkbox"/> Follow more than one diet
7. If the answer is yes, does this diet have been prescribed to you by a specialist?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8. Do you use alternative sugar (sweeteners) for tea, coffee or food?	<input type="checkbox"/> Not at all <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/> Very often
9. Do you drink soft drinks?	<input type="checkbox"/> Yes <input type="checkbox"/> No
10. If the answer is yes, what types do you drink?	<input type="checkbox"/> Normal <input type="checkbox"/> Diet <input type="checkbox"/> Both
10. How much do you drink soft drinks in a week?	<input type="checkbox"/> Normal.....can/week <input type="checkbox"/> Diet.....can/week
11. How many days a week (except for parties) you eat fresh fruit?	.....Times a week.
12. How many servings of fresh fruit or fresh juice do you usually consume every day?	.....servings (medium piece of fruit, 10 pieces of grapes or cherries or half cup of fruit salad or juice)
14. How many days a week you usually eat fresh vegetables?	.....Times a week.
15. How many servings of fresh vegetables you normally eat every day?	.....servings (a cup of fresh vegetables or half cup of cooked vegetables of juice)

How many times a week –do you usually , (except for certain occasions) eat the following?

Dates	.....Times a week
Beef or sheep	.....Times a week
Meat products (burger, hot dogs, shawrama)	.....Times a week
Chicken	.....Times a week
Fish	.....Times a week
Shrimps	.....Times a week
Eggs	.....Times a week
Nuts (pistachio - cashew - peanuts)	.....Times a week
Legumes (kidney beans - peas - beans)	.....Times a week
How many times a week you usually drink milk?	.....Times a week
What kind of milk you usually drink?	<input type="checkbox"/> Full fat <input type="checkbox"/> Low fat <input type="checkbox"/> Other..... <input type="checkbox"/> All
How many times a week you usually eat dairy products?	.....Times a week
Which of these kinds you eat?	<input type="checkbox"/> Full fat <input type="checkbox"/> Low fat <input type="checkbox"/> Other..... <input type="checkbox"/> All

C. Smoking: Personal Behaviours

Do you smoke?

- ☐ Cigarette
☐ Shisha
☐ Nargille
☐ Gadw
☐ I don't smoke

D. Stress and Sleep: Personal Behaviours

How would you rate the stress in *your* life?

- ☐ High ☐ Moderate ☐ Low

What are the main causes of stress in your life?

.....

.....

.....

I sleep:

- ☐ Soundly ☐ I don't sleep well.

I sleep hours a night on average.

SECTION 4**Beliefs Related to Healthy Lifestyle for the Overall Health**

Do you believe that physical activity/exercise makes a difference to a person's health overall?	<input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure <input type="checkbox"/> Agree <input type="checkbox"/> Strongly agree
Do you believe that what a person eats makes a difference to his or her health in general?	<input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure <input type="checkbox"/> Agree <input type="checkbox"/> Strongly agree
Do you believe that smoking has a bad effect on a smoker's health?	<input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure <input type="checkbox"/> Agree <input type="checkbox"/> Strongly agree
Do you believe that stress has a negative effect on a person's health?	<input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure <input type="checkbox"/> Agree <input type="checkbox"/> Strongly agree

SECTION 5**Beliefs Related to the Prevention and Management of Diabetes**

Please check the correct answer:

Disease	Exercise	Diet/Nutrition	Quitting Smoking	Stress
Diabetes and it's concomitants	<input type="checkbox"/> Important <input type="checkbox"/> not	<input type="checkbox"/> Important <input type="checkbox"/> not	<input type="checkbox"/> Important <input type="checkbox"/> not	<input type="checkbox"/> Important <input type="checkbox"/> not

SECTION 6

Understanding of Health-related Religious Teachings

A. As you best recall, what do the Qur'an and Hadith say, if any, about the following areas of health:

-Physical activity and exercise

.....
.....

-Food and nutrition

.....
.....

-Stress and sleep

.....
.....

B. Are there any other important things you are aware of that the Qur'an or Hadith say about health and living a healthy life that you have not mentioned?

.....
.....
.....
.....

We thank you very much for your time in answering this questionnaire on health and sharing your opinions with us. The information is very valuable, and will help health professionals and government provide better health services. Any other comments?

.....
.....
.....
.....

