


10-14-2019

## **A Nutrition Education Intervention with Maternal Support Among Children Participating in Summer Camps to Prevent Overweight and Obesity in Kuwait**

Mashaël Huwaikem  
*Florida International University*, [mhuwa001@fiu.edu](mailto:mhuwa001@fiu.edu)

Follow this and additional works at: <https://digitalcommons.fiu.edu/etd>

 Part of the [Dietetics and Clinical Nutrition Commons](#), [Medical Nutrition Commons](#), [Other Public Health Commons](#), [Other Social and Behavioral Sciences Commons](#), and the [Public Health Education and Promotion Commons](#)

---

### **Recommended Citation**

Huwaikem, Mashaël, "A Nutrition Education Intervention with Maternal Support Among Children Participating in Summer Camps to Prevent Overweight and Obesity in Kuwait" (2019). *FIU Electronic Theses and Dissertations*. 4324.  
<https://digitalcommons.fiu.edu/etd/4324>

This work is brought to you for free and open access by the University Graduate School at FIU Digital Commons. It has been accepted for inclusion in FIU Electronic Theses and Dissertations by an authorized administrator of FIU Digital Commons. For more information, please contact [dcc@fiu.edu](mailto:dcc@fiu.edu).

FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

A NUTRITION EDUCATION INTERVENTION WITH MATERNAL SUPPORT  
AMONG CHILDREN PARTICIPATING IN SUMMER CAMPS TO PREVENT  
OVERWEIGHT AND OBESITY IN KUWAIT

A dissertation submitted in partial fulfillment of

the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

DIETETICS AND NUTRITION

by

Mashaël Huwaikem

2019

To: Dean Tomás R. Guilarte  
Stempel College of Public Health and Social Work

This dissertation, written by Mashaël Huwaikem, and entitled A Nutrition Education Intervention with Maternal Support among Children Participating in Summer Camps to Prevent Overweight and Obesity in Kuwait, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

---

Catherine Coccia

---

Fatma G. Huffman

---

Florence George

---

Adriana Campa, Major Professor

Date of Defense: October 14, 2019

The dissertation of Mashaël Huwaikem is approved.

---

Dean Tomás R. Guilarte  
Stempel College of Public Health and Social Work

---

Andrés G. Gil  
Vice President for Research and Economic Development  
and Dean of the University Graduate School

Florida International University, 2019

© Copyright 2019 by Mashaël Huwaikem

All rights reserved.

## DEDICATION

I dedicate this dissertation to everyone supported me to complete this degree. It is dedicated specially to my mother for supporting me financially and emotionally from thousands of miles away. This dissertation is also dedicated to Rakan Alajmi, who convinced me to pursue the doctoral degree, to Dr. Sarah Alghamdi and Dr. Eman Almutairi for being always there to make it possible for me, and to my siblings for their support and good wishes.

## ACKNOWLEDGMENTS

There are many people to thank for helping to complete this dissertation. First, I would like to express my deepest appreciation to my major professor Dr. Campa, without her guidance, supervision and persistent help this dissertation would never have been completed.

I would like to thank Dr. Huffman, for all her support, encouragement, feedback and suggestions since she accepted me in this program. Thank you so much for forcing me sometimes to look at my work in different ways, your support was important for my success.

I would like also to thank Dr. Coccia, for serving in my committee and providing advice that made my project a much better product.

My statistical analysis would have not been completed without Dr. George guidance and advice. I am grateful for her cooperation in the difficult field assignment.

Finally, I would like to thank the members of Dietetics and Nutrition department. The faculty, staff, and students who made my goal achievable. A special thanks to Dr. Vijaya Narayanan who empowered my skills in teaching by her guidance and Julia Gonzales who was always there to assist me in the administrative work.

My friends Rasha Sankar and Dr. Nadine Mikati, your help in every aspect of my life to complete this degree is deeply appreciated.

ABSTRACT OF THE DISSERTATION

A NUTRITION EDUCATION INTERVENTION WITH MATERNAL SUPPORT  
AMONG CHILDREN PARTICIPATING IN SUMMER CAMPS TO PREVENT  
OVERWEIGHT AND OBESITY IN KUWAIT

by

Mashaël Huwaikem

Florida International University, 2019

Miami, Florida

Professor Adriana Campa, Major Professor

Kuwait has the highest prevalence of obesity within Arab countries at 37.8%. The prevalence of childhood obesity, believed to be a reliable measure of future obesity, is increasing in there year after year. However, the potential effect of any type of preventive measures has not been adequately studied. Therefore, this dissertation aimed to increase awareness of long-term risks of childhood obesity among children and their mothers. Additionally, to assess the impact of the Healthy Habits (HH) program on changing eating behaviors among 6 to10 year-old children participating in summer camps.

Seventy-nine children participated in two summer camps for 8 weeks in Kuwait. One of these camps was randomly assigned to be the Healthy Habits group. The other camp was considered the comparison group. The HH intervention focused on changing eating behaviors based on the Social Cognitive Theory (SCT). Anthropometrics, body

composition and changing in behaviors were measured at baseline and post intervention. After the 8-week nutrition education program, HH group significantly improved their eating behaviors and attitudes. There were also significant positive changes in self-efficacy among the HH group. In addition, those in the HH group maintained weight during the intervention while the comparison group gained weight [ $(-.1954 \pm .537)$  vs  $(.4413 \pm .406)$ ,  $P \leq .001$ ]. The body composition changes were also significantly associated with the nutrition education. There was a significant decrease in %Fat Mass in the HH group compared with the comparison group [ $(-1.495 \pm .933)$  vs  $(.3763 \pm .603)$   $P \leq .001$ ]. Children in the intervention group with maternal support showed significant improvement in eating behavior and attitude compared with those without maternal support. Maternal eating behaviors and attitudes were also significantly changed by their participation.

In conclusion, the HH program had great impact on preventing and ameliorating childhood obesity as a long-term outcome. Indeed, the HH group changed their eating behaviors and body composition significantly when compared with the comparison group. In addition, focus on maternal involvement in this type of intervention to decrease childhood obesity, made it more successful. The outcomes of this study showed that maternal support in the intervention group promoted more positive changes compared to children receiving the intervention but without maternal support.



## TABLE OF CONTENT

CHAPTER	PAGE
CHAPTER I: INTRODUCTION .....	1
- Statement of the problem .....	1
- Significance of the Study .....	2
- Innovation .....	3
- Specific Aims and Hypothesis .....	3
- Statistical Analysis of Hypothesis .....	6
- References .....	9
CHAPTER II: LITERATURE REVIEWS .....	11
- Etiology .....	11
- Childhood Obesity and Behavioral Modifications .....	12
- Childhood Obesity and Family Support .....	14
- Childhood Obesity and Summer Camps .....	18
- Childhood Obesity and Type of Food .....	21
- Childhood Obesity and Body Composition .....	22
- Childhood Obesity and Portion Size .....	23
- Childhood Obesity and Skipping Breakfast .....	23
- CATCH Program .....	25
- Kuwaiti Lifestyles .....	26
- Summary .....	26
- References .....	28
CHAPTER III: METHODOLOGY .....	34
- Study Design .....	34
- Study Setting .....	35
- Intervention .....	38
- Social Cognitive Theory Constructs .....	41
- Measurements .....	42
- Study protocol .....	46
- References .....	47
CHAPTER IV: EFFECT OF NUTRITION EDUCATION INTERVENTION ON EATING BEHAVIOR AMONG CHILDREN PARTICIPATING IN SUMMER CAMPS IN KUWAIT .....	51
- Abstract .....	51
- Introduction .....	52
- Method .....	53
- Data Collection .....	54
- Statistical Analysis .....	55
- Results .....	55

- Discussion .....	65
- Conclusion .....	68
- References .....	69
CHAPTER V: IMPACT OF NUTRITIONAL EDUCATIONAL INTERVENTION TO CHANGE EATING BEHAVIORS ON PERCENT FAT MASS .....	73
- Abstract .....	73
- Introduction .....	74
- Method .....	75
- Data Collection .....	76
- Statistical Analysis .....	77
- Results .....	77
- Discussion .....	84
- Conclusion .....	86
- References .....	87
CHAPTER VI: IMPACT OF MOTHERS PARTICIPATING IN NUTRITION EDUCATION INTERVENTION ON THEIR CHILDREN EATING BEHAVIOR .....	91
- Abstract .....	91
- Introduction .....	92
- Method .....	93
- Data Collection .....	94
- Statistical Analysis .....	96
- Results .....	96
- Discussion .....	108
- Conclusion .....	109
- References .....	110
CHAPTER VII: CONCLUSION .....	113
CHAPTER VIII: STRENGTHS AND LIMITATION .....	115
- Reference .....	116
CHAPTER IX: FUTURE STUDIES .....	118
APPENDICES .....	119
VITA .....	172

## LIST OF TABLES

TABLE	PAGE
CHAPTER I	
- Table 1: Statistical Analysis of Hypothesis .....	6
CHAPTER III	
- Table 1: Social Cognitive Theory Constructs .....	41
CHAPTER IV	
- Table 1: Demographic characteristics .....	56
- Table 2: Baseline Anthropometrics and Groups differences .....	57
- Table 3: Body weight and Behavior Changes at baseline and end 8-week program .....	58
- Table 4: Body weight and Behavior changes between groups .....	59
- Table 5: Self-efficacy Changes .....	62
- Table 6: Attitudes' Changes .....	64
CHAPTER V	
- Table 1: Anthropometrics and Groups differences .....	78
- Table 2: Body weight and body composition at baseline and end 8-week program .....	79
- Table 3: Body weight and Body composition changes between groups .....	80
- Table 4a: Univariate Regression Effect of Eating Behavior Changes on Children's Fat Mass Percent .....	82
- Table 4b: Multivariable Regression Effect of Eating Behavior Changes on Children's Fat Mass Percent .....	82
- Table 5: Baseline body fat mass percentage .....	84
CHAPTER VI	
- Table 1: General Characteristics .....	97
- Table 2: Body weight and Behavior Changes at baseline and end 8-week program .....	99
- Table 3: Body weight between both groups .....	99
- Table 4: Behavior changes between both groups .....	101
- Table 5: Self-efficacy Changes .....	103
- Table 6: Attitudes' Changes .....	105
- Table 7: Nutrition Education Program and Mothers' Attitudes, Behaviors, and Beliefs .....	107

## LIST OF FIGURES

FIGURE	PAGE
CHAPTER IV	
- Figure 1: Body weight Changes in both groups .....	59
- Figure 2: Caloric intake Changes in both groups .....	60
CHAPTER V	
- Figure 1: Relationship between Waist/Height ratio and %FM .....	78
- Figure 2: Differences in Mean Percent of Fat Mass Changes in Both groups .....	81
- Figure 3 A: Behavioral Changes Affect Body Fat mass .....	82
- Figure 3 B: Behavioral Changes Affect Body Fat mass .....	83
CHAPTER VI	
- Figure 1: Body weight Changes in both groups .....	100

## ABBREVIATIONS AND ACRONYMS

WHO	World Health Organization
GCC	Gulf Cooperation Council countries
BMI	Body Mass Index
BMIz	Body Mass Index z-score
SCBT	Social Cognitive Behavioral Theory
CATCH	Coordinated Approach To Child Health
HH	Healthy Habits program
FIU	Florida International University
IRB	Institutional Review Board
%FM	Fat Mass Percent
%FFM	Fat Free Mass Percent

## CHAPTER I: INTRODUCTION

### Statement of the Problem

Since the end of the 20<sup>th</sup> century, obesity has escalated globally at an alarming rate, prompting the World Health Organization (WHO) to declare obesity a global epidemic in this century.<sup>1</sup> At the beginning of the Millennium, the world-wide obesity rate was 4.2%; however, by 2010 it reached 6.7%. In 2020, obesity has been predicted to increase to 9.1%.<sup>1</sup>

Paralleling the global growth of obesity, the prevalence of obesity within Arab countries has been increasing, and its growth is accelerating rapidly in the Gulf Cooperation Council (GCC) countries, which are the countries in the region with the highest incomes.<sup>2</sup> Among GCC countries, Kuwait has the highest rate of obesity at 37.8%.<sup>2,3</sup>

The growth of obesity in the Kuwait's adult population mirrors the pediatric population. There is an increased concern that childhood obesity in Kuwait will be a significant risk factor for most chronic diseases later in life, including diabetes, cardiovascular diseases, cancers, as well as neurological diseases.<sup>2</sup> According to the Kuwait Nutrition Surveillance System,<sup>2</sup> the prevalence of obesity in 2011 among 5 to 9-year old boys reached 18.9% and another 14.8% were already overweight. The prevalence of obesity among girls in this age group was 17.3% while 17.3% were overweight. Younger children (<5 years) had an obesity prevalence of 2.5%, while 6.6 % were overweight.<sup>2</sup> However, the potential effect of any type of preventive measures has not been adequately studied in the context of the Gulf countries culture and their political and economic status.<sup>2,3</sup>

International recommendations endorse modifying behavior, involving family, nutrition education, and increasing physical activity are the essential fundamentals to launch a childhood obesity intervention.<sup>4-8</sup> Weight-loss interventions that involve a combination of behavior modification, diet, and physical activity are associated with the most success in obesity interventions.<sup>8</sup>

This study proposed to use an established nutrition intervention with added maternal support and compared this group with those who received the intervention without maternal support and with a comparison group. The analyses compared the pre and post-intervention measures for behavioral and physical results within and in-between groups. This study aims at improving beliefs, attitudes and behaviors towards a healthier diet and weight maintenance in children, and testing the importance of maternal engagement in successful outcomes.

## **Significance of the Study**

### **Childhood obesity is increasing in Kuwait**

Kuwait has 37.8% of its population in the obese range.<sup>2,3</sup> The prevalence of childhood obesity, believed to be a reliable measure of future obesity, is increasing in Kuwait year after year.<sup>2</sup> Although obesity is considered worldwide as one of the most significant risk factors for most chronic diseases,<sup>1</sup> few programs and interventions for preventing or reversing the trends in childhood obesity have been currently implemented in Kuwait.

Childhood obesity interventions that include nutrition education and physical activity sessions have shown to significantly decrease Body Mass Index (BMI)<sup>9-15</sup> and improve health in other parts of the world.<sup>10,16</sup> They have been also shown to increase self-

esteem among obese children,<sup>10,17</sup> to improve nutrition knowledge and health among children and their families,<sup>10,17-21</sup> and to reduce sedentary lifestyle habits; in addition to increase confidence in changing behaviors among obese children.<sup>11,17</sup>

### **Innovation**

This study intervention was innovative as new methodology was employed. Children took pictures of their food before and after they ate their meals by using electronic devices (iPod, iPad or phones). This technique is known as **Photographic Food Record** which provided accurate results in this study, because it involved young children who might not be good historians. Children's fat mass was measured by using Bioelectrical Impedance technique. These technology could be used as an indication that Kuwait and other GCC countries need to develop their own pediatric **Curves Reference for Body Fat percentage**. In the following three studies and hypotheses were tested and results presented as a research paper.

### **Specific Aims and Hypothesis**

#### **CHAPTER IV: EFFECT OF NUTRITION EDUCATION INTERVENTION ON EATING BEHAVIORS AMONG CHILDREN PARTICIPATING IN SUMMER CAMPS IN KUWAIT**

**Specific Aim 1:** To assess the impact of Healthy Habits program (HH) on weight, eating behaviors and attitudes among children age 6-10 years who participated in summer camps.

**Hypotheses:** When Comparing the HH group with a comparison group, after an 8-week intervention, the HH group:

- a. Maintained or decreased body weight compared to their baseline and comparison group.
- b. Decreased skipping breakfast compared with their baseline and comparison group.



- c. Reduced their calorie intake compared with their baseline and comparison group.
- d. Chose more healthy snacks compared with their baseline and comparison group.
- e. Reduced meal portion size compared with their baseline and comparison group

## **CHAPTER V: IMPACT OF NUTRITIONAL EDUCATIONAL INTERVENTION TO CHANGE EATING BEHAVIORS ON PERCENT FAT MASS**

**Specific Aim 2:** To assess the impact of the HH program on body composition including fat mass (FM) and fat free mass (FFM)

**Hypotheses:** When comparing the HH group with a comparison group, after an 8-week program, the HH group:

- a. Reduced fat mass compared with their baseline and comparison group.
- b. Increased fat free mass compared with their baseline and comparison group.

## **CHAPTER VI: IMPACT OF MOTHERS PARTICIPATING IN NUTRITION EDUCATION INTERVENTION OF THEIR CHILDREN EATING BEHAVIOR**

**Specific Aim 3:** To determine whether mothers have an influence on maintaining obese children's body weight and improving their health behavior.

**Hypotheses:** When comparing the influence of mothers participating in the program with unparticipating mothers on their children's behaviors and weight;

- a. Children with maternal support decreased or did not gain more weight compared with their baseline and other children in the HH group.
- b. Children with maternal support had more positive changes on their eating behavior compared with their baseline and other children in the HH group.

**Specific Aim 4:** To evaluate changes in behaviors and attitudes toward food for children and mothers participating in the intervention.

**Hypothesis:** The intervention group (child and mother) had more positive changes in behaviors, attitude, and self-efficacy at the end of the intervention compared to their baseline and comparison group.

**Table 1:** Statistical Analysis of Hypothesis

<b>1<sup>st</sup> Aim:</b> To assess the impact of Healthy Habits program (HH) on weight, eating behaviors and attitudes among children age 6-10 years who participated in summer camps.					
<b>Hypothesis</b>	<b>Independent Variables</b>	<b>Dependent Variables</b>	<b>Outcomes</b>	<b>Statistical Analyses</b>	
<b>When comparing the HH group with a comparison group, after 8 weeks of intervention, the HH group:</b> <b>A.</b> Maintained or Decreased their body weight.	▪ Nutrition education	▪ Body Weight	▪ Decrease in average body weight among children in the HH group compared with control group and baseline	▪ Paired t-test ▪ Independent t t-test	
	<b>B.</b> Decreased skipping breakfast	▪ Nutrition education	▪ Number of skipping breakfast	▪ Decrease in average number of skipping breakfast among children in the HH group compared with control group and baseline	▪ Paired t-test ▪ Independent t t-test
	<b>C.</b> Reduced their calorie intake	▪ Nutrition education	▪ Calories intake	▪ Reduce the average calories intake among children in the HH group compared with control group and baseline	▪ Paired t-test ▪ Independent t t-test
	<b>D.</b> Chose healthy snacks	▪ Nutrition education	▪ Healthy snacks	▪ Decrease proportion number of choosing healthy snacks among children in the HH group compared with control group and baseline	▪ McNemar test ▪ Pearson's Chi-square

E. Reduced meal portion size	▪ Nutrition education	▪ Healthy snacks	▪ Reduce proportion of portion size among children in the HH group compared with control group and baseline	▪ Pearson's Chi-square
------------------------------	-----------------------	------------------	---	------------------------

---

**2<sup>nd</sup> Aim:** To assess the impact of the HH program on body composition including fat mass and fat free mass

---

<b>When comparing the HH group with comparison group, after 8-week program, the HH group:</b>	▪ Nutrition education	• Body fat mass	▪ Decrease in mean of fat mass among children in HH compared with baseline and comparison group	▪ Paired t-test ▪ Independent t-test
---	-----------------------	-----------------	---	---

A. Reduced fat mass

B. Increased fat free mass	▪ Nutrition education	▪ Children fat free mass	▪ Increase in mean fat free mass among children in HH compared with baseline and comparison group	▪ Paired t-test ▪ Independent t-test
----------------------------	-----------------------	--------------------------	---	---

---

**3<sup>rd</sup> Aim:** To determine whether mothers have an influence on maintaining obese children's body weight and improving their health behavior.

---

<b>Comparing the influence of mothers participating in the program with unparticipating mothers on their children's behavior and weight</b>	▪ Mothers support	▪ Children weight	▪ Decrease in mean of the body weight among children with mothers' support compared with children whose mothers do not participate.	▪ Paired t-test ▪ Independent t-test
---	-------------------	-------------------	---	---

A. Obese children did not gain weight

B. Children had more positive changes in their eating behavior including (increasing healthy snacks and , decreasing high calories intake and skipping breakfast.)	▪ Mothers support	▪ Children behavior (No. of healthy snacks, calories intake, No. of skipping breakfast)	▪ Improve of behavior (increasing proportion of healthy snacks and, decreasing mean of high calories intake and reducing mean skipping breakfast) among children whose mothers participate compared	▪ Paired t-test ▪ Independent t-test ▪ McNemar test ▪ Pearson's Chi-square
--	-------------------	---	---	---

with children whose mothers do not participate

---

**4<sup>th</sup> Aim:** To evaluate changes in behaviors and attitudes toward food for overweight children and mother participating in the intervention.

---

The intervention group (child and his mother) had more positive changes in behaviors, attitude, and self-efficacy at the end of the intervention compared to their baseline and comparison group.	<ul style="list-style-type: none"><li>• Nutrition education</li></ul>	<ul style="list-style-type: none"><li>▪ Children's attitude</li><li>▪ Mother's attitude</li></ul>	<ul style="list-style-type: none"><li>▪ Improve in children and mothers attitude compared with baseline and comparison group</li></ul>	<ul style="list-style-type: none"><li>▪ Paired t-test</li><li>▪ Independent t-test</li><li>▪ McNemar test</li><li>▪ Pearson's Chi-square</li></ul>
---	---	---	--	--

---

## References

1. World Health Organization, [www.who.int/news-room/fact-sheets/detail/obesity-and-overweight](http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight)
2. Alhamad N, Alsumaie M, Alanazi F, Aldamani N, Alamir N and Subahkaran M, Kuwait Nutrition Surveillance System, *Ministry of Health*, (2015):1-27.  
<https://www.moh.gov.kw/Renderers/ShowPdf.ashx?Id=aa1caabd-6aea-4dbb-9441-c9768458941d>
3. ALNohair S. Obesity in Gulf Countries. *International Journal of Health Sciences*, (2014); 8(1):79-83.
4. Sacher P, Kolotourou M, Chadwick P, Cole T, Lawson M, Alan Lucas A and Singhal A, Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity, *OBESITY*, (2010); 18(1): S62-S68
5. Gately PJ, Cooke CB, Butterly RJ, Mackreth. P, and Carroll S, The Effects of a Children's Summer Camp Programme on Weight Loss, with a 10 Month Follow-up, *International Journal of Obesity*, (2000); 24(11): 1445-452.
6. Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S, Waters E, Interventions for treating obesity in children, *Cochrane Database of Systematic Review*, (2003); 3: CD001872.
7. Spear BA, Barlow SE, Ervin C, Ludwig DS, Saelen BE, Schetzina KE, Taveras EM, Recommendations for treatment of child and adolescent overweight and obesity, *Pediatrics*, (2007); 120: S254–S288.
8. Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, Summerbell CD, Interventions for treating obesity in children, *Sao Paulo Medical Journal*, (2009); 127(5): 321.
9. Pstein, L. H. & Myers, M. D. Treatment of pediatric obesity. *Pediatrics*, (1998); 101: 554–571.
10. Croker H, Lucas R and Wardle J, Cluster-randomised trial to evaluate the 'Change for Life' mass media/ social marketing campaign in the UK, *BMC Public Health*, (2012); 12:404
11. Whitlock EP, O'Connor EA, Williams SB, Beil TL, Lutz KW, Effectiveness of Weight Management Programs in Children and Adolescents. Evidence Report/Technology Assessment, *Agency for Healthcare Research and Quality*, (2008); 170: 201-308.
12. Choudhry S, McClinton-Powell L, Solomon M, Davis D, Lipton R, Darukhanavala A, Steenes A, Selvaraj K, Gielissen K, Love L, Salahuddin R, Embil F, Huo D, Chin M,

- Quinn M, Burnet D, Power-Up: A Collaborative After-School Program to Prevent Obesity in African American Children, *Prog Community Health Partnersh.* (2011); 5(4): 363–373.
13. Wofford L, Froeber D, Clinton B, Ruchman E, Free afterschool program for at-risk african american children: Findings and lessons, *Family Community Health.* (2013); 36(4): 299-310.
14. Rogers V, Hart P, Motyka E, Rines E, Vine J, and Deatrck D, Impact of Let’s Go! 5-2-1-0: A Community-Based, Multisetting Childhood Obesity Prevention Program, *Journal of Pediatric Psychology,* (2013); 38(9):1010–1020.
15. Hopkins LC, Fristad M, Goodway JD, Eneli I, Holloman C, Kennel JA, Melnyk B, and Gunther C, Camp NERF: Methods of a Theory-based Nutrition Education Recreation and Fitness Program Aimed at Preventing Unhealthy Weight Gain in Underserved Elementary Children during Summer Months, *BMC Public Health,* (2016);16 (1): 1122.
16. Nemet D, Barkan S, Epstein Y, Friedland O, Kowen G, Eliakim A, Short- and long-term beneficial effects of a combined dietary-behavioral-physical activity intervention for the treatment of childhood obesity, *Pediatrics,* (2005);115(4):e443–e449.
17. Eisenmann JC, Alaimo, K., Pfeiffer, K, Paek, H J, Carlson J.J., Hayes H, Thrompson T, Kelleher D, Oh HJ, Orth J, Randall S, Mayfield K, Holmes, D, Project FIT: Rationale, design and baseline characteristics of a school- and community-based intervention to address physical activity and healthy eating among low-income elementary school children, *BMC Public Health,* (2011); 11: 607.
18. McCallum Z, Wake M, Gerner B, Baur L, Gibbons K, Gold Lisa, Gunn J, Naughton G, Riess C, Sancu L, Sheetan J, Ukumunne O, Waters E, Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity, *International Journal of Obesity,*(2007);31(4):630–636.
19. Kalavainen MP, Korppi MO, Nuutinen OM. Clinical efficacy of group- based treatment for childhood obesity compared with routinely given individual counseling. *International Journals of Obesity,* (2007);31(1):1500–1508.
20. Bandura A, Health Promotion by Social Cognitive Means, *Health Education & Behavior,* (2004); 31(2): 143-164.
21. Larsen KT, Huang T, Ried-Larsen M, Andersen LB, Heidemann M, Møller NC, A Multi-Component Day-Camp Weight-Loss Program Is Effective in Reducing BMI in Children after One Year: A Randomized Controlled Trial. *PLoS ONE,* (2016); 11(6): e0157182.

