UNIVERSITI PUTRA MALAYSIA

EFFECT OF AN EDUCATIONAL INTERVENTION ON THE PROMOTION OF DIETARY AND LIFESTYLE CHANGES FOR THE PREVENTION OF BREAST CANCER AMONG FEMALE TEACHERS IN SELECTED SCHOOLS IN SELANGOR, MALAYSIA

HALA HAZAM AI-OTAIBI

FPSK(P) 2008 4
EFFECT OF AN EDUCATIONAL INTERVENTION ON THE PROMOTION OF DIETARY AND LIFESTYLE CHANGES FOR THE PREVENTION OF BREAST CANCER AMONG FEMALE TEACHERS IN SELECTED SCHOOLS IN SELANGOR, MALAYSIA

HALA HAZAM AI-OTAIBI

DOCTOR OF PHILOSOPHY
UNIVERSITI PUTRA MALAYSIA

2008
EFFECT OF AN EDUCATIONAL INTERVENTION ON THE PROMOTION OF DIETARY AND LIFESTYLE CHANGES FOR THE PREVENTION OF BREAST CANCER AMONG FEMALE TEACHERS IN SELECTED SCHOOLS IN SELANGOR, MALAYSIA

By

HALA HAZAM AL-OTAIBI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirement for the Degree of Doctor of Philosophy

August 2008
Dedication

This work is dedicated to my mother, Rowaidah Bawabeji, who passed away from breast cancer in February 15, 1997. Her strength and tremendous love provided inspiration to all who knew her.
EFFECT OF AN EDUCATIONAL INTERVENTION ON THE PROMOTION OF DIETARY AND LIFESTYLE CHANGES FOR THE PREVENTION OF BREAST CANCER AMONG FEMALE TEACHERS IN SELECTED SCHOOLS IN SELANGOR, MALAYSIA

By

HALA HAZAM AL-OTAIBI

August 2008

Chairman : Associate Professor Mirnalini Kandiah, PhD
Faculty : Medicine and Health Sciences

Breast cancer affects more women in the world today than any other cancer. Epidemiological studies have consistently shown that diet and lifestyle play a substantial role in the development of breast cancer in women. The landmark reports by the World Cancer Research Fund (1997 & 2007) concluded that cancer is largely a preventable disease. The objective of this study is to determine the effect of an educational intervention to modify the nutrition and physical activity related to breast cancer risk among female secondary school teachers in Selangor. This study aimed to improve diet and lifestyle behaviors that included fruit and vegetable intake, the total energy from fat, physical activity and anthropometric indicators. Psychosocial factors (knowledge, attitude, barriers and self-efficacy) were examined for their relationship to change in diet and physical activity. This intervention was developed based on the guidelines of the World Cancer
Research Fund (WCRF, 1997; 2007) for cancer prevention, as well as the Malaysian Guidelines for Cancer Prevention of The National Cancer Society of Malaysia. A total of 210 female teachers, from eight randomly selected schools in four districts in the state of Selangor, were randomized into the intervention group (n= 108) and the control group (n= 102). The intervention group received a multi-component diet and lifestyle educational program, comprising a one-day seminar, a self-help educational module, face to face diet and lifestyle motivational counselling. The control group received only the self-help educational material after completing the final follow-up assessment. A validated and reliable questionnaire was used to obtain the necessary information, over three time points i.e: baseline, immediate (post-1) intervention and 4-months follow-up (post-2). Descriptive and multivariate analyses were used to analyze the data. The teachers were predominantly Malays, Muslims, and married with a mean age of 37 years. At baseline, the mean consumption of fruit and vegetable intakes were two servings per day in both groups, with a high proportion in both groups showing a moderate level of physical activity and body fat percentage. Both groups were at the moderate level for total knowledge and the three sub-scales of knowledge, attitude, barriers and self-efficacy. The results of the ANOVA - GLM Repeated Measure showed that there was a significant difference within and between the groups (p<0.05) for change in the consumption of fruit and vegetables (+0.68 serving/ day), body fat percentage (-.61%), and the multiple of resting metabolic rates (+210.56 MET), as well as for the time spent for high, moderate and walking activities, where significant changes were found within groups only. A significant difference between the groups (p<0.05) indicated an increase in knowledge, attitude, and self-efficacy, as well as a reduction in barriers in the intervention group. No significant change was observed in the
control group for the consumption of fruit and vegetables, and body composition, but there was significant increase in knowledge was observed. The change in self-efficacy was found to be predictors for the change in the intake of fruit and vegetables, MET and reduction in the percentage of body fat in the intervention group. The reduction in barriers and the increase in knowledge were found to be the predictors for the reduction in the percentage of body fat. These findings suggest that the strategies used in this intervention study have had some impact in promoting positive changes in the diet and lifestyle behaviours. In conclusion, this study confirmed that apparently healthy and educated women participated in short term intervention can be motivated to increase their dietary intake of fruits and vegetables, improved their physical activity and reduce their body fat percentage.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia untuk memenuhi syarat mendapatkan ijazah Doktor Falsafah