Appendix 2: Proportions of Recruited Participants from Primary Health Centers in Dammam

Number	Primary Health Clinic	Number of Visitors	Number of Participants
1	Jalawaya	4346	26
2	Adama	1728	12
3	Iskan	2666	17
4	Azizia	2450	16
5	Itisalat	1753	12
6	Al-Badia	5610	34
7	Ibn Rashid	1936	13
8	Al-Qadesia	2013	13
9	Al-Khaleej	2855	15
10	Al-Mubarakia	3397	22
11	Badar	7906	49
12	Ghurnata	2541	18
13	Al-Nakheel	1583	12
14	Uhud	6375	38
15	Al-Badea	2355	15
16	Al-Jame'ian	4361	27
17	Al-Anood	3167	20
18	Al-Iskan Al-Muaisar	424	3
19	Al-Shifa	5060	31
20	Ibn Khaldun	746	6
21	Al-Mazroua'	1113	8
22	Total	64385	407

Appendix 3: Study Two Design

Time	Intervention Group	Usual Care Group
Baseline Assessment and Evaluation	Session 1 Blood glucose check-up Body composition measures Six minute walk test Session 2 Survey questionnaires (diabetes knowledge, life satisfaction, health-related quality of life, lifestyle-related health beliefs and behaviours)	Session 1 Blood glucose check-up Body composition measures Six minute walk test Session 2 Survey questionnaires (diabetes knowledge, life satisfaction, health-related quality of life, lifestyle-related health beliefs and behaviours)
1-6 weeks	Education program Sessions > 2x1 week	Follow up with their physicians if they are diabetic
1-2 weeks	Session 1 Blood glucose check-up Body composition measures Six minute walk test Session 2 Survey questionnaires (diabetes knowledge, life satisfaction, health-related quality of life)	Session 1 Blood glucose check-up Body composition measures Six minute walk test Session 2 Survey questionnaires (diabetes knowledge, life satisfaction, health-related quality of life)

Appendix 4: Diabetes Knowledge Test

Excerpted from (Michigan Diabetes Research and Training Center)

-
1. The diabetes diet is:
 - a. the way most Saudi people eat
 - b. a healthy diet for most people
 - c. too high in carbohydrate for most people
 - d. too high in protein for most people
 2. Which of the following is highest in carbohydrate?
 - a. Baked chicken
 - b. Swiss cheese
 - c. Baked potato
 - d. Peanut butter
 3. Which of the following is highest in fat?
 - a. Low fat milk
 - b. Orange juice
 - c. Corn
 - d. Honey
 4. Which of the following is a “free food”?
 - a. Any unsweetened food
 - b. Any dietetic food
 - c. Any food that says “sugar free” on the label
 - d. Any food that has less than 20 calories per serving
 5. Glycosylated hemoglobin (hemoglobin A1) is a test that is a measure of your average blood glucose level for the past:
 - a. day
 - b. week
 - c. 6-10 weeks
 - d. 6 months
 6. Which is the best method for testing blood glucose?
 - a. Urine testing
 - b. Blood testing
 - c. Both are equally good
 7. What effect does unsweetened fruit juice have on blood glucose?
 - a. Lowers it
 - b. Raises it
 - c. Has no effect
 8. Which should not be used to treat low blood glucose?
 - a. 3 hard candies
 - b. 1/2 cup orange juice
 - c. 1 cup diet soft drink
 - d. 1 cup skim milk
 9. For a person in good control, what effect does exercise have on blood glucose?
 - a. Lowers it
 - b. Raises it
 - c. Has no effect
 10. Infection is likely to cause:
 - a. an increase in blood glucose
 - b. a decrease in blood glucose
 - c. no change in blood glucose
 11. The best way to take care of your feet is to:
 - a. look at and wash them each day
 - b. massage them with alcohol each day
 - c. soak them for one hour each day
 - d. buy shoes a size larger than usual
 12. Eating foods lower in fat decreases your risk for:
 - a. nerve disease
 - b. kidney disease
 - c. heart disease
 - d. eye disease
 13. Numbness and tingling may be symptoms of:
 - a. kidney disease
 - b. nerve disease
 - c. eye disease
 - d. liver disease
 14. Which of the following is usually not associated with diabetes:
 - a. vision problems
 - b. kidney problems
 - c. nerve problems
 - d. lung problems
 15. Signs of ketoacidosis include:
 - a. shakiness
 - b. sweating
 - c. vomiting
 - d. low blood glucose
 16. If you are sick with the flu, which of the following changes should you make?
 - a. Take less insulin
 - b. Drink less liquids
 - c. Eat more proteins
 - d. Test for glucose and ketones more often
 17. If you have taken intermediate-acting insulin (NPH or Lente), you are most likely to have an insulin reaction in:
 - a. 1-3 hours
 - b. 6-12 hours
 - c. 12-15 hours
 - d. more than 15 hours
 18. You realize just before lunch time that you forgot to take your insulin before breakfast. What should you do now?
 - a. Skip lunch to lower your blood glucose
 - b. Take the insulin that you usually take at breakfast
 - c. Take twice as much insulin as you usually take at breakfast
 - d. Check your blood glucose level to decide how much insulin to take
 19. If you are beginning to have an insulin reaction, you should:
 - a. exercise
 - b. lie down and rest
 - c. drink some juice
 - d. take regular insulin
 20. Low blood glucose may be caused by:
 - a. too much insulin
 - b. too little insulin
 - c. too much food
 - d. too little exercise
 21. If you take your morning insulin but skip breakfast your blood glucose level will usually:
 - a. increase
 - b. decrease
 - c. remain the same
 22. High blood glucose may be caused by:
 - a. not enough insulin
 - b. skipping meals
 - c. delaying your snack
 - d. large ketones in your urine
 23. Which one of the following will most likely cause an insulin reaction:
 - a. heavy exercise
 - b. infection
 - c. overeating
 - d. not taking your insulin