## CHAPTER II: LITERATURE REVIEWS

### **Etiology**

There are many factors that might cause obesity including genetics, illness, lifestyle (behavioral), as well as culture and habits.<sup>1</sup> A study was conducted among three generations of families to assess the relationship between children and parents BMI and children and grandparents BMI. The investigators reported significant correlations between 1) parent and child BMI and sedentary lifestyle, 2) grandparent and child BMI, and 3) grandparent and parent activity with child activity.<sup>2</sup>

A national behavioral Survey (Youth Risk Behavioral Surveillance System) was conducted in 2011 to examine unhealthy risk behaviors that led to morbidity and mortality among youth and adult school students. It showed that 4.8% of students did not consume fruits, 5.7% did not eat vegetables, and, 31% of them spend 3 or more hours a day on video games on average school days.<sup>3</sup>

Furthermore, not all cultural and lifestyle factors have positive influences on an individual's health.<sup>1,4</sup> A cross-sectional study was conducted among secondary school children in Kuwait. It reported that most students did not only skipped breakfast but also did not consume milk, milk products, fruits and vegetables. Girls had more sedentary activities than boys, as it was part of the culture that they did not do exercises. Also, both genders consumed high sugar drinks more than 3 times a week. The reason for these new obesogenic behaviors was the fast economic growth in Kuwait that has changed Kuwaiti habits and lifestyle.<sup>4</sup>



## **Childhood Obesity and Behavior Modification**

Weight-loss interventions that involve a combination of behavior modification, diet, and physical activity are associated with the most success in obesity interventions.<sup>5</sup> A variety of programs in the literature review have been developed and conducted to change undesirable behaviors and educate children in healthy habits that may influence the outcomes of obesity, but only a few have demonstrated significant weight reduction. Although, most of these programs showed positive behavioral changes. These programs used different models and theories to change children's behaviors.<sup>5-11</sup> For instance, Social Cognitive Behavior Theory (SCBT),<sup>12</sup> which states that the acts (behaviors) are affected by environment, other actors and events. People, especially children, who are watching behavioral models such as parents, TV characters, teachers or friends who are performing certain types of behavior are likely to learn and repeat this behavior.<sup>12</sup> Also, observing a role model can work as a stimulus for copying a behavior. For example, children will remember a series of things they have observed and use this information as a reference for their own behaviors.<sup>8</sup> This theory was applied in Mind, Exercise, Nutrition, Do it (MEND)<sup>5</sup> and other programs that showed some effective results in weight reduction or changing behavior.<sup>5,10,13</sup>

The Mind, Exercise, Nutrition Do it (MEND) program is a healthy lifestyle program integrated nutritional and physical activity learning, based on social cognitive theories. It included 18 sessions in 9 weeks. The sessions consisted of changing behavior sessions, nutrition education, physical activity sessions and a closing session. After the 9 weeks of sessions, parents gained free access to the community swimming pool for 12 weeks. The program recruited 117 obese children aged 8-12 years. Investigators tested

several measurements of adiposity, including waist circumference, BMI, and body composition. They reported significant decrease in BMI z-score after nutritional education and a physical activity program that lasted for 6 months and followed post-intervention for 12 months. Significant results were also observed in cardiac muscle's fitness, inactive lifestyle, and self-esteem.<sup>5</sup> Several interventions with similar designs have also shown significant results in changing behavior, decreasing BMI and increasing physical activities.<sup>14-17</sup> Among these examples are an 8-week camp that used social cognitive theory to decrease body mass index among 194 participants ages 9-14 years. It consisted of lessons developed for changing behavior using Cognitive Behavioral Theory (CBT), nutrition sessions and a physical activity program. Results indicated significant reduction in body mass index. However, after 10 months of intervention, the investigators observed a regain in BMI of 14%.<sup>18</sup>

In another study called the "Power Up", the investigators adopted a conceptual model that included beliefs, social, environmental, and community factors to change behavior. The program aimed to assess the effect of Power-Up on decreasing obesity among 40 African American children ages 5 to 12 years. The program included 14 sessions of nutrition education and physical activity to change the children's behaviors. They measured BMI, blood pressure and dietary behavior using the Harvard Children's Nutrition Questionnaire.<sup>16</sup> The investigators reported significant decrease in weight among overweight children (BMI z-scores), and the decrease from 1.05 to 0.81 ( $P < 0.0001$ ). The study also showed successful results in changing attitude. Important changes in attitudes were observed in post-intervention questionnaire scores as they were higher compared to baseline, for example, responses of children to "eat more foods that are good for you" had

significantly higher scores than baseline (77% to 90%;  $P=0.027$ ). Assessing the physical activity by “try more things like running or playing sports every day” showed improvement (77% to 85%;  $P=0.030$ ). Also, “try some new sports” that reflected changes in physical activity was reported to have significant improvement. (80% to 88%;  $p = .007$ ) after intervention.<sup>6</sup> Although there were effective results, many of the children quit the program, probably due to low parental engagement in the program activities. On the other hand, intervention conducted in 12 weeks and recruited children aged 6-11 years old. It was focusing on increasing fruit and vegetable intake, decreasing sugary beverage intakes, increasing drinking water, and increasing level of physical activity. The results showed improved knowledge about healthy behaviors with increased levels of activity. It also noted reduction in sweetened beverages consumption. However, no differences in BMI were observed.<sup>19</sup>

In summary, most programs in the literature used psychological therapeutic process that showed behavioral changes<sup>5,6,10</sup> The programs, however, were difficult to compare due to limited details, dissimilar measurements, low generalizability because of methodological issues or differences in the system and environmental approach such as using schools, summer camps or clinics. In addition, only few interventions showed significant results in weight reduction.<sup>5,9,20</sup>

### **Childhood Obesity and Family Support**

Several studies found that parents’ behaviors influence their children’s weight, diet, sugar intake and adapting physical activity lifestyle.<sup>8,21,22</sup> It was found that parents have a role in children’s behavior, because children tend to mimic their parents.<sup>8,21,22</sup> In the

development of the social-cognitive theory, it was assumed that if children join their parents and use them as role-models for selecting healthy meals and performing physical activity, this will affect their behaviors positively.<sup>8</sup> Therefore, parents should be participating directly or indirectly in behavioral modification interventions to be successful long-term.<sup>10</sup> Several programs involve parents as a fundamental element to change children's behavior and decrease their weight.<sup>5,6,10</sup> Some of the examples of these programs are: MEND, LET'S GO, Change 4 Life, Nutrition Education Recreation Fitness (NERF), The Day Camp Intervention Arm (DCIA) and Coordinated Approach To Child Health (CATCH).<sup>5,7, 9,11,13</sup>

The LET'S GO program involved child's family to reinforce desirable healthy behaviors such as consuming more fruits and vegetables among their children. It aimed to assess the effect of exposing families and their children to messages about healthy behaviors in multiple settings. Investigators motivated children and their families to increase drinking water and physical activity, to cook and eat healthy by adding more fruits, vegetables to their meals, and to incorporate low-cost food, including canned and frozen food in a healthy way. They measured the changes through the Youth Risk Behavior Survey Questionnaire.<sup>23</sup> Key findings were: (1) the child's family knowledge about healthy lifestyle improved significantly from 10% to 47% knowledge, (2) children reported an increase in fruits and vegetables intake with decreasing sugary drinks, and (3) other positive changes in healthy behaviors were reported.<sup>9</sup> Similar observations were presented in a report of a 12-week intervention that included 101 obese and overweight children and their families. It aimed to enhance parental skills and confidence in controlling children's eating and activity behavior. Also, it aimed to improve a healthy lifestyle in their family.

The results were a significant decrease in child's BMI z-score and changes in their eating and activity behaviors. In addition, the intervention increased parent's confidence and satisfaction in controlling children's behavior.<sup>24</sup>

DCIA was a 6-week summer camp that assessed the impact of a multicomponent day-camp weight-reduction intervention conducted among 55 overweight and obese children that also involved their family in the process. DCIA included nutrition and physical activity sessions. The camp provided three meals and snacks during the day without caloric restriction and trained the participants on maintaining records of their food intake. Families had nutrition education sessions and meetings to choose topics and discussed them. Children were compared with other children participating in the Standard Intervention Arm (SIA). In SIA, children had one physical activity class per week and the parents had only one health and lifestyle educational session during 6-week intervention. Although both interventions included physical activity and education sessions, the differences were the number and type of sessions. Also, there were no food intake records for SIA. The outcomes showed DCIA children had significantly decreased BMI z-score after 6 weeks (-2.2 kg/m<sup>2</sup>) compared with SIA. Also, BMI z-score decreased significantly after 52 weeks (-1.2 kg/m<sup>2</sup>) without reported changes in body composition. Comparing cardiovascular risk between both interventions showed a decrease in z-score in the longer intervention group (-0.23 (95% CI -0.37 to -0.08)). Although the study demonstrated a positive impact of involving families in the intervention on reduction of BMI and improving health of children with overweight and obesity, the effects decreased with time.<sup>11</sup> Another study assessed the effect of a parental education program on the weight control of overweight children after a follow-up of 3 months. The program enrolled 43

children ages 3-11 years and their families. The family received 2-hour sessions for 4 days per week with a comprehensive parent treatment manual. The results of this structured program showed significant decrease in children's BMI and energy consumption. Comparing with the baseline, children's activity level increased slightly. However, there were no differences in parents' BMI. Also, there were no changes in child's sedentary lifestyle and waist circumference.<sup>25</sup>

The Change 4 Life program focused on a family intervention to modify their children's behavior. It aimed to motivate their participants to develop healthier eating habits and reduce sedentary time through many stages. Investigators started by changing the concept of obesity among participants, by changing how they looked to potential health problem. Then, parents were given a 'family information pack' which including 8 goals to change children's eating behavior such as decreasing fat and sugar intake. The control group was given basic healthy lifestyle messages including national healthy eating guidelines and '5-a-day' messages. The intervention increased awareness among parents and their children from 75% at baseline for both groups (96% in the intervention group and 87% the control group). Investigators also demonstrated that including parents as role model significantly influenced children's attitude toward physical activity.<sup>7</sup> Although the program demonstrated effectiveness in increasing awareness, it did not report significant changes in eating behaviors.

Kim et al.<sup>26</sup> conducted a randomized control trial that assessed parents' participation in a childhood obesity intervention to control children's weight-related behavior and to enhance children and parent relationships; 42 parents of overweight/obese children aged 7 to 11 years were enrolled in the intervention group and provided with news-

letters and text messages for 5 weeks. Children in both the intervention and control groups received nutrition education with a physical activity program. The Child-Parent Relationship Score (CPRS)<sup>27</sup> and Lifestyle behavior checklist (LBC)<sup>28</sup> were used to assess the effect of parents' participation. Investigators found that the children's dietary self-efficacy significantly improved in the intervention group. Also, CPRS and LBC tests showed high score among the parents in the intervention group, which indicated better child-parent relationship and greater parental control.<sup>26</sup>

In summary, the evidence showed that parents' engagement is essential for the success of obesity prevention strategies. Lack of parental engagement as a component of an intervention will decrease effectiveness of potential intervention and long-term sustainability its effect, therefore, our planned intervention was engage not only the children in the camp but also their parents.

### **Childhood Obesity and Summer Camps**

Most obese children during summer vacation may gain even more weight, because they practice a sedentary lifestyle: watching TV, playing video games and eating without time restrictions.<sup>10,11</sup> To overcome this problem, it is important to provide social support by integrating physical activities such as summer camps to influence children's behaviors.<sup>11,29</sup> One intervention was Kamp K'aana, a residential weight management program for 108 children with BMI >95th percentile. Kamp K'aana was a two-week multi-setting program that consisted of physical activity, nutrition education, and behavior changing sessions. Dietitians provided healthier meal options with 1800 kcal/day, which met the Recommended Daily Allowances.<sup>30</sup> Investigators calculated BMI with z-score pre-

and post- intervention and after 11 months as a follow up. They found that children after the 2-week stay at Kamp K'aana camp had significantly decreased their body weight (85.0 kg  $\pm$ 18.6 kg to 81.4 kg  $\pm$ 17.9 kg,) with significant reduction in BMI (33.6  $\pm$ 5.8 kg/m<sup>2</sup> to 32.3  $\pm$ 5.8 kg/m<sup>2</sup>) and BMI z-score too (2.34  $\pm$ 0.30 to 2.24  $\pm$  0.34). In addition, when comparing post camp with long-term measures, the investigator found small mean reductions in BMI percentile and BMI z-score. However, weight and BMI increased significantly after 11 months of follow-up for 66% of children.<sup>30</sup> The weight gain was expected, because children were growing and many metabolic changes were taking place, but as growth set in, BMI was not expected to change, which demonstrated high weight gains that were not balanced by growth. In addition, the intervention in the camp was just too short to achieve long-term changes in behavior.<sup>30</sup>

Similar observations were presented in a study aimed to assess the impact of 10 weeks weigh reduction in summer camp for obese children. It also evaluated the prevalence and degree of Non-Alcoholic Fatty Liver Diseases (NAFLD) and insulin sensitivity after a12-month follow-up; 117 obese children were provided daily 3 healthy meals with 3 healthy snacks daily. In addition, children were offered small pieces of candy once a week. Dietitian calculated the caloric requirements for each child. Healthy lifestyle sessions with nutrition education and physical activity sessions were provided. Anthropometrics, blood pressure and body composition were measured. Liver enzymes, lipid profile, fasting glucose and insulin were measured, and a 2-hour oral glucose tolerance curve was assessed. Key finding were: 1) significant weight loss of 7.1 $\pm$  2.7 kg during the camp stay, 2) children's liver echogenicity score related significantly to the child's body fat component



at baseline, 3) there was no increase in fatty liver fibrosis after 12 months follow up and 24% of the children maintained their body weight. In conclusion, behavior modification, diet, and exercise programs work effectively for both normal and sick children.<sup>31</sup>

Another camp study in Shanghai included a behavior modification program that was aimed to test the impact of several nutrition and physical activity sessions that were focused on behavior, body composition and metabolic factors in obese and overweight children and adolescents. Investigators enrolled 20 children and adolescents aged 7-17 years in a 4-week summer camp. Their results showed a significant weight reduction of  $7.2 \pm 2.2$  kg, with fat mass losses of  $5.5 \pm 2.2$  kg. In addition, the investigators reported abdominal and hip fat losses that were associated with decreased waist/hip circumference ratio and blood pressure. There were significant decreases in total cholesterol, triglycerides, LDL cholesterol, HbA1C, insulin, C-Peptide and insulin resistance (HOMA-IR) and the ratio of fatty liver. However, no significant differences in Resting Energy Expenditure (REE) were observed.<sup>32</sup>

In addition, Seal et al.<sup>33</sup> conducted a research at the Wellness Summer Camp (WSC) to assess a short-term intervention on children's eating behavior, knowledge and physical activity. Eighteen children ages 8-12 years were participating in 10-day WSC program that included nutrition education and physical activity sessions. Investigators used age-appropriate developmental theory,<sup>34,35</sup> which consisted of healthy behavior developmental skills and reinforcement of effective behavior choices and action patterns. They reported significantly increased awareness of healthy foods and healthy snacks. It also reported increased healthy eating behaviors and self-perception scores. There was a slightly increased physical activity score.<sup>33</sup>

A study conducted at Camp Jump Start compared a 4-week with an 8-week program that were aimed to decrease weight among 74 overweight and obese children ages 9-18 years. The programs were comprised of physical activities and self-esteem sessions. It also included nutrition education that included a diet plan for 3 meals and 2 snacks. The results indicated a significant BMI and blood pressure reduction in 8 weeks compared with the 4-week program.<sup>36</sup>

Another camp included 13 participants ages 13 to 18 years who were visiting the Hershey Medical Center's Divisions of Pediatric Endocrinology and Pediatric Weight Management for 4 months before the summer camp. It was multi-component intervention, which included nutrition education group sessions about healthy eating. Dietitians provided restricted calorie meals with 1800 kcal/day. Physical activities such as swimming, team sports, hiking, canoeing, and archery were included for one to three hours a day. Changing behavior sessions were also included in the camp with weekly visit by a psychologist. The study reported weight and BMI z-score reduction by 9.1% ( $40.2 \pm 13.0$  kg/m<sup>2</sup> vs.  $36.5 \pm 12.0$  kg/m<sup>2</sup>). Waist circumference was reduced by 7.4% ( $48.4 \pm 9.6$  cm vs.  $44.9 \pm 9.4$  cm). Investigators also measured fasting glucose and reported levels decreased by 23.1% (84 mg/dL vs. 62 mg/dL) compared to pre-intervention.<sup>37</sup>

### **Childhood Obesity and Type of Food**

Body weight is significantly affected by the type of foods. Therefore, the type of foods that are provided to children should be observed. Five national surveys had been conducted from 1989 to 2008 to assess food intake, they reported significantly increased intake of high added sugars foods, solid fats and sodium in the diets of children ages 2 to

6 years. They also found significant increase of energy by 109 kcal of total energy intake daily.<sup>38</sup>

A cohort analysis was applied on a longitudinal study conducted in the United Kingdom among parents and children ages 7–13 years. The study lasted 3 years to explore the associations between specific food and beverage intake and extra weight gain. The results provided evidence that there were significant positive associations between butter, breaded chicken, French fried, potato chips, processed meats, coated fish, sugar-sweetened beverages, sweets and extra weight gain. On the other hand, whole grains and high-fiber cereals were associated with weight loss.<sup>39</sup>

Another study was conducted among 8 to 10-year old children to assess the relationship between type and amount of the snack that was consumed and body weight. They reported that obese and overweight children had high energy and sugar snack more than normal weight children. However, there was no significant relationship between number of snacks and body weight.<sup>40</sup>

High quality food should be provided for children's diets because that might help in decreasing children body weight.<sup>40</sup> Also, healthy snack between meals would be effective in reducing childhood obesity.<sup>41</sup>

### **Childhood Obesity and Body Composition**

Food has a role in the body physiology including fat distribution in the body.<sup>42</sup> Children who gained much weight early will be at risk to develop obesity later.<sup>43</sup> A randomized controlled trial (RCT) was conducted among 170 overweight and obese children, ages 7 to 11 years who were recruited for a family-based behavioral weight loss treatment (FBT) that lasted 16 weeks. The aim was to assess the effectiveness of improving

diet quality, which included decreasing energy intake, sugar and fat and added fiber. The collected child's anthropometrics included z- BMI score and fat mass after treatment. Significant decrease in z-BMI and fat mass with improving diet quality were observed.<sup>44</sup>

Another study was conducted among 53 infants to mid-childhood to assess the changes on the body composition on the growth of overweight/obesity. Their weight, fat mass and lean mass were measured three times during their development by total body electrical conductivity. They estimated that increased body weight in early age led to mid-childhood overweight/obesity. Increased fat mass was more related to this conclusion than lean mass.<sup>43</sup>

### **Childhood Obesity and Portion Size**

Bigger portion size of food provides more calories.<sup>45</sup> There are some evidence that portion size increases appetite also.<sup>45,46</sup> A study was conducted to assess the relationship between portion size and appetite with obesity. They observed significant increased total energy intake and satiety by increasing portion size. However, increasing body weight was not significant.<sup>45</sup> Another study aimed to prevent pediatric obesity by changing portion size, eating rate and dietary habits. They found significant reduction in BMI Standard Deviation Score. They also observed significant association between portion size and BMI SDS reduction.<sup>47</sup>

In conclusion, moderating portion size and reducing energy density were effective to decrease childhood obesity.<sup>47,48</sup>

### **Childhood Obesity and Skipping Breakfast**

Consuming breakfast has a role in healthy lifestyle. Therefore, skipping breakfast is strongly associated with increased risk of childhood overweight/obesity.<sup>49</sup> An

Australian survey was conducted among children ages 5–16 years. They measured body mass index (BMI; kg/m<sup>2</sup> per age) and waist-to-height ratio (WHtR; waist circumference/height). Eating and screen time behaviors were measured too by using self-reported questionnaire. They concluded that promoting having breakfast decreases prevalence of childhood obesity.<sup>50</sup>

Another study aimed to examine the relationship between having breakfast and adiposity among adolescents. They interviewed the children face to face to collect their breakfast intake and other behavioral intake. Then, they divided them into two groups; skipping breakfast vs. nonskipping breakfast. After a year, they found that participants who ate their breakfast reduced body fat.<sup>51</sup> One more longitudinal observational study of middle school students was conducted to explore the association between breakfast patterns and weight status over time among preadolescents. Students were recruited from 12 randomly selected schools in urban school district, they filled questionnaire and completed physical measurements. The study showed that students who had breakfasts at school were more likely to have a healthy weight trajectory.<sup>52</sup>

A cross-sectional study showed that skipping breakfast has an indirect role in increasing BMI. The study was conducted in Greece among 2655 schoolchildren age 9–13 years. It was aimed to explore the association of consuming late dinner with skipping breakfast and obesity. They found that late night overeating was associated with skipping breakfast, which decreased the level of children activity and raised the risk of increasing BMI.<sup>53</sup>

Previous studies showed the negative effect of skipping breakfast on body weight.<sup>49-53</sup> Skipping breakfast was inversely associated with cognitive performance, nutritional adequacy, and bone and cardiovascular health.<sup>52</sup>

### **CATCH Program**

The Coordinated Approach To Child Health program focuses on preventing childhood obesity among school-age children.<sup>54</sup> This program is approved as the “Whole School, Whole Community, Whole Child” (WSCC) model. It is a multi-component program to improve children’s health. CATCH is designed to modify children’s behaviors including eating behaviors and physical activities. It is proven that CATCH improved children knowledge and behaviors significantly and decreased childhood obesity.<sup>54</sup> In a quasi-experimental design study that was conducted in Texas among 4 El Paso CATCH schools and El Paso 4 elementary control schools with 896 third-grade children, the CATCH curriculum was implemented in the intervention schools. In conclusion, the prevalence of overweight and obesity decreased among girls and boys in the CATCH schools, however; it increased in the control schools.<sup>55</sup>

The Farm to School program implemented the CATCH curriculum to improve nutrition knowledge and fruit and vegetables intake behavior. Sixty-five 3<sup>rd</sup> grade children were participating in the study. They received two nutrition education sessions and a farm tour. They found that the children’s knowledge was significantly improved. The intake of vegetables was also significantly improved.<sup>56</sup>

CATCH was also implemented using a randomized control design to assess the impact of the combined behavioral intervention with food services modifications and physical education. Third to fifth grade children participated from 56 schools located in

four states: California, Louisiana, Minnesota and Texas. The study showed that energy intake from fat was significantly reduced. Students also reported increasing physical activities.<sup>57</sup> In conclusion, CATCH is one of the most successful programs for improving healthy behaviors and increasing physical activities.