KESAN SATU INTERVENSI PENDIDIKAN UNTUK MEMPROMOSIKAN PERUBAHAN-PERUBAHAN PEMAKANAN DAN GAYA HIDUP SEBAGAI PENCEGAHAN KANSER PAYUDARA DI KALANGAN GURU-GURU PEREMPUAN DI SEKOLAH-SEKOLAH TERPILIH DI SELANGOR

Oleh

HALA HAZAM AL-OTAIBI

Ogos 2008

Pengerusi : Profesor Madya Mirnalini Kandiah, PhD
Fakulti : Perubatan dan Sains Kesihatan

perubahan dalam pengambilan buah-buahan dan sayur-sayuran (+0.68 sajian/hari), peratus lemak badan (-0.61%), dan kadar metabolik rehat pelbagai (+210.56 MET), begitu juga dengan masa yang digunakan untuk aktiviti berjalan, aktiviti berintensiti sederhana dan aktiviti berintensiti tinggi, dengan perubahan yang signifikan hanya dikenalpasti dalam kumpulan sahaja. Perbezaan yang signifikan juga dapat dilihat di antara kumpulan dan dalam kumpulan (p < 0.05), menunjukkan peningkatan dari segi tahap pengetahuan, sikap dan keyakinan diri, begitu juga penurunan dalam tahap halangan bagi kumpulan intervensi. Tiada perbezaan yang signifikan dapat dilihat dalam kumpulan kawalan dari segi pengambilan buah-buahan dan sayur-sayuran dan komposisi badan, namun peningkatan tahap pengetahuan yang signifikan dapat dilihat. Perubahan tahap keyakinan diri dikenalpasti sebagai perantara kepada perubahan dalam pengambilan buah-buahan dan sayur-sayuran, kadar metabolik rehat pelbagai dan penurunan peratus lemak badan di kalangan subjek dalam kumpulan intervensi. Penurunan tahap halangan dan peningkatan tahap pengetahuan pula telah dikenal pasti sebagai perantara kepada penurunan peratus lemak badan. Hasil kajian mencadangkan bahawa strategi yang digunakan dalam kajian ini mempunyai impak untuk mempromosikan perubahan yang positif dalam tingkah laku pemakanan dan gaya hidup. Sebagai kesimpulannya, kajian ini mengesahkan bahawa golongan wanita yang sihat dan berpendidikan yang menyertai program intervensi jangka masa pendek boleh dimotivaskan untuk meningkatkan pengambilan buah-buahan dan sayur-sayuran harian, memperbaiki aktiviti fizikal serta mengurangkan peratus lemak dalam badan mereka.
ACKNOWLEDGEMENTS

First of all, I would like to thank Allah for blessing me in every way, for guiding my steps and also for the wonderful educational experiences I have had here at Universiti Putra Malaysia.