Appendix 5: Diabetes Knowledge Test, Test of Reliabilities

Excerpted from Michigan Diabetes Research and Training Center. (2013). Retrieved from <http://www.med.umich.edu/mdrtc/profs/survey.html>

Component ¹	Community			Michigan Public Health			Total		
	Percent Correct	Item-Total Corr	Alpha	Percent Correct	Item-Total Corr	Alpha	Percent Correct	Item-Total Corr	Alpha
General Test (1 - 14)	(n=312)		.70	(n=499)		.71	(n=811)		.71
Item 1	.87	.19		.82	.23		.84	.22	
Item 2	.42	.38		.46	.32		.45	.34	
Item 3	.36	.16		.29	.26		.32	.23	
Item 4	.61	.29		.53	.38		.56	.35	
Item 5	.29	.27		.28	.18		.29	.22	
Item 6	.79	.25		.72	.28		.74	.27	
Item 7	.59	.36		.51	.35		.54	.36	
Item 8	.54	.42		.52	.38		.53	.39	
Item 9	.90	.28		.81	.30		.85	.30	
Item 10	.78	.28		.80	.29		.79	.28	
Item 11	.88	.40		.88	.33		.88	.35	
Item 12	.88	.30		.84	.40		.85	.37	
Item 13	.81	.41		.75	.43		.77	.43	
Item 14	.93	.38		.90	.37		.91	.37	
Insulin Use (15 - 23)	(n=111)		.74	(n=195)		.76	(n=306)		.75
Item 15	.16	.35		.20	.34		.19	.33	
Item 16	.86	.36		.74	.41		.78	.40	
Item 17	.47	.36		.34	.44		.39	.42	
Item 18	.55	.51		.59	.24		.58	.33	
Item 19	.90	.21		.79	.36		.83	.32	
Item 20	.74	.52		.70	.53		.71	.53	
Item 21	.60	.49		.67	.53		.64	.51	
Item 22	.79	.48		.65	.55		.70	.53	
Item 23	.43	.45		.35	.50		.38	.49	

¹ Missing items are scored as incorrect.

Appendix 6: Data Sheet for Pre and Post Exercise Measures

Participant Code:

	Baseline	Six Weeks	3 Months
Date			
RESTING MEASURES			
Heart Rate			
Blood Pressure			
Glucose			
Rating of Perceived Exertion (0-10)			

	Baseline	Six Weeks	3 Months
Date			
POST SIX MINUTE WALK TEST			
Heart Rate			
Blood Pressure			
Glucose			
Rating of Perceived Exertion (0-10)			
6 Minute Walk Distance			

Appendix 7: Life Satisfaction Questionnaire (LISAT 9)

*Question on sex life is removed

Here are a number of statements concerning how satisfied you are with different aspects of your life. For each of these statements please mark a box indicating how you feel.