### **Kuwaiti Lifestyles**

After discovering oil in GCC countries specially in Kuwait, culture and lifestyles have been dramatically changed.<sup>58</sup> Urbanization have affected the type of food consumed, since people have had access to international cuisines and fast food restaurants which are high in fat and calories. The newly found wealth has made cars more available; therefore, life has become more sedentary and walking decreased, which until recently, it was an important part of physical activities.<sup>58</sup> Many low-cost laborers, usually imported from other countries, do most of house chores.<sup>59</sup> Poor health education and lack of nutrition knowledge also has played a role in the growth of obesity.<sup>58</sup> Hot weather in this area forces people to stay indoors longer, so they miss the chances to do physical activities.

### **Summary**

In summary, the reports from the studies in camps and other pediatric programs were different in age ranges, elements in the interventions and support systems. Even when some of them were short-term, and results were reversed with time, in general, they supported positive outcomes in weight reduction and behavioral modifications. Programs targeting obese children from 6 to 10 years of age using family support, specifically mothers, are scarce in Kuwait. Therefore, our program was aimed to control childhood obesity among Kuwaiti children and to increase the awareness of this growing problem among their families. Based on the literature, we developed an evidence-based program

that included behavior modification techniques based on the Social Cognitive Behavioral Theory. This program was based on the principles of the CATCH program. The program was modified to respond to Kuwait's culture and set of beliefs. It included a unique nutrition education curriculum that was age-appropriate. The camps, where the study was conducted, offered a physical activity program as part of aftercare program or with the summer camps. Our program also promoted parental engagement by providing parents with educational sessions in healthy lifestyle and nutritional education materials.<sup>44</sup> Similar programs have shown effective results in reducing weight, improving eating behavior, increasing physical activity and awareness among children and their families in other cultures.<sup>13,54,60</sup>

This program focused on assessing changes in lifestyle factors, which included diet and parented support in changing behavior, and their impact on childhood obesity in the setting of a summer camp. The findings from this study might be helpful in developing effective strategies for changing undesirable behaviors to ameliorate or reverse growing problem of childhood obesity.<sup>5,6,11,13,30,54,60</sup>



## References

1. Pulgaron ER, Delamater AM, Obesity and type 2 diabetes in children: Epidemiology and treatment, *Current Diabetes Reports*, (2014); 14(8): 508-14.
2. Polley DC, Spicer MT, Knight AP, Hartley BL, Intrafamilial correlates of overweight and obesity in african-american and native-american grandparents, parents, and children in rural Oklahoma, *Journal of American Diet Association*, (2005); 105(2): 262-265.
3. Eaton DK, Kann L, Kinchen S, Shanklin S, Flint K H, Hawkins J, Harris W A, Lowry R, McManus T, Chyen D, Whittle L, Lim C, Wechsler H, Youth risk behavior surveillance - united states, 2011, *MMWR Surveillance Summary*, (2012); 61(4):151-162.
4. Allafi A, Alfayes M, Alathari B, Alajmi F, Alhazza H, Musagir A, Ahmed F. Physical activity, sedentary behaviours, dietary habits among Kuwaiti adolescence, *Public Health Nutrition*, (2014); 17: 2045-2052.
5. Sacher P, Kolotourou M, Chadwick P, Cole T, Lawson M, Alan Lucas A and Singhal A, Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity, *OBESITY*, (2010); 18(1): S62-S68.
6. Choudhry S, McClinton-Powell L, Solomon M, Davis D, Lipton R, Darukhanavala A, Steenes A ,Selvaraj K, Gielissen K, Love L, Salahuddin R, Embil F, Huo D, Chin M, Quinn M, and Burnet D, Power-Up: A Collaborative After-School Program to Prevent Obesity in African American Children, *Progress Community Health Partnersh*, (2011); 5(4): 363–373.
7. Croker H, Lucas R and Wardle J, Cluster-randomised trial to evaluate the ‘Change for Life’ mass media/ social marketing campaign in the UK, *BMC Public Health* (2012); 12: 404.
8. Eisenmann J C, Alaimo K, Pfeiffer K, Paek H.-J, Carlson J J, Hayes H., Thompson T, Kelleher D, Oh H J, Orth J, Randall S, Mayfield K, Holmes D, Project FIT: Rationale, design and baseline characteristics of a school- and community-based intervention to address physical activity and healthy eating among low-income elementary school children. *BMC Public Health*, (2011); 11: 607.
9. Rogers V, Hart P, Motyka E, Rines E, Vine J, and Deatrck D, Impact of Let’s Go! 5-2-1-0: A Community-Based, Multisetting Childhood Obesity Prevention Program, *Journal of Pediatric Psychology*, (2013); 38(9): 1010–1020.
10. Hopkins, L C, Fristad M, Goodway J, Eneli I, Holloman C, Kennel K A, Melnyk B M, Gunther C, Camp NERF: Methods of a Theory-based Nutrition Education Recreation and Fitness Program Aimed at Preventing Unhealthy Weight Gain in Underserved Elementary Children during Summer Months, *BMC Public Health* (2016); 16: 1122.

11. Larsen KT, Huang T, Ried-Larsen M, Andersen LB, Heidemann M, Møller NC, A Multi-Component Day-Camp Weight-Loss Program Is Effective in Reducing BMI in Children after One Year: A Randomized Controlled Trial. *PLoS ONE*, (2016); 11(6): e0157182.
12. Bandura A, Health Promotion by Social Cognitive Means, *Health Education & Behavior*, (2004); 31(2): 143-164.
13. Evans A, Ranjit N, Hoelscher D, Jovanovic C, Lopez M, McIntosh A, Ory M, Whittlesey L, Mckyer L, Kirk A, Smith C, Walton C, Heredia NI, Warren J, Impact of school-based vegetable garden and physical activity coordinated health interventions on weight status and weight-related behaviors of ethnically diverse, low-income students: Study design and baseline data of the Texas, Grow! Eat! Go! (TGEG) cluster-randomized controlled trial, *BMC Public Health*, (2016); 16(1): 973.
14. McCallum Z, Wake M, Gerner B, Baur L, Gibbons K, Gold Lisa, Gunn J, Naughton G, Riess C, Sanci L, Sheetan J, Ukumunne O, Waters E, Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity, *International Journal of Obesity*, (2007); 31(4): 630–636.
15. Nemet D, Barkan S, Epstein Y, Friedland O, Kowen G, Eliakim A, Short- and long-term beneficial effects of a combined dietary-behavioral-physical activity intervention for the treatment of childhood obesity, *Pediatrics*, (2005); 115(4): e443–e449.
16. Reinehr T, de Sousa G, Toschke AM, Andler W. Long-term follow-up of cardiovascular disease risk factors in children after an obesity intervention, *American Journal Clinical Nutrition*, (2006); 84(3): 490–496.
17. Kalavainen MP, Korppi MO, Nuutinen OM. Clinical efficacy of group-based treatment for childhood obesity compared with routinely given individual counseling, *International Journal of Obesity*, (2007); 31(10): 1500–1508.
18. Gately P J, Cooke C B, Butterly R J, Mackreth P, Carroll S, The Effects of a Children's Summer Camp Programme on Weight Loss, with a 10 Month Follow-up, *International Journal of Obesity*, (2000); 24(11): 1445-1452.
19. Wofford L, Froeber D, Clinton B, Ruchman E, Free afterschool program for at-risk african american children: Findings and lessons, *Family Community Health*. (2013); 36(4): 299-310.
20. Whitlock EP, O'Connor EA, Williams SB, Beil TL, Lutz KW. Effectiveness of Weight Management Programs in Children and Adolescents, *Evidence Report/Technology Assessment*, (2008): 290-302.
21. Bois, J E, Sarrazin, P G, Brustad, R J, Trouilloud, D O, Cury, F, Elementary

schoolchildren's perceived competence and physical activity involvement: The influence of parents' role modelling behaviours and perceptions of their child's competence, *Psychology of Sports and Exercise*, (2005); 4(6): 381- 397.

22. Cohen DA, Finch BK, Bower A, Sastry N, Collective efficacy and obesity: The potential influence of social factors on health, *Social Science & Medicine*, (2006); 62(3): 769-778.

23. Centers for Disease Control and Prevention, Youth Risk Behavior Survey Questionnaire, (2007): Retrieved from [www.cdc.gov/yrbs](http://www.cdc.gov/yrbs)..

24. West, Felicity, Matthew R. Sanders, Geoffrey J. Cleghorn, Peter S.w. Davies, Randomised Clinical Trial of a Family-based Lifestyle Intervention for Childhood Obesity Involving Parents as the Exclusive Agents of Change, *Behaviour Research and Therapy*, (2010); 48(12): 1170-1179.

25. Shelton, Doug, Kim Le Gros, Lyza Norton, Sue Stanton-Cook, Jane Morgan, and Paul Masterman, Randomised Controlled Trial: A Parent-based Group Education Programme for Overweight Children, *Journal of Paediatrics and Child Health*, (2007); 43(12): 799-805.

26. Kim, Hee Soon, Jiyoung Park, Kye-Yeong Park, Myung-Nam Lee, and Ok Kyung Ham, Parent Involvement Intervention in Developing Weight Management Skills for Both Parents and Overweight/Obese Children, *Asian Nursing Research*, (2016); 10(1): 11-17.

27. Driscoll K, Pianta R C, Mothers' and fathers' perception of conflicts and closeness in parent-child relationships during early childhood, *Journal of Early Child Infant Psychology*, (2011); 7: 1-24.

28. West F, Sanders M, Cleghorn G J, Davies PS, Randomized clinical trial of a family-based lifestyle intervention for childhood obesity involving parents as the exclusive agents of change, *Behaviour Research and Therapy*, (2010); 48 (12): 1170-1179.

29. Li X, Zhou X, Hesketh, T, Experiences and perspectives of children attending a weight loss camp in China: A qualitative study. *Child: Care, Health and Development*, (2016); 42(5):644-651.

30. Farhat A E, Sharma S, Abrams S H, Wong W W, Barlow S E, Kamp K'aana, a 2-Week Residential Weight Management Summer Camp, Shows Long-Term Improvement in Body Mass Index z-Scores, *Journal of Pediatric Gastroenterology and Nutrition*, (2016); 62(3):491-494.

31. Grønbaek H, Lange A, Birkebæk N H, Holland-Fischer P, Solvig J, Hørlyck A, Vilstrup H, Effect of a 10-week Weight Loss Camp on Fatty Liver Disease and Insulin Sensitivity in Obese Danish Children, *Journal of Pediatric Gastroenterology and Nutrition*, (2012); 54(2): 223-228.
32. Qingya Tang, Huijuan Ruan, Yexuan Tao, Xiaofei Zheng, Xiuhua Shen, Wei Cai, Effects of a summer program for weight management in obese children and adolescents in Shanghai, *Asia Pacific Journal of Clinical Nutrition*, 2014;23(3):459-464
33. Seal N, Seal J, Developing healthy childhood behaviour: Outcomes of a summer camp experience, *International Journal of Nursing Practice*, (2011); 17(4): 428–434
34. Piaget J, The Origins of Intelligence in Children, *New York: International Universities Press, Inc.*, (1952).
35. Piaget J, The Moral Judgment of the Child, *New York: Free Press*, (1965).
36. Huelsing J, Kanafani N, Mao J, White N H, Camp Jump Start: Effects of a Residential Summer Weight-Loss Camp for Older Children and Adolescents, *Pediatrics*, (2010); 125(4): 84-890.
37. Wong W W, Barlow S E, Mikhail C, Wilson T A, Hernandez P M, Shypailo R J, Abrams S H, A Residential Summer Camp Can Reduce Body Fat and Improve Health-related Quality of Life in Obese Children, *Journal of Pediatric Gastroenterology and Nutrition*, (2013); 56(1): 83-85.
38. Ford CN, Slining MM, Popkin BM, Trends in dietary intake among US 2- to 6-year-old children, 1989-2008. *Journal of the Academy of Nutrition and Dietetics*, (2013);113(1): 35-42.
39. Dong D, Bilger M, Van Dam R, Finkelstein E, Consumption Of Specific Foods And Beverages And Excess Weight Gain Among Children And Adolescents, *Health Affairs*, (2015); 34(11): 1940-1948.
40. Maffeis C, Grezzani A, Perrone L, Del Giudice EM, Saggese G, Tatò L, Could the savory taste of snacks be a further risk factor for overweight in children? *Journal of Pediatric Gastroenterology and Nutrition*, (2008); 46(4): 429-437.
41. US Department of Agriculture, Snacks: Percentage of selected nutrients contributed by food and beverages consumed at snack occasions, by gender and age, What we eat in America, NHANES 2013-2014, *Agricultural Research Service*, (2016); 1-5  
[https://www.ars.usda.gov/ARSUserFiles/80400530/pdf/1314/Table\\_1\\_NIN\\_GEN\\_13.pdf](https://www.ars.usda.gov/ARSUserFiles/80400530/pdf/1314/Table_1_NIN_GEN_13.pdf)
42. Feambach N, English L, Lasschujit M, Wilson S, Savage J, Fisher J, Rolls B, Keller K, Brain response to images of food varying in energy density is associated with body

composition in 7- to 10-year-old children: Results of an exploratory study, *ELSEVIER*, (2016); 162(1): 3-9.

43. Koontz MB, Gunzler DD, Presley L, Catalano PM, Longitudinal changes in infant body composition: association with childhood obesity, *Pediatric obesity*, (2014); 9(6):141-144.

44. Altman M, Holland JC, Lundeen D, et al. Reduction in food away from home is associated with improved child relative weight and body composition outcomes and this relation is mediated by changes in diet quality. *Journal of the Academy of Nutrition and Dietetics*, (2015); 115(9): 1400-1407.

45. Brich L, Savage J, Fisher O, Right sizing prevention, food portion size effect on children's eating and weight, *Appetite*, Vol: 88, (2015):11-16

46. Mooreville M, Dsvey A, Orloski A, Hannah E, Mathias K, Brich L, Karl, T, Zakeria I, Fisher J, Individual differences in susceptibility to large portion sizes among obese and normal weight children, *Pediatric Obesity*,(2015); 23(4): 808-814.

47. Torbahn G, Gellhaus I, Koch B, Von Kries R, Obermeier V, Holl R W, Frink K, Van Egmond-Frolich A, Reduction of Portion Size and Eating Rate Is Associated with BMI-SDS Reduction in Overweight and Obese Children and Adolescents: Results on Eating and Nutrition Behaviour from the Observational KgAS Study, *Obesity Facts*, (2017);10(5):503-516.

48. Kling SMR, Roe LS, Keller KL, Rolls BJ, Double trouble: Portion size and energy density combine to increase preschool children's lunch intake, *Physiology & behavior*, (2016); 162: 18-26.

49. Okada C, Tabuchi T and Iso H, Association between skipping breakfast in parents and children and childhood overweight/obesity among children: a nationwide 10.5-year prospective study in Japan, *International Journal of Obesity*, (2018); 42(10):1724–1732.

50. Mhrshali S, Dryton B, Bauman A and Hardy L, Associations between childhood overweight, obesity, abdominal obesity and obesogenic behaviors and practices in Australian homes, *BMC Public Health*, (2017); 17(1): 736.

51. Cyres S, Urban J, Fernandes R, Physical Activity and Skipping Breakfast Have Independent Effects on Body Fatness Among Adolescents, *journal of Pediatric Gastroenterology and Nutrition*, (2018); 67(5): 666-670.

52. Wang S, Schwartz M, Shbel F, Read M, Henderson K and Ickovics J, School breakfast and body mass index: a longitudinal observational study of middle school students, *Pediatric World Obesity*, (2017); 12(3): 213-220
53. Karatzi K, Moschoinos G, Choupi E, Manolis Y, and Healthy Growth study group, Late-night overeating is associated with smaller breakfast, breakfast skipping, and obesity in children: The Healthy Growth Study, *Nutrition*, (2017); 33: 141-144
54. <http://catchinfo.org/wp-content/uploads/2016/03/CATCH-alignment-with-WSCC-model.pdf>
55. Coleman KJ, Tiller CL, Sanchez J, Heath EM, Sy O, Milliken G, Dezwaltowski DA, Prevention of the epidemic increase in child risk of overweight in low-income schools: the El Paso coordinated approach to child health, *Archives of Pediatric and Adolescent Medicine*, (2005); 159(3): 217–224.
56. Moss A, Smith S, Null D, Long Roth S, Tragoudas U, Farm to School and Nutrition Education: Positively Affecting Elementary School-Aged Children's Nutrition Knowledge and Consumption Behavior, *Childhood Obesity*, (2013); 9(1): 51–56. doi:10.1089/chi.2012.005.
57. Luepker RV, Perry CL, McKinlay SM, Nader PR, Parcel GS, Stone EJ, Webber LS, Elder JP, Feldman HA, Johnson CC. et al. Outcomes of a Field Trial to Improve Children's Dietary Patterns and Physical Activity: The Child and Adolescent Trial for Cardiovascular Health (CATCH), *JAMA*, (1996); 275(10): 768–776. doi:10.1001/jama.1996.03530340032026.
58. ALNohair S. Obesity in Gulf Countries. *International Journal of Health Sciences*, (2014); 8(1):79-83.
59. Al-Shammari SA, Khoja TA, Al-Maatouq MA, Al-Nuaim LA, High prevalence of clinical obesity among Saudi females: a prospective, cross-sectional study in the Riyadh region, *The Journal of tropical medicine and hygiene*, (1994); 97(3); 183- 188.
60. Centers for Disease Control and Prevention, Oklahoma State Nutrition, Physical Activity, and Obesity Profile, (2016). Retrieved from <http://www.cdc.gov/nccdphp/dnpao/state-local-programs/profiles/oklahoma.html>

## **CHAPTER III: METHODOLOGY**

### **Study Design**

A Quasi-experimental trial was conducted at two summer camps in Kuwait during summer (July 2<sup>nd</sup> - August 31<sup>st</sup>). It included two groups; the intervention and comparison groups that were followed for 8 weeks to assess the impact of a nutritional educational intervention (**Healthy Habits (HH)** program) on management of childhood obesity by changing eating habits in Kuwaiti children. Two summer camps were selected from the Mathllah Expo 2017; it is an annual summer camps expo that specializes in the development of child's skills in Kuwait. Summer camps were contacted if they were eligible for this study. The selected camps were similar in the range of activities offered, curricula and duration of the camps. In addition, participants in both camps were similar in age range, distribution of overweight and obesity, and socio-economic factors. One of the camps was randomly assigned to the HH program and the other was considered the comparison camp.

Children in the HH program received nutrition education sessions with physical activities offered by the camp during the 8 weeks of the study. Children in the comparison group were receiving regular physical activities offered by the camp. They were asked to follow their regular routine without the intervention.

### **Comparison group**

The comparison group was needed to estimate the changes in eating behaviors that might be ascribed to the nutritional education. This study design was used by other studies to compare the effect of a nutrition interventions versus non-intervention.<sup>1-3</sup> It is reliable to demonstrate the power of the intervention on expected outcomes.

## **Study Setting**

The intervention was developed and evaluated using the construct of the Social Cognitive Theory to promote behavioral and knowledge changes. These constructs are outcome expectations, self-efficacy, observational learning/ modeling, facilitation/behavioral capability, goal setting and reinforcements. In general, the literature reviewed showed that an education intervention promoted significant results on changing behavior based on this theory.<sup>2-6</sup> This theory is based on providing knowledge and skills to implement the gained new knowledge. The intervention presented healthy behavioral models that children encountered during their daily life in the camp to promote change. Children observed the role-model's behavior and engraved that behavior in their memory. Later, they will reproduce this behavior by using the modeled behavior as a reference.<sup>7</sup>

## **Social Cognitive Theory**

This theory shows how cognitive and social factors become part of human health and disease.<sup>7</sup> A number of studies have conducted programs using SCT to evaluate the relationship between health behaviors and health outcomes.<sup>2-8</sup> The theory also provides a framework for designing, implementing and evaluating programs.<sup>7</sup>

## **Recruitment**

Participants were recruited from two summer camps in Kuwait: My gym & Little gym. Both camps were similar in:

- Distribution of overweight and obesity.
- Duration of the camp: 9am – 8 pm.
- Age range: 3- 12 years.



- Socio-economic factors:
  - Average income.
  - Similar financial incentives in both groups (or special discount) for participants who earned high grades in school.
- Location: 6 miles apart in the center of the city
- Offered Activities: similar curriculum of activities such as dance, gymnastics, and sport skills.

Children who registered in the camps were given brochures about the study (**Appendix 1**). The study was approved by the Florida International University (FIU) Institutional Review Board (IRB) and both children gyms in Kuwait before starting the study (**Appendix 2**).

### **Sample**

Eighty-nine children (N=89) were screened based on the following criteria:

#### **Inclusion criteria**

- Age 6 – 10 years old
- Willing to participate in the study for 8 weeks
- Willing to attend at least 80 % of the session and complete the program
- Child assent
- Parental consent

#### **Exclusion criteria:**

- Using nutritional supplements.
- Mental disability such as autism or Attention Deficit Disorder.

- Chronic disease that require medication such as Diabetes, Cancer and Heart diseases.

After screening 89 children in both groups, 79 were enrolled. Six children were not willing to participate for 8 weeks, and four children were excluded because of suffering from chronic diseases. Two children had diabetes, one child had a heart condition, and another child had a genetic disorder in Glucose-6-Phosphate Dehydrogenase G6PD. In total, 41 children were enrolled in the intervention group and 38 in the comparison group, and included in the intent-to-treat analysis. However, two children in the HH group did not complete the intervention with an attendance of less than 80% (Diagram 1).

### **Program Characteristics**

#### **Children (6- 10 years old)**

The literature suggested that children in this age range become more independent and have less adult control for choosing their food and role-play in their games. At this age, they start selecting their own meals and physical activity behaviors as well as acquiring their own attitudes and beliefs.<sup>9</sup> A study by Summerbell et al.<sup>10</sup> demonstrated that the most successful childhood obesity programs were implemented between the ages of 6 to 12 years.<sup>10</sup>

#### **Family support**

Parents have a role in the development of children's behaviors because children reproduce what they observe from their parents.<sup>2,11,12</sup> Evidence from the literature suggested that parent's behaviors influenced their children's weight, diet, sugar intake and adapting physical activity lifestyle.<sup>2,11,12</sup> For example, if children joined their parents in preparing healthy foods and shared in physical activities, that affected their behaviors

positively.<sup>13</sup> Therefore, parents who were engaged in their children's education intervention would reinforce what their children learned at the camp.