There are many people to whom I am deeply grateful. I wish to extend a genuine and heartfelt gratitude to my supervisor, Assoc. Prof. Dr. Mirnalini Kandiah for her countless guidance and invaluable advice in helping me to complete this thesis, and for believing that I can complete such a challenging task.

I would like to thank my committee members, Dr. Hejar Abdul Rhaman and Assoc. Prof. Dr. Saidi Bin Moin, for their insights, encouragement, and for teaching me the many things I needed to learn. To the new friends that I met in Malaysia, thank you for the emotional and spiritual support that you have shown and given me.

My deep and sincere thanks also go to my father and my sister Huda, who have taught me that one loving family is more than a fair share, I am blessed to have both of you in my life. To my husband, Mohammed and my children Lama, Talal, Omar and Khalid, my endless love and appreciation for your patience and the faith you have in me. I could not have done it without all of you!
I certify that an Examination Committee met on 27-8-2008 to conduct the final examination on Hala Hazam AL-Otaibi, on her Doctor of Philosophy thesis entitled, “Effect of an Educational Intervention on the Promotion of Dietary and Lifestyle Changes for The Prevention of Breast Cancer among Female Teachers in Selected Schools In Selangor, Malaysia” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Putra Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

Mary Huang Soo Lee, PhD.
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Zaitun Yassin, Ph.D.
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Zalilah Mohd. Shariff, Ph.D.
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Fatimah Arshad, Ph.D.
Professor
International Medicine University
(External Examiner)

HASANAH MOHD. GHAZALI, PhD
Professor / Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 29 January 2009
This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment was of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

**Miralini Kandiah, PhD**
Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Hejar Abdul Rhaman, PhD**
Lecturer  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

**Saidi Bin Moin, PhD**
Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

---

**HASANAH MOHD. GHAZALI, PhD**  
Professor / Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 12 February 2009
DECLARATION

I declare that the thesis is based on my original work, except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously and is not concurrently submitted for any other degree at UPM or at any other institution.

________________________
HALA HAZAM AL-OTAIBI

Date: 27 January 2009
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>x</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>xi</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xviii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xxvi</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xxviii</td>
</tr>
</tbody>
</table>

## CHAPTER

### 1 INTRODUCTION

1.1 Background 1
1.2 Problem Statement 4
1.3 Significance of the Study 11
1.4 Objectives of Study 12
1.5 Null Hypotheses 14
1.6 Operational Definition 15

### 2 LITERATURE REVIEW

2.1 Nutrition Transition in Malaysia 16
2.2 Magnitude of Breast Cancer 18
2.3 Risk Factors for Breast Cancer 19
2.4 Diet and Lifestyle Factors Associated with Reduction Breast Cancer Risk
   2.4.1 Vegetables and Fruits 21
   2.4.2 Dietary Fibers 24
   2.4.3 Antioxidant Vitamins 26
   2.4.4 Folic Acid 30
   2.4.5 Vitamin D 32
   2.4.6 Calcium 34
   2.4.7 Selenium 35
   2.4.8 Phytoestrogens 36
   2.4.9 Dairy 38
   2.4.10 Green Tea 40
   2.4.11 Physical Activity 40
2.5 Diet and Lifestyle Factors Associated with Increased Breast Cancer Risk
   2.5.1 Total Energy 43
   2.5.2 Total Fat 45
   2.5.3 Meat 51
   2.5.4 Poultry and Fish 53
   2.5.5 Smoking 54
   2.5.6 Alcohol 55
2.6 Anthropometric Indicators Associated with Breast Cancer Risk
2.6.1 Height 57
2.6.2 Weight 58
2.6.3 Body Mass Index 59
2.6.4 Waist Circumference and Waist Hip Ratio 61

2.7 Theories and Models for Influencing Diet and Physical Activity Behavior
2.7.1 The Health Belief Model (HBM) 63
2.7.2 The Transtheoretical (Stage of Change) Model 64
2.7.3 The Social Cognitive Theory (SCT) 65