	Very satisfying	Satisfying	Rather satisfying	Rather dissatisfying	Dissatisfying	Very dissatisfying
1. My life as a whole is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. My vocational situation is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. My financial situation is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. My leisure situation is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. My contact with friends and acquaintances is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. My ability to manage my self-care is: (dressing, hygiene, transfers, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. My family life is: <input type="checkbox"/> have no family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. My partner relationship is: <input type="checkbox"/> have no steady partner/relationship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. My physical health is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. My psychological health is:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix 8: Health-related Quality of Life Questionnaire

(b) SF-12v2 ® Health Survey Scoring Questionnaire

This survey asks for your views about your health. This information will help you keep track of how you feel and how well you are able to do your usual activities.

Answer every question by selecting the answer you indicated. If you are unsure about how to answer a question, please give the best answer you can.

General Health

In general, would you say your health is

1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

Physical Functioning

Are you now limited in moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf? Does your health now?

1. Limit you a lot
2. Limit you a little
3. Not limit you at all

How about climbing several flights of stairs? Would you say your health now?

1. Limit you a lot
2. Limit you a little
3. Not limit you at all

Role Functioning (Physical)

During the past 4 weeks, how much of the time have you had any of the following problems with your work or regular daily activities as a result of your physical health? How much of the time have you accomplished less than you would like?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

How much of the time were you limited in the kind of work or other activities you could do?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Bodily Pain

During the past four weeks, how much did pain interfere with your normal work including both outside the home and housework, would you say...?

1. Extremely
2. Quite a bit
3. Moderately
4. A little bit
5. Not at all

Vitality

How much of the time during the past four weeks did you have a lot of energy? Would you say...?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Role Functioning (Emotional)

During the past four weeks, how much of the time have you had any of the following problems with your work or other daily activities as a result of any emotional problems, such as feeling depressed or anxious? How much of the time have you accomplished less than you would like?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

How much of the time did you have trouble doing work or other activities as carefully as usual?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Mental Health

How much of the time during the past four weeks have you felt calm and peaceful? Would you say...?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

How much of the time during the past four weeks have you felt downhearted and blue?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Social Functioning

During the last four weeks, how much of the time has your physical health or emotional problems interfered with your social activities, like visiting with friends, relatives, etc.?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Appendix 9: Body Composition Data Sheet

Participant:

Code:

Date:

	Baseline	6 weeks	3 months
	Date	Date	Date
Waist girth (cm)			
Hip girth (cm)			
Waist:hip ratio			
Weight (kg)			
Height (cm)			
Body mass index			

Appendix 10: Program Satisfaction Questionnaire

Adapted from the work of (Clark, Snyder, Meek, Stutz, & Parkin, 2001) to measure patients' satisfaction with a managed care environment to improve diabetes outcomes

Knowledge and information

1. In the past 6 weeks, how satisfied have you been with your knowledge of your diabetes?
(satisfied, very satisfied, extremely satisfied, dissatisfied, extremely dissatisfied)
2. How helpful is the information that you received from the education program about taking care of your diabetes or preventing it?
(excellent, very good, good, a lot)

Program staff

1. How satisfied are you with the way the educator treated you?
(satisfied, very satisfied, extremely satisfied, dissatisfied, extremely dissatisfied)
2. How satisfied are you with the number of times that the educator talked with you?
(satisfied, very satisfied, extremely satisfied, dissatisfied, extremely dissatisfied)

Program recommendation

1. Overall, how satisfied are you with the education program?
(satisfied, very satisfied, extremely satisfied, dissatisfied, extremely dissatisfied)
2. "Will recommend the education program to someone else?"
(yes, no)

Appendix 11: Number of Participants and Dropouts

Time Period	Intervention Group		Usual Care Group	
	Drop-out	Remaining	Drop-out	Remaining
Recruitment	-	16	-	19
Before the start of the education program	3	13	13	6
During the education program	5	8	0	6
Completed the study	-	8	-	6

Appendix 12: Chart of Normal and Abnormal Blood Sugar Levels

Excerpted from MD India Network for Health. (2013). Retrieved from http://www.medindia.net/patients/calculators/bloodsugar_chart.asp#ixzz2Ht8lasd0

Category of a person	Fasting		Post Prandial
	Minimum mg / dl	Maximum mg / dl	Value 2 hours after consuming glucose
Normal	70	100	Less than 140
Early Diabetes	101	126	140 to 200
Established Diabetes	More than 126	-	More than 200

Appendix 13: Certificate for Participants in the Usual Care Group



Appendix 14: Certificate for Participants in the Intervention Group