### **Nutrition education**

Nutrition plays an important role in person's weight and health.<sup>1,4,14</sup> Providing nutrition education and healthy eating behaviors would encourage children to choose and eat healthy, reinforcing their self-efficacy. Childhood obesity interventions used nutrition education as a main component in their programs. It showed significant results in decreasing weight<sup>4,14</sup> and changing attitudes.<sup>1,3,14</sup>

### **8-week Intervention**

Reviewed programs were implemented between 6-24 weeks,<sup>1,2,4</sup> therefore, we modified our intervention to last the duration of the camps, which was 8 weeks. At the end of the intervention, participants were followed with the same questionnaires and measures implemented at baseline to assess the impact of the intervention.

### **Intervention**

The Healthy Habits program included two parts: one was for the participating children and a second part that recruited the children's mothers. Children had nutrition education sessions every week, so they received 8 nutritional topics for the entire summer camp. Each session was 40 minutes, participants were divided into 2 groups based on their age (6 and 7 years old in one class, 8 – 10 in another class). In a session, the investigator discussed and gave information about nutrition topics. There were 8 nutritional topics that were discussed with the children during the intervention. The topics that were covered respectively were: **Nutrition and Health, The importance of breakfast, Fast Food, Healthy snack, Go, Slow, and WHOA Food, How many servings, Energy balance and**

**Go, Go, Go for snack.** These lessons were taken from CATCH Kids Club nutrition curriculum.<sup>15</sup> Children also had educational games and interactive activities. The activities met the learning objectives of that session. For more detailed information of this lessons and materials (CATCH Kids Club).<sup>15</sup>

Investigator set measurable goals that children could achieve by the next session such as avoiding fried food. Children's success was measured by achieving small positive changes in dietary consumption. When they reached the goal, they earned a score. The child who received more scores won. Also, children who answered questions like being able to list two healthy snacks correctly in a game, received prizes as positive reinforcement. Another type of activity, for example, was assigning children to help in preparing healthy snacks like "Fruits Kobab" during the session; then, they tasted them. They were also asked to prepare these types of healthy snacks at home for their families. Children were taught how to make a healthy plate (including the five food groups) by having discussions and interactions. They were also engaged in games to test children's perception about the topics. After each session, children were encouraged to participate in physical activities offered in the camp and learn physical games and exercises that they could do at home.

Fourteen mothers of children participating in the HH program were willing to participate in the program. They were educated based on the social-cognitive theory constructs using "what's app" messages. The investigator explained the importance of having a goal to make a change like avoiding frying. Achieving the goals was measured by any changes in the way of cooking. They were educated on how to self-reward every time they accomplished a successful change. They also received materials related to the topic

covered with their respective children such as food recipes, healthy cooking, and lists of healthy snacks for them to encourage their children to continue these behaviors at home. Mothers were reminded to offer opportunities to their children to participate in preparing and cooking the healthy foods and physical activities learned in the camp, such as assigning physical chores, walks and play time outdoors.

All mothers were instructed how to collect photographic food recalls for their children. The mother-child dyad were trained how to use their telephone camera to take photos of food before and after they ate and sent them to the investigators to measure portion sizes, calculate calories intake and report types of foods.

On the other hands, investigator visited the comparison summer camp at baseline and follow-up. Weight and height were measured, and BMI was calculated at each visit. Two-day a week photographic food recall or two-day 24hr-recall were taken twice during the intervention to measure eating behavior. Body composition analysis was measured during these visits.

The evaluation of this intervention was based on social cognitive theory constructs which included:

**Table 1:** Social Cognitive Theory Constructs

Construct	Definition	Description
<b>Self-efficacy</b>	A person belief that S/he is willing to perform a desired behavior successfully. <sup>12</sup>	<p><b>Children:</b> success was measured by small positive achievable goals in dietary consumption or physical activity. When they reached a goal, they earned a score. The child who received more scores won the game.</p> <p><b>Mothers:</b> had conversation about health and nutrition concerns with investigators</p> <p>They were helped and encouraged with social modeling</p>
<b>Goal setting</b>	Goals need to be realistic and measurable to reach desired outcomes and expectations. <sup>9</sup>	<p><b>Children:</b> in each session, investigators set measurable goals that the children should achieve by the next session if they wanted to advance in knowledge and behaviors.</p> <p><b>Mothers:</b> were educated about the importance of had a goal to make a change.</p> <p>Expressed the importance of being specific and of objective measurement.</p>
<b>Observational learning/ modeling</b>	Learning how to perform a new behavior by observing how this behavior is performed. <sup>7</sup>	<p><b>Children:</b> observed model's behaviors. The model's behaviors were an incentive for new behaviors. Investigator were role-models. Mothers were advised to become good role models for their children as well.</p> <p><b>Mothers:</b> received healthy cooking tips through what's app messages demonstrating how to prepare healthy recipe. They were advised how to and encourage their children to help in preparation meals and be role-model</p>
<b>Reinforcement (Incentive motivation)</b>	To reinforce a behavior, rewards or punishes should be used. <sup>9</sup>	<p><b>Children:</b> who answered questions correctly in games received prizes as positive reinforcement.</p> <p><b>Mothers:</b> were educated how to self- reward for the completion of the 8-week program. Shared ideas.</p>

<b>Outcome expectations</b>	A person belief of benefits of the desired behaviors and consequences of a behavior <sup>7</sup>	<p><b>Children:</b> were taught the positive results that are expected when they follow what they learn from the intervention.</p> <p><b>Mothers:</b> demonstration the benefits of healthy eating.</p> <p>‘Reframe’ obesity as a health issue rather than an appearance problem.<sup>2</sup></p>
<b>Facilitation /behavioral capability</b>	This construct makes a behavior easy to be performed by using tools and resources. <sup>7</sup>	<p><b>Children:</b> learned how to make a healthy plate by having discussion and interaction at each session. They were engaged in games to test children perception about the topics.</p> <p><b>Mothers:</b> learned how to cook and feed their children healthy by receiving what’s app massages tips. They discussed their nutrition concerns with the investigators.</p>

## Measurements

**Socio-demographic Questionnaire:** At baseline parents completed a socio-demographic questionnaire that reported parents and children social status. The information included: age, gender, nationality, economic status, parents’ educational status, parents’ marital status, health status, number of siblings and having a Nanny helping at home (**Appendix 3**).

**Anthropometric measurement:** Children’s height were taken in centimeters by using a stadiometer. Weight was measured in kilograms by using a weighing scale using light clothes. In addition, children’s waist circumference was taken by using the standard tape taking the average of three readings. All anthropometrics were measured at baseline and at the end of the program.

**BMI -for- Age Percentile:** It was determined by using WHO BMI (AnthroPlus software).<sup>16</sup> Mother's BMI was also calculated. BMI is considered as a practical method of screening adiposity.<sup>17</sup> Comparing BMI with other methods that are used to assess adiposity, it is low-cost, simple, and noninvasive.<sup>16</sup> Based on the literature, health risks are associated with BMI categories. Another reason of using this measure that many studies in the same field used it as main measure to assess obesity.<sup>17-23</sup>

**Waist-to-height ratio (WHtR):** Waist circumference was taken by using a standard tape and taking the average of three readings. WHtR was calculated to measure abdominal (central) obesity among children.<sup>24,25</sup> Based on Ashwell et al.<sup>25</sup>, they defined abdominal obesity at 0.5. Abdominal obesity associated with metabolic diseases including diabetes and heart diseases.<sup>23-25</sup>

**Body composition analyzer** is an easy and noninvasive method of analyzing body fat mass. It is commonly used because it is very quick and accurate compared to other techniques that analyze body composition.<sup>26</sup> We measured fat mass and fat free mass by using the bioelectrical impedance technique in (TANITA BF-689) which depends on body's conductivity of the electrical current. Fat and fat-free compartments have very different impedance (resistance to safe electrical current). The fat-free compartment is high water content which is a good conductor of current and yields a low impedance. The fat compartment is a poor conductor of current and yields a high impedance.<sup>26</sup> BMI by itself does not provide much information about body composition.<sup>27</sup> Therefore, we used bioimpedance to estimate body composition at baseline and at end of the program.



**Photographic Food Records:** Children took a picture of their food before and after they ate their meals by using electronic devices (iPod, iPad or phones). They recorded two days of dietary intake pre- and post- intervention to estimate changes in food intake when they were at home. This technique provided accurate results in other studies involving children. It was also reported that it was more convenient for adult participants than keeping standard food records.<sup>28,29</sup> It is an easy technique especially for children 6-10 years old who might not be good historians.<sup>28,29</sup> In this way, parents did not need to write or measure food intake.

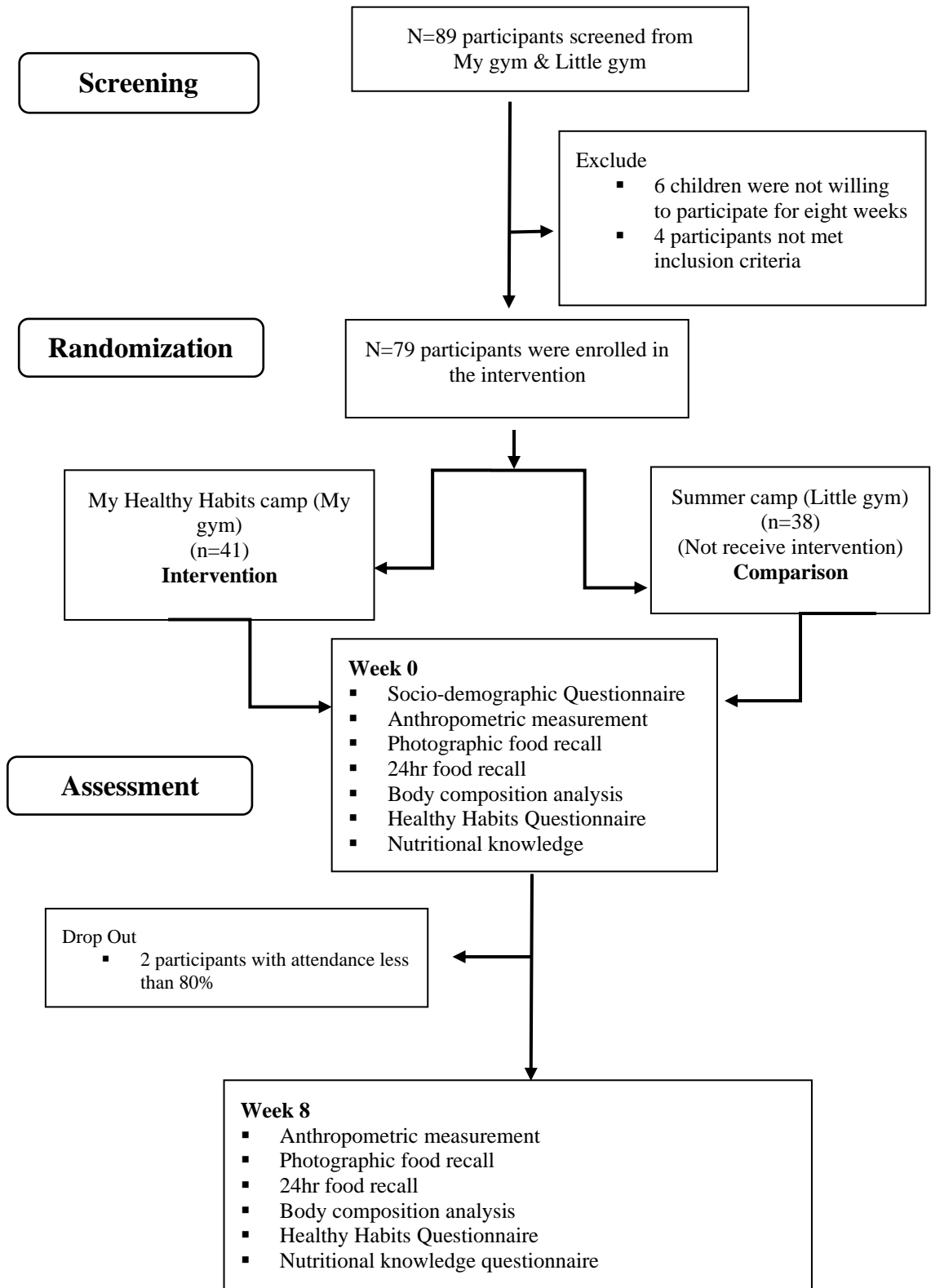
**24-hour Recalls (24-HR):** Children were also interviewed twice a week at baseline and at the end of the intervention to assess their food intake at home. With this method, we could measure children's energy consumption, type of food and portion size. Studies suggested that three 24HRs can estimate accurate energy consumption.<sup>30</sup>

**Healthy Habit Questionnaire (modified):** It is designed to evaluate the relationship between behavior, knowledge and health.<sup>31</sup> The questionnaire was developed based on the Social Cognitive Behavioral Theory components. It included two type of questions. One of them focused on assessing attitude, beliefs and self-efficacy. The second part was a food frequency questionnaire that covered children's eating behaviors, which included low-fat and low-sugar diet, healthy snack, smaller portion size and five portions of fruit and vegetables per day. Therefore, we used this measure at baseline and at the end of the intervention to assess the changes attitude, beliefs, self-efficacy and eating behavior. The questionnaire was modified by adding two questions on time spent in front of a computer, smart telephone or television screen (**Appendix 4**).

**General Nutritional knowledge and Behavior Questionnaire for Adult (modified):** It is a validated questionnaire that was designed to assess mother's knowledge, behavior and

their influence on children's eating behavior and weight.<sup>32</sup> It included two parts: the first part assessed mother's knowledge, beliefs and self-efficacy. The second assessed mothers' eating behavior and attitude. This measure was used at baseline and at the end of the program to assess the changes in knowledge, attitude, beliefs, self-efficacy. This questionnaire was modified to add questions on, behavior and self-efficacy, how to select healthy snacks and meals<sup>31</sup> (**Appendix 5**).

**Diagram 1:** Study protocol



## References

1. Choudhry S, McClinton-Powell L, Solomon M, Davis D, Lipton R, Darukhanavala A, Steenes A, Selvaraj K, Gielissen K, Love L, Salahuddin R, Embil F, Huo D, Chin M, Quinn M, and Burnet D, Power-Up: A Collaborative After-School Program to Prevent Obesity in African American Children, *Prog Community Health Partnersh.* 2011 ; (4): 363–373.
2. Croker H, Lucas R and Wardle J, Cluster-randomised trial to evaluate the ‘Change for Life’ mass media/ social marketing campaign in the UK, *BMC Public Health* 2012, 12:404
3. Rogers V, Hart P, Motyka E, Rines E, Vine J, and Deatrck D, Impact of Let’s Go! 5-2-1-0: A Community-Based, Multisetting Childhood Obesity Prevention Program, *Journal of Pediatric Psychology*, 38(9):1010–1020, 2013
4. Sacher P, Kolotourou M, Chadwick P, Cole T, Lawson M, Alan Lucas A and Singhal A, Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity, *OBESITY*, (2010); 18(1): S62-S68
5. Larsen KT, Huang T, Ried-Larsen M, Andersen LB, Heidemann M, Møller NC, A Multi-Component Day-Camp Weight-Loss Program Is Effective in Reducing BMI in Children after One Year: A Randomized Controlled Trial. *PLoS ONE*, (2016); 11(6): e0157182.
6. Evans A, Ranjit N, Hoelscher D, Jovanovic C, Lopez M, Mcintosh A, Ory M, Whittlesey L, Mckyer L, KirK A, Smith C, Walton C, Heredia NI, Warren J, Impact of school-based vegetable garden and physical activity coordinated health interventions on weight status and weight-related behaviors of ethnically diverse, low-income students: Study design and baseline data of the Texas, Grow! Eat! Go! (TGEG) cluster-randomized controlled trial, *BMC Public Health*, (2016); 16(1):973.
7. Bandura A, Health Promotion by Social Cognitive Means, *Health Education & Behavior*, (2004); 31(2): 143-164.
8. Gately P J, Cooke C B, Butterly R J, Mackreth P, Carroll S, The Effects of a Children's Summer Camp Programme on Weight Loss, with a 10 Month Follow-up, *International Journal of Obesity*, (2000); 24(11): 1445-1452.
9. Lytle LA, Seifert S, Greenstein J, McGovern P, How do children's eating patterns and food choices change over time? results from a cohort study, *American Journal of Health Promotion*, (2000);14(4):222-228.
10. Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S, Waters E, Interventions for treating obesity in children, *Cochrane Database of Systematic Review*, (2003); 3: CD001872.

11. Centers for Disease Control and Prevention, Youth Risk Behavior Survey Questionnaire, (2007): Retrieved from [www.cdc.gov/yrbs](http://www.cdc.gov/yrbs)..
12. Cohen DA, Finch BK, Bower A, Sastry N, Collective efficacy and obesity: The potential influence of social factors on health, *Social Science & Medicine*, (2006); 62(3): 769-778.
13. Wofford L, Froeber D, Clinton B, Ruchman E, Free afterschool program for at-risk African American children: Findings and lessons, *Family & Community Health*, (2013);36(4):299-310.
14. Eisenmann JC, Alaimo, K., Pfeiffer, K, Paek, H J, Carlson J.J., Hayes H, Thompson T, Kelleher D, Oh HJ, Orth J, Randall S, Mayfield K, Holmes, D, Project FIT: Rationale, design and baseline characteristics of a school- and community-based intervention to address physical activity and healthy eating among low-income elementary school children, *BMC Public Health*, (2011); 11: 607.
15. CATCH Kids Club, Healthy habits & nutrition (Grades K-5) curriculum, Activities for After-School and Community Recreation Settings.
16. WHO AnthroPlus for Personal Computers Software for assessing growth of the world's children and adolescents, Designed and developed by Monika Blössner, Amani Siyam, Elaine Borghi Adelheid, Onyango Mercedes de Onis, Department of Nutrition for Health and Development, Geneva, Switzerland, Simon Goumaz blue-infinity, sa, Geneva, Switzerland.
17. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, Flegal KM, Guo SS, Wei R, Mei Z, Curtin LR, Roche AF, Johnson CL, CDC growth charts: United states. *Advance Data*, (2000); 8(314):1-27.
18. McCallum Z, Wake M, Gerner B, Baur L, Gibbons K, Gold Lisa, Gunn J, Naughton G, Riess C, Sanci L, Sheetan J, Ukumunne O, Waters E, Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity, *International Journal of Obesity*, (2007); 31(4): 630–636.
19. Nemet D, Barkan S, Epstein Y, Friedland O, Kowen G, Eliakim A, Short- and long-term beneficial effects of a combined dietary-behavioral-physical activity intervention for the treatment of childhood obesity, *Pediatrics*, (2005); 115(4): e443–e449.
20. Reinehr T, de Sousa G, Toschke AM, Andler W. Long-term follow- up of cardiovascular disease risk factors in children after an obesity intervention, *American Journal Clinical Nutrition*, (2006); 84(3): 490–496.

21. Kalavainen MP, Korppi MO, Nuutinen OM. Clinical efficacy of group- based treatment for childhood obesity compared with routinely given individual counseling, *International Journal of Obesity*, (2007); 31(10): 1500–1508.
22. Shelton, Doug, Kim Le Gros, Lyza Norton, Sue Stanton-Cook, Jane Morgan, and Paul Masterman, Randomised Controlled Trial: A Parent-based Group Education Programme for Overweight Children, *Journal of Paediatrics and Child Health*, (2007); 43(12): 799-805.
23. Fryar CD, Gu Q, Ogden CL, Anthropometric reference data for children and adults: United States 2007–2010. National Center for Health Statistics, *Vital Health Statistics*, 2012; 11: 252.
24. Magalhães E, Sant’Ana L, Priore S, Franceschini S, Waist circumference, waist/height ratio, and neck circumference as parameters of central obesity assessment in children, *Revista paulista de pediatria*, (2014): 32(3): 273–281.
25. Ashwell M, Lejeune S, McPherson K, Ratio of waist circumference to height may be better indicator of need for weight management, *BMJ*, (1996); 312: 377.
26. Lukaski HC, Johnson PE, Bolonchuk WW, Lykken GI, Assessment of fat-free mass using bioelectrical impedance measurements of the human body, *American Journal of Clinical Nutrition*, (1985); 41(4): 810-817.
27. Koontz MB, Gunzler DD, Presley L, Catalano PM, Longitudinal changes in infant body composition: association with childhood obesity, *Pediatric Obesity*, (2014);9(6):e141-e144.
28. Higgins JA, LaSalle AL , Zhaoxing P , Kasten MY, Bing KN, Ridzon SE, Witten TL, Validation of photographic food records in children: are pictures really worth a thousand words?, *European Journal of Clinical Nutrition*, (2009); 63: 1025–1033.
29. Wang DH, Kogashiwa M, Ohta S, Kira S, Validity and reliability of a dietary assessment method: the application of a digital camera with a mobile phone card attachment, *Journal of Nutrition Science Vitaminol (Tokyo)*, (2002); 48: 498–504.
30. MA Y, Olendzki BC, Pagoto SL, Hurley TG, Magner RP, Okene IS, Schneider KL, Merriam PA, Hebert JR, Number of 24-Hour Diet Recalls Needed to Estimate Energy Intake. *Annals of epidemiology*, (2009);19(8):553-559.
31. Hall E, Chai W, Koszewski W, Albrecht J, Development and validation of a social cognitive theory-based survey for elementary nutrition education program. *The International Journal of Behavioral Nutrition and Physical Activity*, (2015);12:47.

32. Al-Shookri A, Al-Shukaily L, Hassan F, Al-Sheraji S, Al-Tobi S. Effect of Mothers Nutritional Knowledge and Attitudes on Omani Children's Dietary Intake. *Oman Medical Journal*, (2011); 26(4): 253-257.

**CHAPTER IV: EFFECT OF NUTRITION EDUCATION INTERVENTION ON  
EATING BEHAVIOR AMONG CHILDREN PARTICIPATING IN SUMMER  
CAMPS IN KUWAIT**

**Abstract**

**Background:** To prevent and treat childhood obesity, it has been recommended the development of prevention programs to modify behavior, by involving family, using nutrition education, and increasing physical activity. These types of programs have shown a significant decrease in BMI and prevention of obesity in other parts of the world. Although obesity is considered worldwide one of the most significant risk factors for most chronic diseases, few programs and interventions for preventing or reversing the trends in childhood obesity were implemented in Kuwait.

**Objective:** To increase awareness of long-term risks of childhood obesity among children and their mothers. Additionally, to assess the impact of the **Healthy Habits (HH)** program on changing eating behavior among 6-10 year-old children participating in summer camps.

**Methods:** A Quasi-experimental trial (HH & comparison group) was conducted during summer in Kuwait. Both groups were followed for 8 weeks to assess the relationship between changing eating habits and childhood obesity. The tools of the intervention were developed based on the Social Cognitive Theory (SCT). Seventy-nine children were recruited from two matched summer camps. Children in HH received nutrition education sessions every week while they were doing physical activity in the camp.

**Results:** Before starting the intervention, participants in HH weight mean $\pm$ SD was 29.64 $\pm$ 7.64) and the comparison group weight was (27.56  $\pm$  8.75). Intent-to-treat analysis was



conducted at  $P \leq 0.05$  level of significance. After the 8-week nutrition education program, children in HH significantly improved their eating behaviors and attitudes. There were also significant positive changes in beliefs and self-efficacy among the HH group. These benefits extended to prevent gaining in body weight that were significantly less in the HH group compared with the comparison group ( $P \leq .001$ ).