2.8 Intervention Studies and Strategies to Promote Diet and Lifestyle Changes for Breast Cancer Prevention

2.9 Dietary Guidelines for Cancer Prevention 77
2.10 Summary 79

3 METHODOLOGY
3.1 Phase 1 81
3.1.1 Study Design 81
3.1.2 Study Location 81
3.1.3 Cluster Sampling and Randomization of Schools 83
3.1.4 Study Population 85
3.1.5 Sample Size Calculation 85
3.1.6 Screening and Recruitment of Study Subjects 86
3.1.7 Development of Instruments 88
3.1.8 Baseline Assessment 113

3.2 Phase 2 - Intervention 113
3.2.1 Developing the Intervention Module 117

3.3 Phase 3 120
3.3.1 Intervention Implementation and Assessment of Outcomes 120
3.3.2 Data Collection 121
3.3.3 Data Analysis 123

4 RESULTS
4.1 Baseline Result 125
4.1.1 Socio-demographic Background 125
4.1.2 Breast Cancer Information Sources 127
4.1.3 Behavioral Factors 128
4.1.4 Anthropometric Measurements and Indicators 158
4.1.5 Psychosocial Factors 161
4.1.6 Summary of Baseline Result 177

4.2 Effect of the Intervention 178
4.3 Primary Outcomes 178
4.3.1 Differences in the Serving Sizes for Fruit and Vegetables - Between Group Comparison (Post-2) 168
4.3.2 Change in Serving Size for Fruit, Vegetables - Within Group Comparison (Post-2) 179
4.3.3 The Effect of Intervention on Serving Sizes of Fruit and Vegetables 180
4.3.4 Difference in Percentage of Calories from Fat-Between Group Comparison (Post-2) 181
4.3.5 Change in Percentage of calories from Fat - Within Group Comparison (Post-2) 182
4.3.6 The Effect of Intervention on Percentage of calories from Fat 183
4.3.7 Difference in the Level of Physical Activity-Between Group Comparison (Post-2) 184
4.3.8 Change in the Level of Physical Activity-Within Group Comparison(Post-2) 185
4.3.9 The Effect of Intervention on the Level of Physical Activity 188
4.3.10 Change in Anthropometric Measurements and Indicators-Between Group Comparison(Post-2) 189
4.3.11 Change in Anthropometric Measurements and Indicators- Within Group Comparison(Post-2) 191
4.3.12 The Effect of Intervention on Anthropometric Measurements and Indicators 194
4.3.13 Differences in Knowledge-Between Group Comparison Immediately after Intervention (post-1) 195
4.3.14 Change in Knowledge (post-1)-Within Group Comparison Immediately after Intervention 203
4.3.15 Difference in Knowledge-Between Groups Comparison at 4-Months Post Intervention (post-2) 204
4.3.16 Change in Knowledge-Within Group Comparison after 4-Months Post Intervention (post-2) 212
4.3.17 The Effect of Intervention on Total and Subscales Knowledge 214
4.3.18 The Comparison of the Mean Score for the Knowledge on Diet within the Intervention Group 215
4.3.19 Comparison of Mean Diet Knowledge Scores within Control Group 216
4.3.20 The Comparison of Mean Physical Activity and Weight Management Knowledge Scores within Intervention Group 217
4.3.21 The Comparison of Mean Physical Activity and Weight Management Knowledge Scores within Control Group 218
4.3.22 The Comparison in the Mean Score for the Knowledge on Lifestyle Within Intervention Group

4.3.23 The Comparison in the Mean Score for the Knowledge on Lifestyle Within Control Group

4.3.24 The Comparison of Mean Total Scores Within Intervention Group

4.3.25 The Comparison of Mean Total Scores Within Control Group

4.3.26 The Difference in Attitude-Between Groups Comparison at 4-Months Post Intervention (post-2)

4.3.27 Change in Attitude-Within Group Comparison after 4-Months Post Intervention (post-2)

4.3.28 The Effect of Intervention on Attitude

4.3.29 The Difference in Perceived Barriers-Between Groups Comparison at 4-Months Post Intervention (post-2)

4.3.30 Change in Perceived Barriers -Within Group Comparison after 4-Months Post Intervention (post-2)

4.3.31 The Effect of Intervention on Perceived Barriers

4.3.32 The Differences in Self-Efficacy-Between Group Comparison (post-2)

4.3.33 Change in Self-Efficacy-Within Group Comparison after 4-Months Post Intervention (post-2)

4.3.34 The Effect of Intervention on Self-Efficacy

4.4 Secondary Outcomes

4.4.1 Differences in the Serving Sizes for Food Groups-Between Group Comparison (post-2)

4.4.2 Change in Serving Size for Food Groups-Within Group Comparison(post-2)

4.4.3 The Effect of Intervention on Serving Size for Food Groups

4.4.4 Frequency of Food Consumption (Post-2)

4.4.5 Difference in Dietary Intake-Between Groups Consumption (Post-2)

4.4.6 Change in Dietary Intake-Within Groups Consumption (Post-2)

4.4.7 The Effect of Intervention on Dietary Intake

4.4.8 The Intake of Nutritional Supplements

4.4.9 Meals Practices and Cooking Methods (Post-2)

4.5 Predictors of Diet and Lifestyle Behavior Change

4.6 Summary of the Null Hypotheses
## DISCUSSION

5.1 Recruitment of the Participants 258
5.2 Baseline Result 259
  5.2.1 Socio-demographic Background 259
  5.2.2 Breast Cancer Information Sources 260
  5.2.3 Behavioral Factors 261
  5.2.4 Anthropometric Measurements and Indicators 270
  5.2.5 Psychosocial Factors 272
5.3 The Effects of the Intervention 280
  5.3.1 Primary Outcomes 280
  5.3.2 Secondary Outcomes 293
5.4 Predictors of Diet and Lifestyle Behavior Change 295

## CONCLUSIONS

6.1 Conclusion 296
6.2 Strengths and Limitations of the Study 298
6.3 Recommendation 299

REFERENCES 302
APPENDICES 327
BIODATA OF STUDENT 402
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>WCRF Cancer Prevention Guidelines</td>
</tr>
<tr>
<td>1.2</td>
<td>Malaysian Cancer Prevention Guidelines</td>
</tr>
<tr>
<td>1.3</td>
<td>Female breast cancer incidence in Malaysia according to age (NCR, 2003)</td>
</tr>
<tr>
<td>1.4</td>
<td>Operational definitions of teams</td>
</tr>
<tr>
<td>2.1</td>
<td>A summary of five studies that have examined different strategies to promote diet and lifestyle for breast cancer prevention</td>
</tr>
<tr>
<td>1.3</td>
<td>Female breast cancer incidence in Malaysia according to age (NCR, 2003)</td>
</tr>
<tr>
<td>3.1</td>
<td>Distribution of secondary schools in the state of Selangor</td>
</tr>
<tr>
<td>3.2</td>
<td>Information used in the calculation of the sample size</td>
</tr>
<tr>
<td>3.3</td>
<td>Summary of the number of teachers and eligible teachers recruited</td>
</tr>
<tr>
<td>3.4</td>
<td>The inclusion and exclusion criteria of the study</td>
</tr>
<tr>
<td>3.5</td>
<td>Item analysis for difficulty and discrimination</td>
</tr>
<tr>
<td>3.6</td>
<td>Reliability test for knowledge, attitude, barriers and self-efficacy</td>
</tr>
<tr>
<td>3.7</td>
<td>Rotated factor analysis of knowledge items</td>
</tr>
<tr>
<td>3.8</td>
<td>Rotated factor analysis of attitude items</td>
</tr>
<tr>
<td>3.9</td>
<td>Rotated factor analysis of barriers items</td>
</tr>
<tr>
<td>3.10</td>
<td>Rotated factor analysis of self-efficacy items</td>
</tr>
<tr>
<td>3.11</td>
<td>Reliability test for the final version of the questionnaire</td>
</tr>
<tr>
<td>3.12</td>
<td>Body mass index classification</td>
</tr>
<tr>
<td>3.13</td>
<td>Waist hip ratio (WHR) and waist circumference</td>
</tr>
<tr>
<td>3.14</td>
<td>The categorization of body fat percentage</td>
</tr>
<tr>
<td>3.15</td>
<td>The categorization of knowledge</td>
</tr>
<tr>
<td>3.16</td>
<td>The categorization of attitude</td>
</tr>
</tbody>
</table>
3.17 The categorization of self-efficacy 113
3.18 Measurements conducted for subjects 114
3.19 The theoretical basis for intervention components 116
3.20 Data collection phase 122
4.1 The Socio-economic characteristics of respondents in the control and intervention groups at baseline 126
4.2 Sources of breast cancer information in the control and intervention groups 127
4.3 The mean serving sizes for intake different food groups in the control and intervention groups at baseline 128
4.4 Frequency of cereals and cereal products at baseline 130
4.5 Frequency of meat and meat products at baseline 131
4.6 Frequency of fish and seafood at baseline 132
4.7 Frequency of fruits at baseline 133
4.8 Frequency of vegetables at baseline 134
4.9 Frequency of milk and milk products at baseline 136
4.10 Frequency of herbal at baseline 137
4.11 Frequency of nuts at baseline 137
4.12 Frequency of confectionary at baseline 138
4.13 Frequency of drinks and beverages at baseline 139
4.14 Frequency of flavors enhancers and additives at baseline 141
4.15 Frequency of fast food at baseline 142
4.16 Frequency of oils at baseline 143
4.17 Food frequency score of the control and intervention groups at baseline 144
4.18 Intake of selected nutrients by the respondents in the control and intervention groups at baseline 147
4.19 The consumption of supplements in the control and intervention groups at baseline 151