**Conclusions:** The Healthy Habits program had a great impact on changing eating behaviors among children and preventing weight gain. Further longer programs should be conducted to develop and improve healthy behavior among children.

### **Introduction**

A variety of programs have been developed and conducted to change undesirable behaviors and educate children in healthy habits that may influence the outcomes of obesity, but only a few have demonstrated effectiveness. These programs used different models and theories to change children's behaviors.<sup>1-7</sup> Because we hypothesized that role models are influential in children behaviors, observational learning/ modeling construct of Social Cognitive Behavior Theory (SCBT)<sup>8</sup> was used in this intervention. The theory also fitted especially well to study the parent-child relationship, as children are acutely exposed to parental behavior as primary behavioral models. There are other role models, however, such as TV characters, teachers or friends that may also influence children's behaviors that they are likely to learn and repeat.<sup>8</sup> For example, children will remember a series of things they have observed and use this information as a reference for their own behaviors.<sup>4</sup>

The SCBT theory has been applied in many programs and has showed some effective results in weight management and changing behavior.<sup>1,6,9</sup> The present study was

designed within the framework on this theory using its main domains as variables to measure to assess the impact of the HH program on changing eating behavior and childhood obesity among Kuwaiti children.

## **Method**

A Quasi-experimental trial (intervention & comparison group) was conducted at summer camps in Kuwait during summer 2017 (July 2<sup>nd</sup>-August 31<sup>st</sup>). The camps were similar in age range of children, range of activities offered and duration of the camp. One of camp was randomly assigned to the Healthy Habits program and the other to the comparison camp. The two groups; intervention and comparison groups were followed for 8 weeks. The tools of the intervention were developed based on the SCT.<sup>8</sup> Children in the HH program received nutritional behavioral educational sessions with physical activities offered by the camp during the 8-week of the study. The comparison group was receiving regular physical activities offered by the camp. They were asked to follow their regular routine without instituting any additional intervention. Mothers were instructed how to collect photographic food recalls for their children.

**Nutritional Educational Sessions:** Children had nutrition education sessions every week, so they received 8 nutritional topics for the entire summer camp. Each session was 40 minutes, participants were divided into 2 groups based on their age (6 and 7 years old in one class, 8–10 in another class). In a session, the Dietitians discussed and gave information about nutrition topics. These lessons were taken from CATCH Kids Club nutrition curriculum.<sup>10</sup> The covered topics were: **Nutrition and Health; The Importance of Breakfast; Fast Food; Healthy Snack; Go, Slow, and WHOA Food; How Many Servings; Energy Balance; and Go, Go, Go for snack.** Children in the intervention group

also had educational games and interactive activities that met the learning objectives of the corresponding session.

### **Data Collection**

**Anthropometric measurement:** Children's height was taken in centimeters by using a stadiometer. Weight was measured in kilograms by using a weighing scale with a light clothing. All anthropometrics were measured at baseline and at the end of the program.

**BMI-for-Age Percentile:** It was determined by using WHO BMI (AnthroPlus software).<sup>11</sup> It is considered as a practical method of screening adiposity.<sup>12</sup> Based on evidence, health risks are always associated with BMI categories. Studies used it as main measure to assess obesity.<sup>12-18</sup>

### **Nutritional Data**

**Photographic Food Records:** Children took a picture of their food before and after they ate their meals by using electronic devices (iPod, iPad or phones). They recorded that for 2 days pre- and post-intervention to provide their food intake data when they are at home. It is an easy technique especially for children 6-10 years old who might not be good historians.<sup>19,20</sup>

**24-hour Recalls (24-HR):** Children were also interviewed twice to assess their food intake at home. With this method, we could measure children's energy consumption, type of food and portion size.<sup>21</sup>

**Healthy Habit Questionnaire (modified):** Children answered the questionnaire, which is designed to evaluate the relationship between behavior, knowledge, food and health.<sup>22</sup> Young children got some help from the investigators in reading the questions. The

questionnaire was developed based on the Social Cognitive Behavioral Theory components.

### **Statistical Analysis**

The collected data were entered directly into a SPSS v.23 (Chicago, USA) and used to analyze the impact of the Healthy Habits program among children in two summer camps in Kuwait. All tests were two-sided with statistical significance set at  $P < 0.05$ . ChooseMyPlate.gov was used to analyze food intake. Descriptive statistics (means  $\pm$  SD, median, and ranges or percent) were used to characterize the population. Since one of the goals of the nutritional intervention was to reduce the number of skipped breakfast meal, a larger number in the results means more breakfast meal was consumed. Analyses of differences between groups for demographic and anthropometric variables were performed using independent samples  $t$  tests for continuous variables and chi-square tests for categorical variables. Changes in weight measures, intake of nutrients and behaviors were compared using paired-samples  $t$  tests within each group and independent samples  $t$  tests between groups. Changes in attitudes and self- efficacy were measured by using Wilcoxon and McNemar within groups and Mann-Whitney between groups. The intent-to-treat principle was applied for statistical analyses. The effectiveness of the nutrition education intervention was assessed by differences in mean between groups from baseline to the end of the 8-week program.

### **Results**

The sample demographic characteristics are reported in **Table 1**. Participants in both camps were similar and were not significantly different at baseline in age range, distribution of weight, and socio-economic factors. Although the sample was recruited in

the same area in Kuwait, there was significant difference in parental nationality, the HH group had more foreign mothers. No significant differences in gender intra or inter groups were observed; 54 % of the total sample was female and 45% were male. There were no significant differences between both groups in distribution of overweight and obesity. Twenty percent of the HH group was overweight and 22% obese, there were 26 % of the comparison group overweight and 16% were obese.

**Table 1:** Demographic characteristics

Variables	Healthy Habits (n=41)		Comparison Group (n=38)		Total (n=79)		P-Value
	n	%	n	%	n	%	
<b>Children's Gender</b>							
Male	20	49	16	42	36	46	.712 <sub>a</sub>
Female	21	51	22	58	43	54	
<b>Children's Nationality</b>							
Kuwaiti	35	85	36	95	71	90	.314 <sub>a</sub>
Non-Kuwaiti	6	15	2	5	8	10	
<b>Mothers' Nationality</b>							
Kuwaiti	33	80	37	97	70	89	.045 <sub>a*</sub>
Non-Kuwaiti	8	20	1	3	9	11	
<b>Income</b>							
Less than Average	1	4	0	0	1	2	.567 <sub>a</sub>
Average	14	61	13	72	27	66	
More than Average	8	35	5	28	13	32	
<b>Mothers' Description</b>							
Underweight	8	20	6	16	14	18	.605 <sub>a</sub>
Healthy weight	21	51	24	63	45	57	
Overweight	11	27	8	21	19	24	
Obese	1	2	0	0	1	1	
<b>BMI z-score</b>							
Underweight	1	2	4	11	5	6	.373 <sub>a</sub>
Healthy weight	23	56	18	47	41	52	
Overweight	8	20	10	26	18	23	
Obese	9	22	6	16	15	19	

<sup>a</sup> Pearson's Chi-square test to compare the difference between groups at baseline

\*Level of significance P<0.05

Baseline anthropometrics were compared between both groups as shown in (table 2). No significant differences in weight, height, and BMI percentile were observed between both groups at baseline.

**Table 2:** Baseline Anthropometrics and Groups differences

		Mean $\pm$ SD	Mean Difference	95% CI		P-Value
				Lower	Upper	
<b>Age</b>	Healthy Habits	7.34 $\pm$ 1.45	-.313	-.950	.324	.331 <sup>a</sup>
	Comparison	7.05 $\pm$ 1.39				
<b>Weight (Kg)</b>	Healthy Habits	29.64 $\pm$ 7.64	-2.089	-5.781	1.603	.263 <sup>a</sup>
	Comparison	27.56 $\pm$ 8.75				
<b>Height (cm)</b>	Healthy Habits	127.5 $\pm$ 10.4	-2.529	-6.765	1.707	.238 <sup>a</sup>
	Comparison	124.9 $\pm$ 8.26				
<b>BMI (percentile)</b>	Healthy Habits	17.85 $\pm$ . 2.860	-.4747	-1.747	.7979	.460 <sup>a</sup>
	Comparison	17.38 $\pm$ .2.817				

<sup>a</sup>Independent t-test to compare between groups at baseline

\*Level of significance P<0.05

95%CI= Confidence Interval of the Difference

### **Effect of Nutrition Education on Children’s Body Weight and Behavior (Skipping Breakfast & Calories Intake)**

**Table 3** shows the results from paired t-test analysis that compared body weight, number of skipped breakfasts, caloric intake at baseline and changes over 8 weeks. A significant difference in children’s body weight was, with the HH group having a slight weight loss when compared their body weight at baseline and the end of the program [(29.92  $\pm$  8.89) vs (29.72  $\pm$  8.89 ),  $P=.029$ ]. However, there was a significantly increased of children’s body weight among the comparison group [( 27.55  $\pm$  7.64) vs ( 27.99  $\pm$  7.67),  $P\leq.001$ ]. Moreover, the changes in behavior between baseline and 8 weeks were significantly associated with the nutrition education. Score of breakfast consumed was

significantly increased among the HH group ( $P \leq .001$ ), but there was no significant change among the comparison group ( $P \leq .324$ ). The HH group had a significant decrease in caloric intake after 8 weeks of the nutritional education as shown in **Table 3** compared with the caloric intake at baseline [ $(2215.9 \pm 462)$  vs  $(1810.4 \pm 245)$ ,  $P \leq .001$ ]. In contrast, the comparison group demonstrated a significant mean increase in caloric intake ( $P \leq .001$ ).

**Table 3:** Body weight and Behavior Changes at baseline and end 8-week program

	Healthy Habits			Comparison Group		
	Baseline	8-week	P-Value	Baseline	8-week	P-Value
	Mean $\pm$ SD	Mean $\pm$ SD		Mean $\pm$ Std	Mean $\pm$ Std	
<b>Weight (Kg)</b>	29.92 $\pm$ 8.89	29.72 $\pm$ 8.89	.029 <sub>a</sub>	27.55 $\pm$ 7.64	27.99 $\pm$ 7.67	$\leq .001$ <sub>a*</sub>
<b>Score of BF meal</b>	4.15 $\pm$ 1.014	4.77 $\pm$ .427	$\leq .001$ <sub>a</sub>	4.11 $\pm$ .798	4.24 $\pm$ .714	.324 <sub>a</sub>
<b>Caloric intake</b>	2215.9 $\pm$ 462	1810.4 $\pm$ 245	$\leq .001$ <sub>a</sub>	1778.2 $\pm$ 339	1899.9 $\pm$ 470	.001 <sub>a*</sub>

<sup>a</sup> Paired t-test to compare baseline with the end of the program both groups

\*Level of significance  $P < 0.05$

**Table 4** displays the results of the independent t- test analysis that was conducted to compare body weight and behavioral changes between both groups. It shows the **mean change of children’s weight** (from baseline to the end of the program) was significantly reduced among HH group compared with the comparison group [ $(-.1954 \pm .537)$  vs  $(.4413 \pm .406)$ ,  $P \leq .001$ ]. This difference is visualized in **Figure 1** below that shows that most of the children in the HH group decreased their body weight by 0.20 kg. compared with children in the comparison group, who increased their weight by 0.50 kg. Furthermore, there was a significant diminished in number of skipping breakfast when focusing on increasing the number of breakfast meal among HH group compering with comparison

group  $[(.6154 \pm .815)$  vs  $(.1316 \pm .811)$ ,  $P \leq .001$ ]. Also, the mean difference of the caloric intake among HH group was significantly  $[(-405.5 \pm 327.5)$  vs  $(121.6 \pm 215.41)$ ,  $P \leq .001$ ] reduced comparing with comparison group. **Figure 2** shows same results that children in HH group decreased approximately 400 kcal, however; the comparison group increased 200 Kcal.

**Table 4:** Body weight and Behavior Changes between both groups

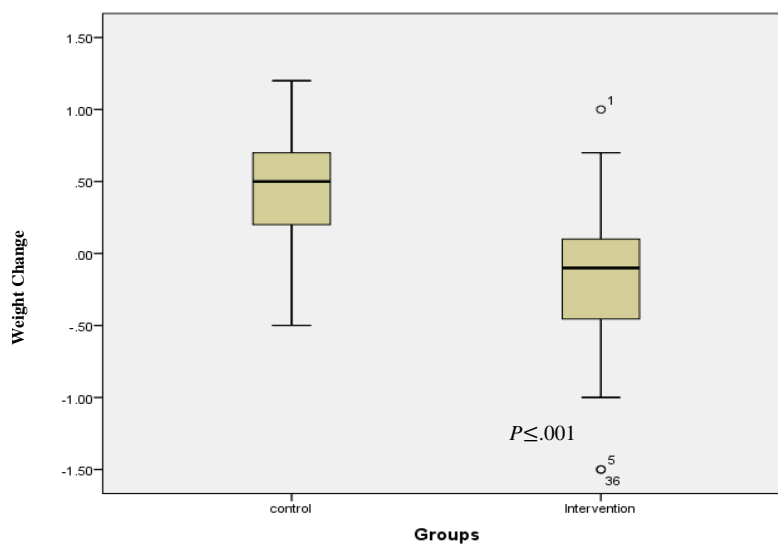
		Mean $\pm$ SD	Mean Difference	95% CI		P-Value
				Lower	Upper	
<b>Weight (Kg)</b>	Healthy Habits	$-.1954 \pm .537$				
	Comparison	$.4413 \pm .406$	.6367	.4201	.8533	$\leq .001_{a^*}$
<b>Score of BF meal</b>	Healthy Habits	$.6154 \pm .815$				
	Comparison	$.1316 \pm .811$	-.4838	-.8529	-.1146	.011 <sub>a*</sub>
<b>Caloric Intake</b>	Healthy Habits	$-405.5 \pm 327.5$				
	Comparison	$121.6 \pm 215.4$	527.1	400.9	653.3	$\leq .001_{a^*}$

a Independent t-test to compare the difference (over 8-week program –baseline) for both groups,

\*Level of significance  $P < 0.05$

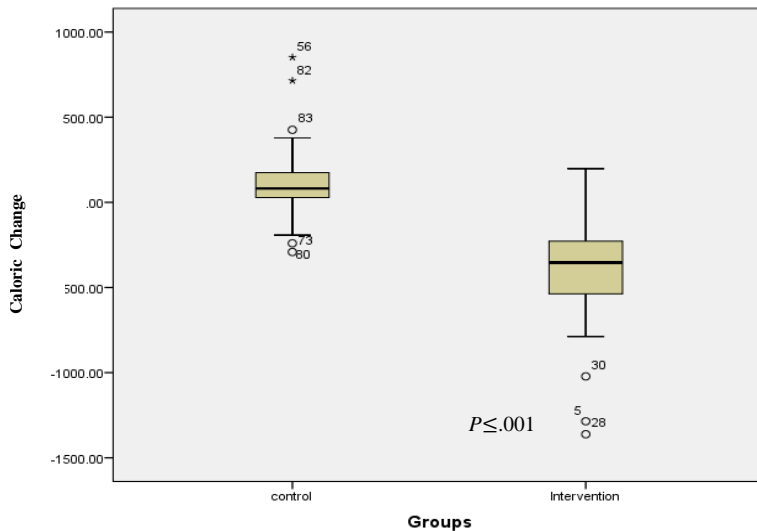
95% CI= Confidence Interval of the Difference

**Figure 1:** Body weight Changes in both groups





**Figure 2:** Caloric intake Changes in both groups



### Effect of Nutrition Education on Children’s Self-efficacy and Attitude

**Table 5** shows Chi-square test analysis that compared choosing healthy snacks and changing in meal portion size at baseline and the changes over 8 weeks. There was 66% of the HH group who selected healthy snacks at baseline. However, a positive change in self-efficacy was observed after 8-week in the Healthy Habits program among the HH group. The number of children who selected healthy snacks was significantly increased to 97% in the intervention group ( $P=.001$ ). In the comparison group, 61% did choose healthy snacks, however; this number decreased to 50% over the 8 weeks in the comparison camp ( $P=.289$ ). Comparing both groups demonstrate significant improvement in the HH group due to the nutrition education ( $P \leq .001$ ).

There were also positive changes in meal portion size over 8 weeks among HH group. They significantly decreased their meals’ portion size by 62% ( $P \leq .001$ ). Most of

the children (84%) in the comparison group had the same portion size that they used to get at baseline while only one third (33%) of the intervention group did not change.

**Table 5: Self-efficacy Changes**

Groups		Healthy Snacks n (%)	Unhealthy Snacks n (%)	P-Value	P-Value	Change in Portion Size			P-Value
						Increased n (%)	Same n (%)	Decreased n (%)	
Healthy Habits Comparison	Baseline	27 (66)	14 (34)	≤.001 <sup>a</sup>		2 (5)	13 (33)	24 (62)	
	8-week	38 (97)	1 (3)			5 (13)	32 (84)	1 (3)	
	Baseline	23 (61)	15 (39)	.289 <sup>a</sup>	≤.001 <sup>b</sup> *				≤.001 <sup>b</sup> *
	8-week	19 (50)	19 (50)						

<sup>a</sup> McNemar test to compare self-efficacy difference at baseline and over 8-week program in both groups

<sup>b</sup> Pearson's Chi-square to compare self-efficacy difference between both groups.

\*Level of significance P<0.05

At the beginning of the program, children were asked “How sure they could choose healthy snacks”. **Table 6** shows their answers, 27 % of the HH group answered that they were very sure that they could choose healthy snacks. After the 8-week nutrition education, the intervention group significantly increased their attitudes of choosing healthy snack by 82% ( $P \leq .001$ ). However, only 18% of the comparison group were sure to select healthy snacks, the proportion that decreased to 5% at the end of the study period ( $P = .165$ ). Comparing both groups demonstrated that the HH group significantly ( $P \leq .001$ ) increased their self-efficacy and beliefs.

Children in both groups were also asked “How sure they could eat breakfast every morning” (**Table 6**). At baseline, 41% of children in the HH group were very sure that they could eat their breakfast every morning. Then, their confidence grew during the 8 weeks of the program significantly ( $P \leq .001$ ), improving their attitudes of having their breakfast every morning to 82%. On the other hands, at the beginning of the study, 45 % of the comparison group were very confident that they could eat their breakfast every morning, which decreased to 24% at the end of the study ( $P = .136$ ). Also, in the comparison group, during the study period, the answer to the question “somewhat sure of having their breakfast every morning” grew by 56%. The responses to these questions were significantly different between the two groups ( $P = .001$ ).

**Table 6: Attitudes' Changes**

Groups		Choose Healthy Snacks				Eat breakfast Every Morning					
		Not Sure n (%)	Somewh at n (%)	Very Sure n (%)	<i>P</i> - Value	<i>P</i> - Value	Not Sure n (%)	Somewh at n (%)	Very Sure n (%)	<i>P</i> -Value	<i>P</i> - Value
<b>Healthy Habits</b>	<b>Baseline</b>	11 (27)	19 (46)	11 (27)	≤.001 <sub>a</sub>	≤.001 <sub>a</sub>	3 (7)	21(51)	17 (41)	≤.001 <sub>a</sub>	≤.001 <sub>a</sub>
	<b>8-week</b>	0 (0)	7 (18)	32 (82)			0 (0)	7 (18)	32 (82)		
<b>Comparison</b>	<b>Baseline</b>	8 (21)	23 (61)	7 (18)	.165 <sub>a</sub>	≤.001 <sub>a</sub>	4 (10)	17 (45)	17 (45)	.136 <sub>a</sub>	≤.001 <sub>a</sub>
	<b>8-week</b>	12 (32)	24 (63)	2 (5)			4 (10)	25 (66)	9 (24)		

<sup>a</sup> Pearson's Chi-square test to compare the difference between groups at baseline

\*Level of significance P<0.05

## **Discussion**

According to most researches, weight-loss interventions that involved a combination of behavior modification, diet, and physical activity are associated with the most success in obesity treatment <sup>1,23-26</sup>

Several studies have been conducted successfully in this field, but this is the first study conducted specifically in Kuwait, having in consideration the cultural differences in dietary and exercise habits. Since obesity is highly prevalent in Kuwait, with 37.8% of its population obese, one of the highest prevalence of obesity,<sup>27,28</sup> this study is warranted. Our intra- and inter-group analyses indicated that the Healthy Habits program had significant impact on the assessed outcomes (BMI percentiles, dietary behavior, attitudes and self-efficacy). Also, our findings supported the hypotheses that children eating behaviors drastically changed after the 8-week nutrition education: the HH group skipped breakfast meal less and they consumed less calories when compared with their baseline and the comparison group.

The results also demonstrated that the Healthy Habits program influenced children's beliefs and attitudes positively as hypothesized. An important factor for successfully promoting change in children was the presentation of healthy behavioral models by the investigators during the children's daily life in the camp. Children observed the role-model's behavior and engraved that behavior in their memory. Later, they reproduced this behavior in their daily life by using model's behavior as a reference.<sup>8</sup>

Implementing the Healthy Habits program led to a dramatic change in the lifestyles of the individuals, particularly the children. Thus, a change in the lifestyle absolutely impacted the childhood obesity and potentially their future health status. Children in this

specific age range become more independent and have less adult control for choosing their food, they use their newly acquired knowledge to role-play in their games. Their new attitudes and beliefs are reflected on the selection of their own meals and physical activity behaviors.<sup>29</sup> Because food preferences and behaviors are acquired in early childhood, children are more likely to adapt the healthy habits and enjoy healthy foods when they grew up.

The first hypothesis referred to changes in weight gain with the intervention. After 8-week intervention, children started reducing their caloric intake by decreasing the portion size and selecting healthier snacks; however, their body weight tended more to be maintained, which is the healthier outcome, since children are in a growing phase and should grow into their weight instead of losing weight. The goal in this case is prevention of obesity instead of weight loss. Our results were supported by multiple studies conducted on other pediatric populations to improve eating behavior and decrease childhood obesity.<sup>24,30</sup>

As proposed in our second hypothesis, at the end of the Healthy Habits program, children skipped breakfast meal less. They consumed more breakfasts at the end of the program because they learned the importance of this meal. This was one of the goals set by the children at the beginning of the program as a part of the social cognitive theory constructs (Goal Settings).<sup>29</sup> When they reached the goal, they earned a score. The child who received more scores won. Thus, the competition motivated eating breakfast, and ultimately adapting this behavior. Therefore, our hypothesis was accepted.

In this study, it was also hypothesized that when compared the results of the Healthy Habits program with their baseline and those of the comparison group, children consumed

less calories. In fact, the traditional food in the Arabian Gulf region, Kuwait specifically, is caloric dense.<sup>27</sup> Additionally, western fast food has rapidly been included as part of the daily diet, which is also high in calories.<sup>27</sup> Thus, children living in Kuwait are more likely to be obese. In measuring children's intake, those who participated in the Healthy Habits program practiced nutrition-related behaviors such as reading nutrition labels and energy balancing. Therefore, children learned through their nutrition education how to control their caloric intake and keep their meals balanced, which explains their significant decrease in caloric intake, and therefore, this hypotheses was accepted.

The fourth hypothesis that was accepted was that children who participated in the Healthy Habits program will choose healthy snacks more frequently comparing with their baseline and the comparison group. In fact, children are more likely to choose unhealthy snacks such as potato chips, candy, cookie and cake.<sup>31,32</sup> This was also considered one of the reasons of increasing body weight and BMI percentile in this population.<sup>31,33</sup> Therefore, the result of this study showed an agreement with the hypothesis. Clearly, our results indicated that children in the intervention group selected significantly more healthy snacks at end of the program. The results of this study were supported by Matvienko et al.,<sup>34</sup> which found that children who participated in nutrition education programs were more likely to choose healthy snacks.

Lastly, it was hypothesized that children would have smaller portion size at the end of the program. In fact, parents always provided their children with big portion of food.<sup>35</sup> In fact, there is a tremendous lack of nutritional knowledge and the meaning of food labels among the population, and a lack of food industry concern about producing healthy food choices.<sup>27</sup> Therefore, lack of portion size control is also a reason of increasing childhood



obesity.<sup>36</sup> Nevertheless, children in the program learned what were the appropriate servings sizes and food groups to achieve energy balance. Thus, children improved their nutritional knowledge and as a consequence changed this behavior. Therefore, this hypothesis was also accepted.

## **Conclusion**

After conducting the Healthy Habits program to change eating behaviors among Kuwaiti children, we concluded that the program had great impact to prevent and ameliorate childhood obesity as a long-term outcome. Indeed, the Healthy Habits group changed their eating behaviors significantly when compared with the comparison group. Even though their body weight did not decrease greatly, they maintained their weight and grew into it, with the goal to achieve or maintain normal body weight as they were growing up.

This was a pilot study of a potential intervention to prevent obesity. The results of this study have been encouraging. A deployment of the program assuring high fidelity in larger populations is recommended to obtain more informative data. Also, an 8-week program was not enough to show obvious changes in body weight among this age range. For measuring success in pediatric populations, especially in an intervention that produces modest weight changes, children should be followed until adulthood. Lack of long-term follow-up was one of the limitations of this study. Since eating behavior change with time, stronger evidence would be provided if there was a chance to evaluate the changes over time.

Furthermore, we strongly recommend a collaboration with the Ministry of Health and the Ministry of Education to increase awareness among children and their mothers

about long-term risk of childhood overweight and obesity. Additionally, we recommend the implementation of this comprehensive program with physical activities, behavior modification and nutrition education that includes families, not only in camps, but also in schools, to decrease childhood obesity and prevent obesity and its sequelae in adulthood among their populations.

## References

1. Sacher P, Kolotourou M, Chadwick P, Cole T, Lawson M, Alan Lucas A and Singhal A, Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity, *OBESITY*, (2010); 18(1): S62-S68.
2. Choudhry S, McClinton-Powell L, Solomon M, Davis D, Lipton R, Darukhanavala A, Steenes A, Selvaraj K, Gielissen K, Love L, Salahuddin R, Embil F, Huo D, Chin M, Quinn M, and Burnet D, Power-Up: A Collaborative After-School Program to Prevent Obesity in African American Children, *Progress Community Health Partnersh*, (2011); 5(4): 363–373.
3. Croker H, Lucas R and Wardle J, Cluster-randomised trial to evaluate the ‘Change for Life’ mass media/ social marketing campaign in the UK, *BMC Public Health* (2012); 12: 404.
4. Eisenmann J C, Alaimo K, Pfeiffer K, Paek H.-J, Carlson J J, Hayes H., Thompson T, Kelleher D, Oh H J, Orth J, Randall S, Mayfield K, Holmes D, Project FIT: Rationale, design and baseline characteristics of a school- and community-based intervention to address physical activity and healthy eating among low-income elementary school children. *BMC Public Health*, (2011); 11: 607.
5. Rogers V, Hart P, Motyka E, Rines E, Vine J, and Deatrick D, Impact of Let’s Go! 5-2-1-0: A Community-Based, Multisetting Childhood Obesity Prevention Program, *Journal of Pediatric Psychology*, (2013); 38(9): 1010–1020.
6. Hopkins, L C, Fristad M, Goodway J, Eneli I, Holloman C, Kennel K A, Melnyk B M, Gunther C, Camp NERF: Methods of a Theory-based Nutrition Education Recreation and Fitness Program Aimed at Preventing Unhealthy Weight Gain in Underserved Elementary Children during Summer Months, *BMC Public Health* (2016); 16: 1122.

7. Larsen KT, Huang T, Ried-Larsen M, Andersen LB, Heidemann M, Møller NC, A Multi-Component Day-Camp Weight-Loss Program Is Effective in Reducing BMI in Children after One Year: A Randomized Controlled Trial. *PLoS ONE*, (2016); 11(6): e0157182.
8. Bandura A, Health Promotion by Social Cognitive Means, *Health Education & Behavior*, (2004); 31(2): 143-164.
9. Evans A, Ranjit N, Hoelscher D, Jovanovic C, Lopez M, McIntosh A, Ory M, Whittlesey L, Mckyer L, Kirk A, Smith C, Walton C, Heredia NI, Warren J, Impact of school-based vegetable garden and physical activity coordinated health interventions on weight status and weight-related behaviors of ethnically diverse, low-income students: Study design and baseline data of the Texas, Grow! Eat! Go! (TGEG) cluster-randomized controlled trial, *BMC Public Health*, (2016); 16(1): 973.
10. CATCH Kids Club, Healthy habits & nutrition (Grades K-5) curriculum, Activities for After-School and Community Recreation Settings.
11. WHO AnthroPlus for Personal Computers Software for assessing growth of the world's children and adolescents, Designed and developed by Monika Blössner, Amani Siyam, Elaine Borghi Adelheid, Onyango Mercedes de Onis, Department of Nutrition for Health and Development, Geneva, Switzerland, Simon Goumaz blue-infinity, sa, Geneva, Switzerland
12. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, Flegal KM, Guo SS, Wei R, Mei Z, Curtin LR, Roche AF, Johnson CL, CDC growth charts: United states. *Advance Data*, (2000); 8(314):1-27.
13. McCallum Z, Wake M, Gerner B, Baur L, Gibbons K, Gold Lisa, Gunn J, Naughton G, Riess C, Sanci L, Sheetan J, Ukumunne O, Waters E, Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity, *International Journal of Obesity*, (2007); 31(4): 630–636.
14. Nemet D, Barkan S, Epstein Y, Friedland O, Kowen G, Eliakim A, Short- and long-term beneficial effects of a combined dietary-behavioral-physical activity intervention for the treatment of childhood obesity, *Pediatrics*, (2005); 115(4): e443–e449.
15. Reinehr T, de Sousa G, Toschke AM, Andler W. Long-term follow- up of cardiovascular disease risk factors in children after an obesity intervention, *American Journal Clinical Nutrition*, (2006); 84(3): 490–496.
16. Kalavainen MP, Korppi MO, Nuutinen OM. Clinical efficacy of group- based treatment for childhood obesity compared with routinely given individual counseling, *International Journal of Obesity*, (2007); 31(10): 1500–1508.

17. Shelton, Doug, Kim Le Gros, Lyza Norton, Sue Stanton-Cook, Jane Morgan, and Paul Masterman, Randomised Controlled Trial: A Parent-based Group Education Programme for Overweight Children, *Journal of Paediatrics and Child Health*, (2007); 43(12): 799-805.
18. Farhat A E, Sharma S, Abrams S H, Wong W W, Barlow S E, Kamp K'aana, a 2-Week Residential Weight Management Summer Camp, Shows Long-Term Improvement in Body Mass Index z-Scores, *Journal of Pediatric Gastroenterology and Nutrition*, (2016); 62(3):491-494.
19. Higgins JA, LaSalle AL , Zhaoxing P , Kasten MY, Bing KN, Ridzon SE, Witten TL, Validation of photographic food records in children: are pictures really worth a thousand words?, *European Journal of Clinical Nutrition*, (2009); 63: 1025–1033.
20. Wang DH, Kogashiwa M, Ohta S, Kira S, Validity and reliability of a dietary assessment method: the application of a digital camera with a mobile phone card attachment, *Journal of Nutrition Science Vitaminol (Tokyo)* , (2002); 48: 498–504.
21. MA Y, Olendzki BC, Pagoto SL, Hurley TG, Magner RP, Okene IS, Schneider KL, Merriam PA, Hebert JR, Number of 24-Hour Diet Recalls Needed to Estimate Energy Intake. *Annals of epidemiology*, (2009);19(8):553-559.
22. Hall E, Chai W, Koszewski W, Albrecht J, Development and validation of a social cognitive theory-based survey for elementary nutrition education program. *The International Journal of Behavioral Nutrition and Physical Activity*, (2015);12:47.
23. Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, Summerbell CD, Interventions for treating obesity in children, *Cochrane Database of Systematic Review*, (2009); 1(1): CD001872.
24. Gately P J, Cooke C B, Butterly R J, Mackreth P, Carroll S, The Effects of a Children's Summer Camp Programme on Weight Loss, with a 10 Month Follow-up, *International Journal of Obesity*, (2000); 24(11): 1445-1452.
25. Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S, Waters E, Interventions for treating obesity in children, *Cochrane Database of Systematic Review*, (2003); 3: CD001872.
26. Spear BA, Barlow SE, Ervin C, Ludwig DS, Saelen BE, Schetzina KE, Taveras EM, Recommendations for treatment of child and adolescent overweight and obesity, *Pediatrics*, (2007); 120: S254–S288.
27. ALNohair S. Obesity in Gulf Countries. *International Journal of Health Sciences*, (2014); 8(1):79-83.

28. Alhamad N, Alsumaie M, Alanazi F, Aldamani N, Alamir N and Subahkaran M, Kuwait Nutrition Surveillance System, *Ministry of Health*, (2015):1-27.
29. Lytle LA, Seifert S, Greenstein J, McGovern P, How do children's eating patterns and food choices change over time? results from a cohort study, *American Journal of Health Promotion*, (2000);14(4): 222-228.
30. Reinehr T, de Sousa G, Toschke AM, Andler W. Long-term follow-up of cardiovascular disease risk factors in children after an obesity intervention, *American Journal Clinical Nutrition*, (2006); 84(3): 490–496.
31. Ford CN, Slining MM, Popkin BM. Trends in dietary intake among US 2- to 6-year-old children, 1989-2008, *Journal of the Academy of Nutrition and Dietetics*, 2013; 113(1): 35-42.
32. Dong D, Bilger M, Van Dam R, Finkelstein E, Consumption Of Specific Foods And Beverages And Excess Weight Gain Among Children And Adolescents, *Health Affairs*, (2015); 34(11): 1940-1948.
33. Maffeis C, Grezzani A, Perrone L, Del Giudice EM, Saggese G, Tatò L, Could the savory taste of snacks be a further risk factor for overweight in children?, *Journal of Pediatric Gastroenterology Nutrition*, 2008; 46(4): 429-437.
34. Matvienko O, Impact of Nutrition Education Curriculum on Snacks Choices of Children Ages Six and Seven Years, *Journal of Nutrition Education*, (2007); 39 (5): 281-285.
35. Small N, Lane H, Vaughan L, Melnyk B, McBurnett D, A Systematic Review of the Evidence: The Effects of Portion Size Manipulation with Children and Portion Education/Training Interventions on Dietary Intake with Adults, *Worldviews on Evidence-Based Nursing*, (2013); 102: 69 -81.
36. Torbahn G, Gellhaus I, Koch B, Von Kries, Obermeier V, Holl RW, Fink K, Van Egmond-Frohlich A, Reduction of Portion Size and Eating Rate Is Associated with BMI-SDS Reduction in Overweight and Obese Children and Adolescents: Results on Eating and Nutrition Behaviour from the Observational KgAS Study, *Obesity Facts*, 2017; 10(5): 503-516.

## CHAPTER V: IMPACT OF NUTRITIONAL EDUCATIONAL INTERVENTION TO CHANGE EATING BEHAVIORS ON PERCENT FAT MASS

### **Abstract**

**Background:** Although changing eating behaviors programs have been shown effective improving health and body weight, few have assessed the effect of changes on eating behaviors on body composition. This study aimed to assess the impact of the Healthy Habits (HH) program on body composition, including fat mass percent (%FM) and percent of fat free mass (%FFM).

**Methods:** Seventy-nine children participated in two summer camps for 8 weeks in Kuwait. One of these camps was assigned to be the HH group. The other camp was considered the comparison group. The Healthy Habits intervention focused on changing eating behaviors among 6-10 years old children. The intervention was developed based on the Social Cognitive Theory (SCT). Anthropometrics, body composition and changing in behavior were measured at baseline and after 8 weeks of intervention.

**Results:** Girls had more body fat mass than boys in their same age group. The changes in body composition between baseline and 8 weeks were significantly associated with the Healthy Habits intervention. %FM and %FFM between the groups was significantly associated with the nutrition education. There was a significant decrease in %FM in the HH group compared with the comparison group [(-1.495 ± .933) vs (.3763 ± .603)  $P \leq .001$ ].

**Conclusion:** The Healthy Habits program extended the benefits to improve the body composition. Fat mass percent is an early predictor of childhood obesity and may signal the need for early intervention.

## **Introduction**

The prevalence of childhood obesity in Kuwait was estimated at 18.9% among boys age 5 to 9 years old and it reached 17.3% among girls in the same age range.<sup>1</sup> Most studies conclude that children who gained too much weight in early life will be at risk to develop obesity later.<sup>2,3</sup> Childhood obesity could be assessed and predicted earlier from body composition.<sup>3</sup> Unfortunately, this type of biomarker for obesity risk has not been adequately studied. In addition, limited studies have been conducted to evaluate the association between changing eating behaviors and body composition.<sup>3</sup> The current study aimed at assessing the impact of the Healthy Habits program on body composition including %FM percent and %FFM. Percent fat mass and fat free mass was estimated by using bioelectrical impedance technique, which depends on body's conductivity of the electrical current. Fat and fat-free compartments have very different impedance (resistance to safe electrical current).<sup>4</sup> The fat-free compartment has high water content, which is a good conductor of current and yields a low impedance. However, the fat compartment is a poor conductor of current and yields a high impedance.<sup>4</sup> The accuracy of the technique is affected by body hydration levels such as food, drinks, exercise and illness. These types of data (fat mass and fat free mass) have not been measured before among children in GCC region. Therefore, the findings of this study could be used as a justification for building a future reference system to detect normal and obesity-predictive cutting points for body fat percent in children in Kuwait and GCC countries since they share similar culture, diet, religious beliefs and lifestyle.

## **Method**

### **Sample**

In the summer of 2017 (July 2<sup>nd</sup> - August 31<sup>st</sup>), 79 children participated in two summer camps for 8 weeks. One of the camps was randomly assigned to the intervention camp (Healthy Habits program) and the other was considered a comparison camp. The two camps were similar in age range, socio-economic status, activities offered, curricula and duration of the camps. For inclusion, participants fulfilled the following criteria: 6–10 years old, able to participate in the study for 8-week and able to attend at least 80 % of the session and complete the program. Exclusion criteria were those who suffered from mental disabilities such as autism or ADD and chronic disease that require medication such as Diabetes, Cancer and Heart diseases and using nutritional supplements.

### **Intervention**

The tools of the intervention were developed based on the Social Cognitive Theory (SCT).<sup>5</sup> Children in the HH program received nutritional behavioral educational sessions with physical activities offered by the camp during the 8-week of the study. The comparison group was receiving similar regular physical activities offered by the camp. They were asked to follow their regular routine without the intervention.

**Nutritional Educational sessions:** There were 8 nutritional topics that were discussed with the children during the intervention. The topics that were covered were: **Nutrition and Health; The Importance of Breakfast; Fast Food, Healthy Snack; Go, Slow, and WHOA Food; How Many Servings; Energy Balance** and **Go, Go, Go for Snack**. These lessons were taken from CATCH Kids Club nutrition curriculum.<sup>6</sup>



## **Data Collection**

**BMI -for- Age Percentile:** After measuring children's height and weight, we categorized the BMI by using WHO BMI (AnthroPlus software).<sup>7</sup> This is considered a practical method of screening adiposity.<sup>8</sup> Based on the literature, health risks are associated with BMI categories.<sup>8-14</sup>

**Waist-to-height ratio (WHtR):** Waist circumference was taken by using the standard tape taking the average of three readings. WHtR was calculated to measure abdominal (central) obesity among children.<sup>15,16</sup> Based on Ashwell et al.<sup>15</sup>, they defined abdominal obesity at 0.5. Abdominal obesity is associated with metabolic diseases including diabetes and heart diseases.<sup>10,15,16</sup>

**Body composition analyzer:** We measured %FM and %FFM by using the bioelectrical impedance technique in (TANITA BF-689), which depends on body's conductivity of the electrical current. The child took off the shoes and socks and stepped on the measuring platform with slightly separated feet. Then, the device calculated the body fat % and displayed in the small screen.

**Healthy Habit Questionnaire (modified):** Children answered the questionnaire, which was designed to evaluate the relationship between behavior, knowledge, food and health.<sup>17</sup> In young children the questionnaire was administered by the investigators. The questionnaire was developed based on the Social Cognitive Behavioral Theory components.

## Statistical Analysis

The intent-to-treat principle was used in the analyses. The statistical analyses were conducted by using SPSS v.23 (Chicago, USA). All tests were two-sided with statistical significance set at  $P < 0.05$ . The effectiveness of the nutrition education intervention was assessed by differences in mean between groups from baseline to the end of the 8-week program. Changes in body compositions were compared using paired-samples  $t$  tests within each group and independent samples  $t$  tests between groups. The influence of eating behavioral changes on fat mass percent was measured by Linear Regression, and independent samples  $t$  tests.

## Results

Forty-one participants in the HH group had a mean BMI of  $17.85 \pm 2.860$  at baseline while 38 participants in the comparison group had a mean BMI of  $17.38 \pm 2.817$ . **Table 1** shows no significant differences in age, weight, waist-to height ratio and BMI percentile between both groups at baseline.

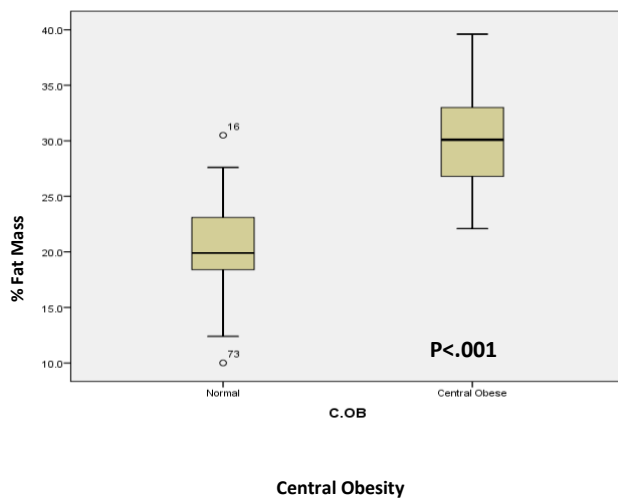
**Table 1:** Anthropometrics and Groups differences

		Mean $\pm$ SD	Mean Difference	95% CI		P-Value
				Lower	Upper	
<b>Age</b>	Healthy Habits	7.34 $\pm$ 1.45	-.313	-.950	.324	.331 <sub>a</sub>
	Comparison	7.05 $\pm$ 1.39				
<b>Weight (Kg)</b>	Healthy Habits	29.64 $\pm$ 7.64	-2.0886	-5.7805	1.6032	.263 <sub>a</sub>
	Comparison	27.56 $\pm$ 8.75				
<b>Height (cm)</b>	Healthy Habits	127.500 $\pm$ 10.4	-2.5289	-6.7650	1.7071	.238 <sub>a</sub>
	Comparison	124.97 $\pm$ 8.26				
<b>Waist Circumference (cm)</b>	Healthy Habits	62.44 $\pm$ 8.91	-1.8783	-5.8550	2.0984	.350 <sub>a</sub>
	Comparison	60.56 $\pm$ 8.83				
<b>Waist- Height ratio</b>	Healthy Habits	.4886 $\pm$ .044	-.008610	-.029561	.012341	.416 <sub>a</sub>
	Comparison	.4800 $\pm$ .049				
<b>BMI (percentile)</b>	Healthy Habits	17.85 $\pm$ .	-.4747	-1.7473	.7979	.460 <sub>a</sub>
	Comparison	17.38 $\pm$ .2817				

a Independent t-test to compare differences between groups at baseline  
 95% CI= Confidence Interval of the Difference,

As shown in **Figure 1**, children who recorded abdominal (central) obesity measurements of Waist/Height ratio  $\geq 0.5$ , had higher fat mass percent.

**Figure 1:** Relationship between Waist/Height ratio and %FM



## Effect of the Healthy Habits Program on Children’s Body Composition (%FM & %FFM)

A significant reduction of children’s body weight were observed among the HH group when baseline body weight was compared with the end of the program [(29.92 ± 8.89kg) vs (29.72 ± 8.89kg),  $P=.029$ ]. However, there was a significant increase in children’s body weight in the comparison group as shown in [(27.55 ± 7.64kg) vs (27.99 ± 7.67kg),  $P\leq.001$ ] (**Table 2**). Also, the changes in body composition between baseline and 8 weeks were significantly associated with the Healthy Habits intervention. **Table 2** shows that fat mass percent was significantly decreased among the HH group after 8-week intervention [(24.94 ± 6.06) vs (23.45± 5.61),  $P\leq.001$ ], however; it was significantly increased among comparison group [(22.91 ± 6.00) vs (23.29± 6.20),  $P\leq.001$ ]. Percent fat free mass was significantly associated with nutrition education as shown in **table 2**, the mean of %FFM among the HH group was significantly increased compared with the %FFM at baseline [(75.06 ± 6.05) vs (76.55 ± 5.60),  $P\leq.001$ ]. Nevertheless, there was significant decrease in mean of %FFM among comparison group [(77.09± 6.00) vs (76.92 ± 6.25),  $P\leq.001$ ].

**Table 2:** Body weight and body composition at baseline and end 8-week program

	Healthy Habits			Comparison Group		
	Baseline	8-week	P-Value	Baseline	8-week	P-Value
	Mean ± SD	Mean ± SD		Mean ± Std	Mean ± Std	
<b>Weight (Kg)</b>	29.92 ± 8.89	29.72 ± 8.89	.029 <sub>a</sub>	27.55 ± 7.64	27.99 ± 7.67	≤.001 <sub>a</sub>
<b>%FM</b>	24.94 ± 6.06	23.45± 5.61	≤.001 <sub>a</sub>	22.91 ± 6.00	23.29± 6.20	≤.001 <sub>a</sub>
<b>%FFM</b>	75.06 ± 6.05	76.55 ± 5.60	≤.001 <sub>a</sub>	77.09± 6.00	76.92 ± 6.25	.001 <sub>a</sub>

<sub>a</sub> Paired t-test to compare at baseline and over 8-week program

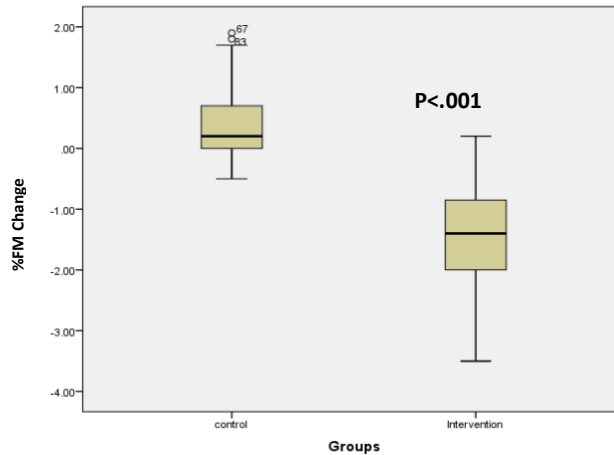
The impact of the program on body composition between the groups is shown in **Table 3**. It shows the mean difference (at the end of the program - at baseline) of children body weights was significantly reduced among the HH group compared with the comparison group program  $[(-.1954 \pm .537\text{kg}) \text{ vs } (.4413 \pm .406\text{kg}), P \leq .001]$ . Furthermore, there was a significant decrease in the percent fat mass percent among the HH group compared with the comparison group  $[(-1.495 \pm .933) \text{ vs } (.3763 \pm .603), P \leq .001]$ . Also, the mean difference of the %FFM among the HH group was significantly increased compared with the comparison group  $[(1.494 \pm .9333) \text{ vs } (-.9974 \pm 1.621), P \leq .001]$ . **Figure 2** below reflects the mean difference between the groups. So, most children in the HH group decreased approximately 1.5% of FM, and therefore, increased their FFM by 1.8 %.