4.20 Frequency of taking meals in the control and intervention groups at baseline 153

4.21 The frequency of using different cooking methods in the control and intervention groups at baseline 154

2.22 The frequency of eating out in the control and intervention groups at baseline 156

4.23 The anthropometric measurements and the respondents’ percentages of body fat in the control and intervention groups at baseline 159

4.24 Distribution of respondents in the control and intervention groups for anthropometric indicators at baseline 160

4.25 Distribution of respondents for knowledge on diet in the control and intervention groups at baseline 163

4.25 Distribution of respondents for physical activity and weight management knowledge in the intervention and control groups at baseline 166

4.27 Distribution of respondents for knowledge on lifestyle in the control and intervention groups at baseline 168

4.28 The mean total knowledge and the three sub-scales score of the respondents in the control and intervention groups at baseline 169

4.29 Distribution of respondents by response on attitude statements in the control and intervention groups at baseline 171

4.30 Perceived barriers in the control and intervention group at baseline 173

4.31 Distribution of respondents for self-efficacy in the control and intervention groups at baseline 176

4.32 The mean serving size for fruit and at 4-months post intervention 179

4.33 The mean serving size for fruit and vegetable in the intervention group at baseline and 4-months post intervention 179

4.34 The mean serving size for fruit and vegetable in the control group at baseline and 4-months post intervention 180

4.35 GLM repeated-measure: between-group and within-group Comparisons serving size for fruit and vegetable of respondents in the control and intervention groups 181
4.36 The intake of fat and percentage of calories from fat in the control and intervention groups at 4-months post intervention 181

4.37 The intake of fat and percentage of calories from fat in the intervention groups at 4-months post intervention 182

4.38 The intake of fat and percentage of calories from fat in the control group at baseline and 4-months post intervention 183

4.39 GLM repeated-measure: between-group and within-group comparisons for fat and percentage of calories from fat of respondents in the control and intervention groups 183

4.40 The mean minutes per day spent for activities and the MET in the intervention group at baseline and 4-months posts intervention 186