**Table 3:** Body Weight and Body Composition Changes between both Groups

		Mean $\pm$ SD	Mean Difference	95% CI		P-Value
				Lower	Upper	
<b>Weight (Kg)</b>	Healthy Habits	$-.1954 \pm .537$	.6367	.42009	.85331	$\leq .001_a$
	Comparison	$.4413 \pm .406$				
<b>FM</b>	Healthy Habits	$-1.495 \pm .933$	1.871	1.513	2.228	$\leq .001_a$
	Comparison	$.3763 \pm .603$				
<b>FFM</b>	Healthy Habits	$1.494 \pm .9333$	-2.492	-3.090	-1.893	$\leq .001_a$
	Comparison	$-.9974 \pm 1.621$				

<sup>a</sup> Independent t-test to compare the difference (over 8-week program –baseline) for both groups, 95%CI= Confidence Interval of the Difference

**Figure 2:** Differences in Mean Percent of Fat Mass Changes in Both Groups



### **Effect of Eating Behavior Changes on Children’s Body Composition**

As reported in the previous chapter, the Healthy Habits program had an effect on changing children’s eating behaviors, these changes extended to their body composition, specifically percent of fat mass. **Table 4a** shows that in univariate analyses, a decrease in caloric intake was significantly associated with a decrease in %FM at the end of the 8-week program ( $P \leq .001$ ). When the caloric intake, portion size and selection of healthy snacks changes were included in a multivariate regression model, only changes in caloric intake and maintained significance (**Table 4b**).

**Table 4a:** Univariate Regression Effect of Eating Behavior Changes on Children’s Fat Mass Percent

Changes	Regression Coefficient	Std. Error	P-Value
Caloric Intake	.738	.001	≤.001

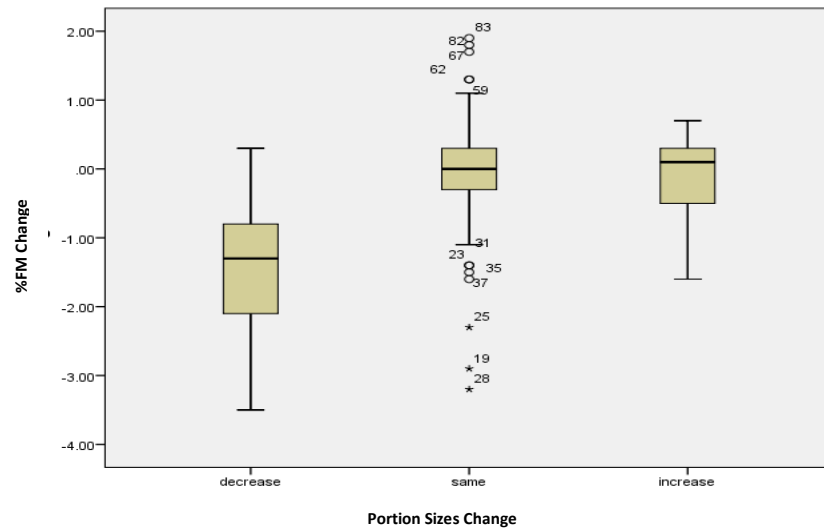
**Table 4b:** Multivariable Regression Effect of Eating Behavior Changes on Children’s Fat Mass Percent

Changes	Regression Coefficient	Std. Error	P-Value
Caloric Intake	.485	.001	.003
Portion Size	.043	.286	.779
Healthy Snack	.157	.259	.174

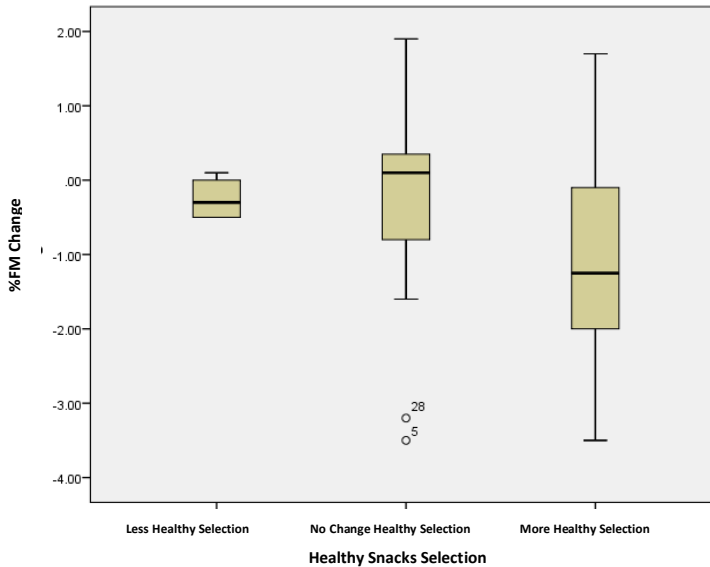
Furthermore, the results indicated that positive changes in portion size and healthy snack were associated with decreased %FM ( $P<.001$ ), which is represented in **Figure 3**.

**Figure 3:** Effect of Behavioral Changes on Body Fat mass

(A)



**(B)**



### **Body Fat Mass Percent among Kuwaiti Children**

**Table 5** reports %FM values for age and gender in children within normal weight. In boys, the average %FM for normal BMI percentile in children age 6 years was  $18.7 \pm 1.680\%$  while the average among girls of the same age and normal BMI percentile category was  $20.14 \pm 2.083\%$ . Moreover, boys who were 7 years of age had an average  $18.7 \pm 1.25\%$  but girls recorded  $21.4 \pm 1.543\%$ . Our cohort of 8 year-old children were all overweight or obese, therefore we were unable to estimate %FM for them, the average %FM among girls of normal weight at this age was  $23.9 \pm 1.081\%$ . In summary, girls had more %FM than boys in their same age range, which is consistent with the literature.<sup>18-20</sup>



**Table 5:** Baseline body fat mass percent

Age	Boys			Girls			Total N
	N	Mean $\pm$ SD	Min - Max	N	Mean $\pm$ SD	Min - Max	
<b>6</b>	11	18.7 $\pm$ 1.680 <sub>a</sub>	15.1 – 21.7	10	20.14 $\pm$ 2.083 <sub>a</sub>	17.2 – 24.9	21
<b>7</b>	4	18.7 $\pm$ 1.25 <sub>a</sub>	17.5 – 19.9	4	21.4 $\pm$ 1.543 <sub>a</sub>	20.1 – 23.4	8
<b>8</b>	0			6	23.9 $\pm$ 1.081 <sub>a</sub>	22.9 – 25.9	6
<b>9</b>	3	21.9 $\pm$ 4.932 <sub>a</sub>	18.6 – 27.6	1	23.1 $\pm$ 0.00 <sub>a</sub>	21.7 – 22.2	4
<b>10</b>	0			2	22.2 $\pm$ .6364 <sub>a</sub>	21.7 – 22.2	2

a Mean  $\pm$  SD, N= number of children

## Discussion

The analysis indicated that both camps were similar in assessed anthropometric parameters (waist circumference, waist/height ratio and BMI percentile) at baseline (**Table 1**) which demonstrated that the second camp was adequate comparison group. This study supported previous studies that children who were defined as abdominally obese, scored high waist to height ratio= 0.5, had more fat mass.<sup>21,22</sup> Our findings also supported the hypotheses that after an 8-week nutrition education (the Healthy Habits intervention), children’s eating behaviors improved and body fat decreased compared with their baseline measures and the comparison group. The factors that associated with the reduction of fat mass were changes in healthy eating behaviors that practiced during the children’s daily life in the summer camp intervention’s period specifically. As observed, children in the intervention decreased their caloric intake, portion size and started having more healthy snacks. Thus, these results supported previous studies that reported that positive changes in healthy eating behaviors, including energy balance and quality diet were associated to changes in body weight and fat mass percent.<sup>23</sup>

The HH program in Kuwait also showed significant increase in %FFM resulting from changes in %FM. Thus, this supported our hypothesis that children in the HH group

would increase their fat free mass percent after 8-week nutrition education program when compared with the baseline and the comparison group.

Implementing this type of intervention to change eating behaviors led to changes in the body composition. The Healthy Habits program educated children how to eat energy balanced meals. Thus, by reducing their caloric intake significantly, the calories that might be stored as fat in the body were reduced. Our findings showed significant association between caloric intake and %FM. These results were supported by studies conducted on other pediatric populations to assess the effect of caloric intake on body weight and fat percent.<sup>23, 24</sup>

After the 8-week intervention, children in the intervention group had smaller portion sizes of their food. This eating behavior had a strong association with body weight reduction as reported in previous studies.<sup>25-27</sup> In this study, we examined the relation between portion size and fat mass percent and found a significant association between smaller portion size and decreasing fat mass percent.

As the Healthy Habits program had significant effect on improving the selection of healthy snacks, the analysis also indicated that the Healthy Habits program had a significant and inverse correlation between selecting healthy snacks and the fat mass percent. These result were in agreement with Altman et.al.<sup>23</sup> that a high-quality diet reduced body weight and fat percent.

In univariate regression analysis (**Table 4a**), all three behaviors, decreasing caloric intake and portion size and improving in selection healthier snacks, were significantly associated with decreased %FM, but in multivariate analysis (**Table 4b**), only caloric

intake and healthier snacks selection maintained significant and independent effects on %FM, explaining 57% of the variance.

Body fat mass percent values, that specified the age and gender for normal BMI percentile, were also reported in this study. As the goal of the study was to use the body composition analysis to examine the effect of the HH program on adiposity. Nevertheless, our results indicated that fat mass percent among our sample was higher compared with other references.<sup>18-20</sup> Girls in the present study had higher fat mass percent compared with boys at the same age. Although children have normal BMI percentile, they still recorded higher fat mass percent compared with Body Fat Percentile Curves for U.S. children and Asian Indian Reference.<sup>20, 28</sup> Therefore, our findings indicate that changes in %FM is a good biomarker of successful interventions for the prevention of obesity, the reported data in this study could be used as an indication that Kuwait and other GCC countries need to develop their own pediatric reference curves for body fat percent, as they share similar culture, religion and lifestyle.<sup>29</sup>

### **Limitations**

Among the limitations of this study were a small sample size and using of a convenience sample, with lack of randomization. However, the fact that both summer camps had similar curricula of activities, the same age group, were contemporaneous, had no differences in the most important demographic characteristics at baseline (**Table 1**), and were in geographic proximity contributed strength to the design.

### **Conclusion**

In summary, the impact of nutrition education on changing eating behaviors was demonstrated by this study that also showed their extended influence on body

compositions. Indeed, the Healthy Habits program changed not only in weight but also in body composition compared to their baseline and the comparison group. Detection of high body fat mass percent among children could help in prevention of childhood obesity and the chronic diseases that later in life that related to obesity.

Also, when we compared the fat mass percent of children in our study with other reference values, they showed higher values, thus; suggesting that Kuwait and the GCC countries may need to develop their own reference values for measuring accurate body compositions for their pediatric populations.

## References

1. Alhamad N, Alsumaie M, Alanazi F, Aldamani N, Alamir N and Subahkaran M, Kuwait Nutrition Surveillance System, *Ministry of Health*, (2015); 1-27.
2. Marques-Vidal P, Marcelino G, Ravasco P, Camilo M E, Oliveira J M, Body fat levels in children and adolescents: Effects on the prevalence of obesity, *Journal of Clinical Nutrition and Metabolism*, (2008); 3: e321-e327.
3. Koontz MB, Gunzler DD, Presley L, Catalano PM, Longitudinal changes in infant body composition: association with childhood obesity, *Pediatric Obesity*, (2014);9(6):e141-e144.
4. Lukaski HC, Johnson PE, Bolonchuk WW, Lykken GI, Assessment of fat-free mass using bioelectrical impedance measurements of the human body, *American Journal of Clinical Nutrition*, (1985); 41(4): 810-817.
5. Bandura A, Health Promotion by Social Cognitive Means, *Health Education & Behavior*, (2004); 31(2): 143-164.
6. CATCH Kids Club, Healthy habits & nutrition (Grades K-5) curriculum, Activities for After-School and Community Recreation Settings.
7. Kalavainen MP, Korppi MO, Nuutinen OM. Clinical efficacy of group- based treatment for childhood obesity compared with routinely given individual counseling, *International Journal of Obesity*, (2007); 31(10): 1500–1508.

8. Shelton, Doug, Kim Le Gros, Lyza Norton, Sue Stanton-Cook, Jane Morgan, and Paul Masterman, Randomised Controlled Trial: A Parent-based Group Education Programme for Overweight Children, *Journal of Paediatrics and Child Health*, (2007); 43(12): 799-805.
9. Farhat A E, Sharma S, Abrams S H, Wong W W, Barlow S E, Kamp K'aana, a 2-Week Residential Weight Management Summer Camp, Shows Long-Term Improvement in Body Mass Index z-Scores, *Journal of Pediatric Gastroenterology and Nutrition*, (2016); 62(3):491-494.
10. Fryar CD, Gu Q, Ogden CL, Anthropometric reference data for children and adults: United States 2007–2010. National Center for Health Statistics, *Vital Health Statistics*, 2012; 11: 252.
11. Magalhães E, Sant'Ana L, Priore S, Franceschini S, Waist circumference, waist/height ratio, and neck circumference as parameters of central obesity assessment in children, *Revista paulista de pediatria*, (2014): 32(3): 273–281.
12. Higgins JA, LaSalle AL, Zhaoxing P, Kasten MY, Bing KN, Ridzon SE, Witten TL, Validation of photographic food records in children: are pictures really worth a thousand words?, *European Journal of Clinical Nutrition*, (2009); 63: 1025–1033.
13. Wang DH, Kogashiwa M, Ohta S, Kira S, Validity and reliability of a dietary assessment method: the application of a digital camera with a mobile phone card attachment, *Journal of Nutrition Science Vitaminol (Tokyo)*, (2002); 48: 498–504.
14. MA Y, Olendzki BC, Pagoto SL, Hurley TG, Magner RP, Okene IS, Schneider KL, Merriam PA, Hebert JR, Number of 24-Hour Diet Recalls Needed to Estimate Energy Intake. *Annals of epidemiology*, (2009);19(8):553-559.
15. Ashwell M, Lejeune S, McPherson K, Ratio of waist circumference to height may be better indicator of need for weight management, *BMJ*, (1996); 312: 377
16. Magalhães E, Sant'Ana L, Priore S, Franceschini S, Waist circumference, waist/height ratio, and neck circumference as parameters of central obesity assessment in children, *Revista paulista de pediatria*, (2014): 32(3): 273–281.
17. Hall E, Chai W, Koszewski W, Albrecht J, Development and validation of a social cognitive theory-based survey for elementary nutrition education program. *The International Journal of Behavioral Nutrition and Physical Activity*, (2015);12:47.
18. Dr Andrew, Body Fat Reference Curves for children Targeted, *BMJ*, (2004).

19. Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y, Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index, *American Journal of Clinical Nutrition*, (2000); 72: 694-701.
20. Chiplonkar S, Kajale N, Ekbote V, Mandlika R, Parthasarathy L, Borade A, Patel P, Patel P, Khadilkar V, Khadilkar A, Reference Centile Curves for Body Fat Percentage, Fat-free Mass, Muscle Mass and Bone Mass Measured by Bioelectrical Impedance in Asian Indian Children and Adolescents, *Indian Pediatric*, (2017); 54(12): 1005- 1011.
21. Browning LM, Hsieh SD, Ashwell M. A systematic review of waist-to-height ratio as a screening tool for the prediction of cardiovascular disease and diabetes: 0.5 could be a suitable global boundary value, *Nutrition Research Review*, (2010); 23: 247–69.
22. Taylor RW, Jones IE, Williams SM, Goulding A, Evaluation of waist circumference, waist-to-hip ratio, and the conicity index as screening tools for high trunk fat mass, as measured by dual-energy X-ray absorptiometry, in children aged 3–19 y, *American Journal of Clinical Nutrition*, (2000);72: 490–495.
23. Altman M, Holand J, Lundeen D, Kolko R, Sealens B, Welch R, Perri M, Reduction in food away from home is associated with improved child relative weight and body composition outcomes and this relation is mediated by changes in diet quality, *Journal of The Academy of Nutrition and Dietetics*, (2015); 115(9): 1400- 1407.
24. Spear BA, Barlow SE, Ervin C, Ludwig D, Sealens B, Schetzina K, Taveras, Recommendations for treatment of child and adolescent overweight and obesity, *Pediatrics*, (2007); 120(4): S254–S288.
25. Torbahn G, Gellhaus I, Koch B, Von Kries, Obermeier V, Holl RW, Fink K, Van Egmond-Frohlich A, Reduction of Portion Size and Eating Rate Is Associated with BMI-SDS Reduction in Overweight and Obese Children and Adolescents: Results on Eating and Nutrition Behaviour from the Observational KgAS Study, *Obesity Facts*, 2017; 10(5): 503-516.
26. Kling SMR, Roe LS, Keller KL, Rolls BJ, Double trouble: Portion size and energy density combine to increase preschool children’s lunch intake, *Physiology & behavior*, (2016); 162: 18-26.
27. Okada C, Tabuchi T and Iso H, Association between skipping breakfast in parents and children and childhood overweight/obesity among children: a nationwide 10.5-year prospective study in Japan, *International Journal of Obesity*, (2018); 42(10):1724–1732.
28. Laurson Kelly, Eisenmann Joey, and Welk Gregory, Fat Percentile Curves for U.S. Children and Adolescents, *American Journal of Preventive Medicine*, (2011); 41(4S2); S87-S92.

29. ALNohair S. Obesity in Gulf Countries. *International Journal of Health Sciences*, (2014); 8(1):79-83.

## **CHAPTER VI: IMPACT OF MOTHERS PARTICIPATION IN A NUTRITION EDUCATION INTERVENTION ON THEIR CHILDREN EATING BEHAVIOR**

### **Abstract**

**Background:** Since parents control children's life and they are their closest role model, children tend to mimic their parents. Therefore, parents' behaviors influence their children's weight, diet, sugar intake and adapting physical activity lifestyle. To prevent and treat childhood obesity, it has been recommended the development of prevention programs to modify behavior, by involving family, using nutrition education, and increasing physical activity. These types of programs have shown a significant prevention of obesity by moderating BMI.

**Objective:** To determine whether mother's participation in a nutrition education program influence obese children's body weight and improving their health behavior. Additionally, this study evaluates changes in attitude toward food, and beliefs for children-mothers dyad participating in the **Healthy Habits (HH)** program.

**Methods:** Fourteen mothers were willing to participate in the intervention. The mother's intervention was offered to the mothers of children participating in the Healthy Habits group only. Mothers received "what's app" text messages and materials related to the nutrition education provided for all children in the Healthy Habits group during the 8-week period.

**Results:** After an 8-week intervention, children with maternal support showed significant improvement in eating behavior and attitude compared with the other group in the



intervention. Maternal eating behaviors, beliefs and attitudes were also significantly changed by their participation.

**Conclusion:** Maternal involvement in the Healthy Habits program showed positive effect on children eating behavior in addition to improvement in maternal behavior. Our findings suggest that actively involving mothers in programs to reduce childhood obesity, will magnify the potential effects of the program on children by changing the family dynamics and creating a supportive environment.

### **Introduction**

There are many factors that might cause obesity including genetics, illness, lifestyle (behavioral), as well as culture and habits.<sup>1</sup> A study to assess the relationship between children and parents BMI and children and grandparents BMI was conducted among three generation of families; the investigators reported significant correlations between 1) parent and child BMI and sedentary lifestyle, 2) grandparent and child BMI, and 3) grandparent and parent activity with child activity.<sup>2</sup> Several studies found that parents' behaviors influence their children's weight, diet, sugar intake and adapting physical activity lifestyle.<sup>3-5</sup> It was found that parents have a role in children's behavior, because children tend to mimic their parents.<sup>3-5</sup>

In the development of the social-cognitive theory, it was assumed that if children join their parents and use them as role-models for selecting healthy meals and performing physical activity, this will affect their behaviors positively.<sup>3</sup> Therefore, parents should be participating directly or indirectly in behavioral modification interventions to be successful long-term.<sup>6</sup> Several programs involve parents as a fundamental element to change

children's behavior and decrease their weight.<sup>6-8</sup> The evidence showed that parents' engagement is essential for the success of obesity prevention strategies. Lack of parental engagement as a component of their child's intervention will decrease its effectiveness and long-term sustainability, therefore, our planned preventive intervention engaged not only the children in the camp but also their parents.

## **Method**

### **Design**

This study was developed based on Social Cognitive Theory SCT<sup>9</sup> to promote knowledge and behaviors changes.

### **Sample**

The number of participating children enrolled in the Healthy Habits program were forty-one. The maternal involvement section of the study included nineteen children aged 6-10 years old and their mothers. Fourteen mothers of the 19 children were recruited for this study.

The inclusion criteria were that (1) children and mothers consented to participate in this study, (2) the dyad was able to participate in this study for 8 weeks, and (3) mothers had children in the summer camp who were willing to attend at least 80% of the sessions and complete the program. Children who suffered from mental disabilities such as autism, attention deficit disorder (ADD) or chronic disease that require medication such as Diabetes, Cancer and Heart diseases were excluded as well as children using nutritional supplements.

## **Intervention**

All children in the HH program received nutritional behavioral educational sessions with physical activities offered by the camp during the 8 weeks of the study. Fourteen mothers of 19 children were educated based on SCT constructs through the “what’s app” messages. They also received materials related to the topic covered by their respective children in the program, such as food recipes, healthy cooking, and lists of healthy snacks for children to be encouraged to continue these behaviors at home. Mothers also were reminded of offering opportunities to their children to participate in preparing and cooking healthy foods and physical activities, such as assigning physical chores, walks and play time outdoors.

**Nutritional Educational sessions:** There were 8 nutritional topics that were discussed with the children during the intervention. The topics that were covered were respectively: **Nutrition and Health; The Importance of Breakfast; Fast Food, Healthy Snack; Go, Slow, and WHOA Food; How Many Servings; Energy Balance and Go, Go, Go for Snack.** These lessons were taken from CATCH Kids Club nutrition curriculum.<sup>10</sup>

## **Data Collection**

**Socio-demographic Questionnaire:** At baseline, parents completed a socio-demographic questionnaire that reported parents and children social status. The information included: age, gender, nationality, economic situation, parents’ education, parents’ marital status, health status, number of siblings and current type of Nanny help at home.

**BMI -for- Age Percentile:** After measuring mothers and children’s height and weight, we calculated and categorized the BMI by using WHO BMI (AnthroPlus software).<sup>11</sup> BMI is

considered a practical method of screening adiposity.<sup>8</sup> Based on the literature, health risks are associated with BMI categories.<sup>12-15</sup>

**Healthy Habit Questionnaire (modified):** Children answered the questionnaire that was designed to evaluate the relationship between behavior, knowledge, food and health.<sup>16</sup> For youngest children, the investigators administered the questionnaire. The types of questions included were developed based on the components of the Social Cognitive Behavioral Theory.