4.41 The distribution of the intervention group, according to the three levels of physical activity at baseline and 4-months post intervention 186

4.42 The mean minutes per day spent for activities and MET of the control group at baseline and 4-months post intervention 187

4.43 The distribution of the control group according to the three levels of physical activity at baseline and 4-months post intervention 188

4.44 GLM repeated-measure: between-group and within-group comparisons for the level of physical activity among respondents in the control and intervention groups 188

4.45 Anthropometric measurement and percentage of body fat of respondents in the control and intervention groups at 4-months post intervention 189

4.46 The distribution of the control and intervention groups for anthropometric indicators at 4-months post intervention 190

4.47 Anthropometrics measurement and percentage of body fat of the intervention group at baseline and 4-months after intervention 191

4.48 The distribution of the intervention group for anthropometric indicators at baseline and 4-months post intervention 192

4.49 Anthropometrics measurement and the percentage in body fat of the control group at baseline and 4-months after intervention 193

4.50 The distribution of the intervention group for anthropometric indicators at baseline and 4-months post intervention 194
4.51 GLM repeated-measure: between-group and within-group comparisons for the mean anthropometric measurements and indicators of respondents in the control and intervention groups

4.52 The distribution of respondents for their knowledge on diet in the intervention and the control groups immediately after intervention (post-1)

4.53 The distribution of respondents for their knowledge on physical activity and weight management in the intervention and control groups immediately after intervention (post-1)

4.54 The distribution of respondents for their knowledge on lifestyle in the control and intervention groups immediately after intervention (post-1)

4.55 Distribution and mean score for the total knowledge and subscales score of the control and intervention groups immediately after intervention (post-1)

4.56 Mean score for the total and subscale knowledge score of the intervention group before and after intervention

4.57 Mean score for the total and subscales knowledge score of the control group before and after intervention

4.58 The distribution of respondents for the knowledge on diet in the intervention and control groups at 4-months post intervention (post-2)

4.59 The distribution of respondents for the knowledge on physical activity and weight management in the intervention and control groups at 4-months post intervention (post-2)

4.60 The distribution of respondents for the knowledge on lifestyle in the control and intervention groups at 4-months post intervention (post-2)

4.61 Distribution and mean score for the total and subscales knowledge in the control and intervention groups at 4-months post intervention

4.62 The mean score for the total and subscales knowledge in the intervention group immediately after the intervention and at 4-months posts intervention

4.63 The mean score for the total and subscales knowledge of the control group immediately after the intervention and at 4-months post intervention
4.64 GLM repeated-measure: between-group and within-group comparisons for the total and three subscales knowledge scores of the respondents in the control and intervention groups

4.65 Comparison of the changes in the knowledge on diet within the intervention group using the GLM repeated measurement

4.66 Comparison change in knowledge on diet within control group using GLM repeated measurement

4.67 Comparison in the changes of the mean scores for the knowledge on physical activity and weight management within the intervention group using the GLM repeated measurement

4.68 Comparison in the changes of in the physical activity and weigh management knowledge within the control group using the GLM repeated measurement

4.69 Comparison in the changes of the knowledge on lifestyle within the intervention group using the GLM repeated measurement

4.70 Comparison in the changes for the knowledge of lifestyle within the control group using the GLM repeated measurement

4.71 Comparison in the changes of the total knowledge within the intervention group using the GLM repeated measurement

4.72 Comparison in the changes of the total knowledge within the control group using the GLM repeated measurement

4.73 The distribution of respondents by response on the attitude statements in the control and intervention groups at 4-months post intervention

4.74 The distribution and mean score for the attitude of respondents in the control and intervention groups at 4-months post intervention

4.75 The mean score for the attitude of respondents in the intervention and the control groups at 4-months post intervention

4.76 The perceived barriers in the control and intervention groups at 4-months post intervention

4.77 The mean score for the respondents’ barriers in the intervention and control groups at 4-months post intervention

4.78 The distribution of respondents for self-efficacy on the dietary change in the control and intervention groups at 4-months post-2