### **Nutritional Data**

**Photographic Food Recalls:** After being trained, children took pictures of their food before and after they ate their meals by using electronic devices (iPod, iPad or phones). They photographed their meals for 2 days pre- and post-intervention to provide their food intake data when they were at home. It is an easy technique, especially for children 6-10 years old who might not be good historians.<sup>17,18</sup>

**24-hour Recalls (24-HR):** Children were also interviewed twice to assess their food intake at home and confirm the accuracy of the photographic logs. With this method, we were able to measure children's energy consumption, type of food and portion size.<sup>19</sup>

### **Maternal Data Collection**

**General Nutritional knowledge and Behavior Questionnaire for Adults (modified):**

The mothers in the study answered questionnaire that were aimed to assess mother's knowledge, behaviors and their influence on their respective children's eating behavior and weight.<sup>16,20</sup>

## **Statistical Analysis**

The intent-to-treat principle analyses was used for this study. The analyses were conducted by using SPSS v.23 (Chicago, USA). All tests were two-sided with statistical significance set at  $P < 0.05$ . The effectiveness of the nutrition education intervention was assessed by differences in mean between groups from baseline to the end of the 8-week program. Changes in body weight and caloric intake were compared using paired-samples *t* tests within each group and independent samples *t* tests between groups. Chi-square test was conducted to compare changes in selecting healthy snacks and in meal portion size between baseline and the end of the study.

## **Results**

The general characteristics of the child-mother dyad are reported in **Table 1**. Participants in both groups were similar and were not significantly different at baseline in gender, mother's BMI, education, nationality, income, marital status, and assistance of nanny at home. Although the sample was recruited from the same camp, there was significant difference in weight distribution, the group with maternal support had significantly more obese children ( $P = .006$ ).

**Table 1:** General Characteristics

Variables	Healthy Habits (n=22)		Healthy Habits with Maternal Support (n=19)		Total (n=41)		P-Value
	n	%	n	%	n	%	
<b>Children's Gender</b>							
Male	13	59	7	37	20	49	.268 <sub>a</sub>
Female	9	41	12	63	21	51	
<b>Children's Nationality</b>							
Kuwaiti	17	77	18	95	35	85	.151 <sub>a</sub>
Non-Kuwaiti	5	23	1	4	6	15	
<b>Mothers' Nationality</b>							
Kuwaiti	17	77	16	84	33	80	.688 <sub>a</sub>
Non-Kuwaiti	5	22	3	26	8	20	
<b>Mothers' Education</b>							
High School	1	5	2	11	3	7	.089 <sub>a</sub>
2-year Diploma	8	36	1	5	9	22	
Bachelor	12	54	10	53	22	54	
Graduate	1	5	6	31	7	17	
<b>Mothers' Marital Status</b>							
Married	22	100	16	84	38	92	.151 <sub>a</sub>
Divorced	0	0	3	16	3	7	
<b>Income</b>							
Less than Average	1	5	0	0	1	2	.789 <sub>a</sub>
Average	13	59	14	74	27	66	
More than Average	8	36	5	26	13	32	
<b>Nanny</b>							
Yes	19	86	18	95	37	90	.402 <sub>a</sub>
No	3	14	1	5	4	10	
<b>Mothers' BMI</b>							
Underweight	2	9	0	0	2	5	.264 <sub>a</sub>
Healthy weight	13	59	10	52	23	56	
Overweight	6	27	6	32	12	29	
Obese	1	5	3	16	4	10	
<b>BMI z-score</b>							
Underweight	1	5	0	0	1	2	.006 <sub>a</sub> *
Healthy weight	15	68	8	42	23	56	
Overweight	5	22	3	16	8	20	
Obese	1	5	8	42	9	22	

<sup>a</sup> Chi-square test to compare the difference between groups at baseline

\*Level of significance P<0.05

## **Results from the pair-t test within the two study groups: Body Weight Change, Skipping Breakfast & Caloric Intake**

**Table 2** shows the results of paired t-test analyses that compared changes in body weight, score of breakfasts and caloric intake at baseline and after 8 weeks of intervention. A significant decrease in children's body weight was observed in the group with maternal support, when their body weight at baseline is compared with that at the end of the program [(33.83  $\pm$  10.2) vs (33.79  $\pm$  9.82),  $P=.014$ ]. However, our findings showed that among the children in the HH only group, without maternal support, the mean pair t-test in children's body weight did not significantly changed and was maintained [(26.21  $\pm$  5.37) vs (26.18  $\pm$  5.27),  $P=0.755$ ].

In contrast, children's behavioral changes between baseline and the end of the study were significant in both groups, with and without maternal support. Score of breakfast consumed was significantly increased in both, in the children with maternal support ( $P=.004$ ), and in those without maternal support ( $P=.003$ ). Children in both groups also had a significant decrease in caloric intake ( $P\leq.001$ ) after the 8-week nutritional education compared with baseline (**Table 2**).

**Table 2:** Body weight and Behavior Changes at baseline and end 8-week program

	Healthy Habits			Maternal Support Group		
	Baseline	8-week	P-Value	Baseline	8-week	P-Value
	Mean ± SD	Mean ± SD		Mean ± Std	Mean ± Std	
<b>Weight (Kg)</b>	26.21 ± 5.37	26.18 ± 5.25	.755 <sup>a</sup>	33.83 ± 10.2	33.79 ± 9.82	.014 <sup>a*</sup>
<b>Score of BF meal</b>	4.00 ± 1.124	4.70 ± .470	.003 <sup>a*</sup>	4.32 ± .885	4.84 ± .375	.004 <sup>a*</sup>
<b>Calories Intake</b>	2286 ± 476	1858 ± 205	≤.001 <sup>a*</sup>	2141 ± 447	1759 ± 277	≤.001 <sup>a*</sup>

<sup>a</sup> Paired t-test to compare at baseline and over 8-week program,

\*Level of significance P<0.05

**Table 3** displays the results of the independent t- test analyses that were conducted to compare body weight and behavioral changes between the groups. It shows the **mean change of children’s weight** (from baseline to the end of the program) was significantly reduced among the maternal support group compared with the HH only group with no maternal support ( $P=.048$ ). This difference is visualized in **Figure1** below that shows that most of the children in the maternal support group decreased their body weight by 0.20 kg. compared with children in the HH only group, who maintained their weight.

**Table 3:** Body weight changes between both groups

		Mean ± SD	Mean Difference	95% CI		P-Value
				Lower	Upper	
<b>Weight (Kg)</b>	Healthy Habits	-0.0305 ± .431				
	Maternal support	-.368 ± .591	.338	-.004	.673	.048 <sup>a*</sup>

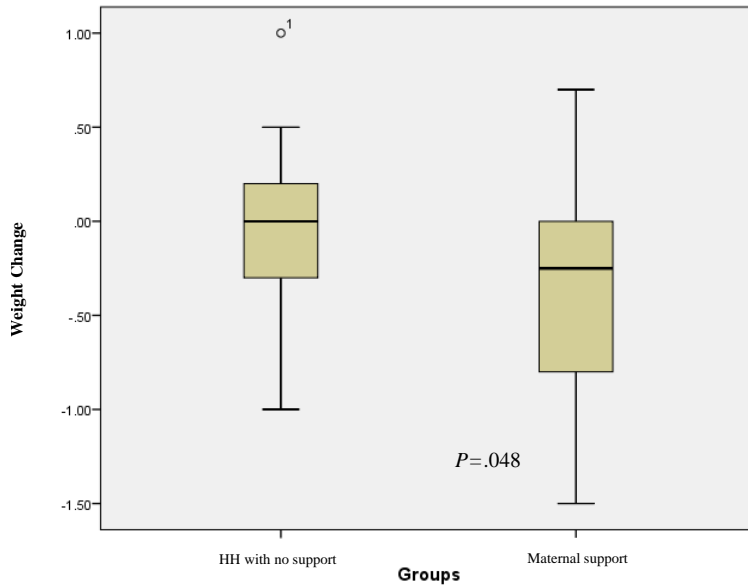
<sup>a</sup> Independent t-test to compare the difference (over 8-week program –baseline) for both groups

95%CI= Confidence Interval of the Difference,

\*Level of significance P<0.05



**Figure 1:** Body weight Changes in both groups



Furthermore, the maternal support group had better breakfast scores, which means that children decreased their habit of skipping breakfast meal at the end of the program compared with the HH group, who had intervention without maternal support. Also, the mean caloric intake among the maternal support group was less at the end of the program compared with the HH only group. However, the magnitude of the change in breakfast scores and caloric intake between the groups was not significant.

**Table 4:** Behavior changes between both groups

		Mean $\pm$ SD	Mean Difference	95% CI		P-Value
				Lower	Upper	
<b>Score of BF meal</b>	Healthy Habits	4.70 $\pm$ .470				
	Maternal support	4.84 $\pm$ .375	-.142	-.419	1.35	.305 <sub>a</sub>
<b>Caloric intake</b>	Healthy Habits	1858 $\pm$ 205				
	Maternal support	1759 $\pm$ 277	99.175	-58.7	257	.211 <sub>a</sub>

<sup>a</sup> Independent t-test to compare between groups

\*Level of significance  $P < 0.05$

95%CI= Confidence Interval of the Difference

### **Effect of Maternal Support with Child's Nutrition Education on Children's Self-efficacy and Attitudes**

**Table 5** shows the Chi-square test analysis that compared changes in selecting healthy snacks and in meal portion size between baseline and the end of the study. In the maternal support group only 21% of the children selected healthy snacks at baseline, but 100% were selecting healthy snacks at the end ( $P \leq .001$ ), a significant change from baseline to the end of the program, and a significant change when compared to those children receiving education but without maternal participation (HH only group) ( $P \leq .001$ ). In the HH only group, however, 45% did choose healthy snacks at baseline, a proportion that increased significantly to 95% over the 8 weeks ( $P = .012$ ), showing that the intervention, even without maternal participation, was significant in changing these attitudes.

There were also positive changes in meal portion size over 8 weeks among children in the maternal support group. Children with active maternal participation significantly

decreased their meals' portion size by 74% ( $P=0.001$ ), but changes in meals' portion size in the HH only group were not significant (**Table 5**).

**Table 5: Self-efficacy Changes**

Groups		Healthy Snacks n (%)	Unhealthy Snacks n (%)	P-Value	P-Value	Change in Portion Size			P-Value
						Increased n (%)	Same n (%)	Decreased n (%)	
<b>Healthy Habits</b>	<b>Baseline</b>	10 (45)	12 (55)	.012 <sup>a*</sup>		1 (5)	9 (45)	10 (50)	
	<b>8-week</b>	19 (95)	1 (5)						
<b>Maternal support</b>	<b>Baseline</b>	4 (21)	15 (79)	≤.001 <sup>a*</sup>	≤.001 <sup>b*</sup>	1 (5)	4(21)	14 (74)	≤.001 <sup>b*</sup>
	<b>8-week</b>	19 (100)	0 (0)						

a McNemar test to compare difference at baseline and over 8-week program in both groups

b Chi-square test to compare difference between both groups.

\*Level of significance P<0.05

Children were asked “How sure that you could choose healthy snacks” at the beginning of the program. **Table 6** shows their answers, 18 % of the children in the maternal support group answered that they were very sure that they could choose healthy snacks. After the 8-week nutrition education, the children in the maternal support group significantly improved their attitudes of choosing healthy snack by 82% ( $P=.011$ ). Similarly, only 36% of children in the HH only group were sure that they could choose healthy snacks, a proportion that also grew significantly to 80% at the end of the study period ( $P=.003$ ). Comparing both groups demonstrated that children in the maternal support group improved their proportion of attitudes more than the HH only group ( $P\leq.001$ ).

Children in both groups were also asked “How sure you could eat breakfast every morning” at the beginning of the program (**Table 6**). At baseline, 58% of children in the maternal support group were very sure that they could eat their breakfast every morning. Then, their confidence grew during the 8 weeks of the program significantly ( $P=.011$ ), improving their attitudes of having their breakfast every morning to 82%.

In the HH only group, at the beginning of the study, 27 % of children were very confident that they could eat their breakfast every morning, which increased significantly to 80% at the end of the study ( $P=.002$ ). Although none of the children in the HH only group answered “not sure that they could have breakfast every morning”, the maternal support group had a higher proportion of being sure of having their breakfast every morning. When comparing both groups, the analysis showed that children with maternal support improved their attitudes significantly ( $P\leq.001$ ) more than the other HH only group.

**Table 6: Attitudes' Changes**

Groups		Choose Healthy Snacks			<i>P</i> -Value	<i>P</i> -Value	Eat breakfast Every Morning			<i>P</i> -Value	<i>P</i> -Value
		Not Sure n (%)	Somewhat n (%)	Very Sure n (%)			Not Sure n (%)	Somewhat n (%)	Very Sure n (%)		
Healthy Habits	Baseline	5 (23)	9 (41)	8 (36)	.003 <sub>a</sub> *		0 (0)	16 (73)	6 (27)	.002 <sub>a</sub> *	
	8-week	0 (0)	4 (20)	16 (80)			0 (0)	4 (20)	16 (80)		
Maternal support	Baseline	6 (32)	10 (53)	3 (18)	.011 <sub>a</sub> *	≤.001 <sub>a</sub> *	3 (18)	5 (26)	11 (58)	.011 <sub>a</sub> *	≤.001 <sub>a</sub> *
	8-week	0 (0)	3 (18)	16 (82)			0 (0)	3 (18)	16 (82)		

<sup>a</sup> Chi-square test to compare self-efficacy, attitudes and beliefs at baseline and 8-week program in both groups.

\*Level of significance  $P < 0.05$

## **Effect of Nutrition Education Program on Mothers' Attitudes and Behaviors**

**Table 7** shows a Chi-square test analysis that compared choosing healthy snacks among mothers participating Healthy Habits program at baseline and the changes over 8 weeks. Only 12% of the participating mothers were able to select healthy snacks at baseline. At the end of the study this proportion grew significantly to 95% ( $P \leq .001$ ), which demonstrated a positive change in self-efficacy.

Mothers also increased significantly their scores on breakfast consumed ( $P \leq .001$ ). Mothers were asked "Do you eat your breakfast every morning?" at the beginning of the program. **Table 7** shows that 21% of the mothers answered that they always ate their breakfast every morning. After participating in the 8-week nutrition education, mothers significantly improved their attitudes about them being able to have breakfast every morning by 82% ( $P = .039$ ).

**Table 7: Nutrition Education Program and Mothers' Attitudes, Behaviors, and Beliefs**

Groups	Healthy Snacks		<i>P</i> -Value	Breakfast	<i>P</i> -Value	Eat breakfast Every Morning			<i>P</i> -Value	
	Healthy Snacks n (%)	Unhealthy Snacks n (%)		Score Mean ± SD		Rare n (%)	Sometimes n (%)	Always n (%)		
<b>Mothers</b>	<b>Baseline</b>	3 (16)	16 (64)	≤.001 <sup>a</sup> *	2.95 ± .470	≤.001 <sup>b</sup> *	4 (21)	11(58)	4(21)	.039 <sup>c</sup> *
	<b>8-week</b>	18 (95)	1(5)		4.47 ± .470		2 (10)	6 (32)	11(58)	

<sup>a</sup> McNemar test to compare self-efficacy difference at baseline and over 8-week program in both groups

<sup>b</sup> Paired t-test to compare at baseline and over 8-week program

<sup>c</sup> Chi-square test to compare attitudes difference between both groups.

\*Level of significance  $P < 0.05$



Although the mother-child dyads' outcomes showed significant changes and improvement in their eating behaviors and attitudes, the comparison between them mostly did not found statistical significance. However, an independent t-test conducted between changes of the mothers and those of their corresponding children in choosing healthy snacks showed that 73% of children from mothers who improved their eating behaviors, also improved their snack selection.

## **Discussion**

This study aimed to evaluate the impact of a nutritional intervention that included the mothers of children participating in a nutritional education intervention in a summer camp in Kuwait, and how maternal changes influence their children eating behaviors and body weight, beyond the benefits afforded by the camp participation. Several studies have been conducted in this field and they reported that weight-loss interventions, which involved mothers or both parent as a part of the intervention, were associated with the most success in obesity treatment. 21- 23

The current study was designed based on a theoretical model that focus on the impact of mothers' involvement for improving their children eating behaviors. Observational learning, a construct of SCT, was applied in this study by identifying mothers as role models. Like in other studies, 24-26 maternal participation influenced their children weight and behaviors. However, most studies did not assess and measure maternal changes in lifestyle, and how these benefited the mothers. Our study is one of few studies that assessed mothers' and children's outcomes in parallel and how maternal changes further influence changes in their children beyond those produced by the camp educational intervention alone.

Our analysis supported the hypotheses that children with maternal support changed their weight and eating behaviors beyond the effects of the 8-week camp's nutritional education. Children with maternal support decreased their body weight, skipped breakfast meal less and consumed less calories when compared with their baseline behaviors and with other children in the camp's nutritional intervention but without maternal support. Therefore, our hypothesis was accepted.

After the 8-week HH intervention program in the camp, both groups, with and without maternal support, consumed more breakfasts, chose more healthy snacks, reduced their portion sizes and decreased their caloric intake significantly in intra-group analysis. However, the inter group analysis showed that the group with maternal support improved their eating behaviors and attitudes significantly more than the group without maternal support.

However, our small maternal sample size was the main limitation in this study. Therefore, future studies with adequate number of participating mothers and adequately powered to show the strength of this relationship need to be conducted, especially because our findings suggested that maternal participation benefits the mothers as much as their children.

## **Conclusion**

Focus on mothers' involvement in this type of intervention to prevent or decrease childhood obesity will increase the success rate of these interventions; as mothers are usually the most important role model in children in the age range of this study. The outcomes of this study showed that maternal support through their involvement in the nutritional education of their children contributed to more positive changes in eating

behaviors and attitudes compared with other children in the Healthy Habits program without maternal involvement. Increasing mothers' awareness and educating them by using text messages and newsletter influenced, not only the children's but also the mothers' eating behaviors, attitudes and beliefs.

## References

1. Pulgaron ER, Delamater AM, Obesity and type 2 diabetes in children: Epidemiology and treatment, *Current Diabetes Reports*, (2014); 14(8): 508-14.
2. Polley DC, Spicer MT, Knight AP, Hartley BL, Intrafamilial correlates of overweight and obesity in african-american and native-american grandparents, parents, and children in rural Oklahoma, *Journal of American Diet Association*, (2005); 105(2): 262-265.
3. Eisenmann J C, Alaimo K, Pfeiffer K, Paek H.-J, Carlson J J, Hayes H., Thompson T, Kelleher D, Oh H J, Orth J, Randall S, Mayfield K, Holmes D, Project FIT: Rationale, design and baseline characteristics of a school- and community-based intervention to address physical activity and healthy eating among low-income elementary school children. *BMC Public Health*, (2011); 11: 607.
4. Bois, J E, Sarrazin, P G, Brustad, R J, Trouilloud, D O, Cury, F, Elementary schoolchildren's perceived competence and physical activity involvement: The influence of parents' role modelling behaviours and perceptions of their child's competence, *Psychology of Sports and Exercise*, (2005); 4(6): 381- 397.
5. Cohen DA, Finch BK, Bower A, Sastry N, Collective efficacy and obesity: The potential influence of social factors on health, *Social Science & Medicine*, (2006); 62(3): 769-778.
6. Hopkins, L C, Fristad M, Goodway J, Eneli I, Holloman C, Kennel K A, Melnyk B M, Gunther C, Camp NERF: Methods of a Theory-based Nutrition Education Recreation and Fitness Program Aimed at Preventing Unhealthy Weight Gain in Underserved Elementary Children during Summer Months, *BMC Public Health* (2016); 16: 1122.
7. Sacher P, Kolotourou M, Chadwick P, Cole T, Lawson M, Alan Lucas A and Singhal A, Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity, *OBESITY*, (2010); 18(1): S62-S68.
8. Choudhry S, McClinton-Powell L, Solomon M, Davis D, Lipton R, Darukhanavala A, Steenes A ,Selvaraj K, Gielissen K, Love L, Salahuddin R, Embil F, Huo D, Chin M,

- Quinn M, and Burnet D, Power-Up: A Collaborative After-School Program to Prevent Obesity in African American Children, *Progress Community Health Partnersh*, (2011); 5(4): 363–373.
9. Bandura A, Health Promotion by Social Cognitive Means, *Health Education & Behavior*, (2004); 31(2): 143-164.
10. CATCH Kids Club, Healthy habits & nutrition (Grades K-5) curriculum, Activities for After-School and Community Recreation Settings.
11. Shelton, Doug, Kim Le Gros, Lyza Norton, Sue Stanton-Cook, Jane Morgan, and Paul Masterman, Randomised Controlled Trial: A Parent-based Group Education Programme for Overweight Children, *Journal of Paediatrics and Child Health*, (2007); 43(12): 799-805.
12. Farhat A E, Sharma S, Abrams S H, Wong W W, Barlow S E, Kamp K'aana, a 2-Week Residential Weight Management Summer Camp, Shows Long-Term Improvement in Body Mass Index z-Scores, *Journal of Pediatric Gastroenterology and Nutrition*, (2016); 62(3):491-494.
13. Fryar CD, Gu Q, Ogden CL, Anthropometric reference data for children and adults: United States 2007–2010. National Center for Health Statistics, *Vital Health Statistics*, 2012; 11: 252.
14. Magalhães E, Sant'Ana L, Priore S, Franceschini S, Waist circumference, waist/height ratio, and neck circumference as parameters of central obesity assessment in children, *Revista paulista de pediatria*, (2014): 32(3): 273–281.
15. Wang DH, Kogashiwa M, Ohta S, Kira S, Validity and reliability of a dietary assessment method: the application of a digital camera with a mobile phone card attachment, *Journal of Nutrition Science Vitaminol (Tokyo)* , (2002); 48: 498–504.
16. Hall E, Chai W, Koszewski W, Albrecht J, Development and validation of a social cognitive theory-based survey for elementary nutrition education program. *The International Journal of Behavioral Nutrition and Physical Activity*, (2015);12:47.
17. Higgins JA, LaSalle AL , Zhaoxing P , Kasten MY, Bing KN, Ridzon SE, Witten TL, Validation of photographic food records in children: are pictures really worth a thousand words?, *European Journal of Clinical Nutrition*, (2009); 63: 1025–1033.
18. Wang DH, Kogashiwa M, Ohta S, Kira S, Validity and reliability of a dietary assessment method: the application of a digital camera with a mobile phone card attachment, *Journal of Nutrition Science Vitaminol (Tokyo)* , (2002); 48: 498–504.

19. MA Y, Olendzki BC, Pagoto SL, Hurley TG, Magner RP, Okene IS, Schneider KL, Merriam PA, Hebert JR, Number of 24-Hour Diet Recalls Needed to Estimate Energy Intake. *Annals of epidemiology*, (2009);19(8):553-559.
20. Al-Shookri A, Al-Shukaily L, Hassan F, Al-Sheraji S, Al-Tobi S. Effect of Mothers Nutritional Knowledge and Attitudes on Omani Children's Dietary Intake. *Oman Medical Journal*, (2011); 26(4): 253-257.
21. West F, Sanders M, Cleghorn GJ, Davies PS, Randomized clinical trial of a family-based lifestyle intervention for childhood obesity involving parents as the exclusive agents of change, *Behavior Research and Therapy*, (2010); 48(12):1170-1179.
22. Davison KK, Jurkowski JM, Li K, Kranz S, Lawson HA, A childhood obesity intervention developed by families for families: results from a pilot study, *International Journal of Behavioral Nutrition and Physical Activity*, (2013); [Internet]
23. Kim, Hee Soon, Jiyoung Park, Kye-Yeong Park, Myung-Nam Lee, and Ok Kyung Ham, Parent Involvement Intervention in Developing Weight Management Skills for Both Parents and Overweight/Obese Children, *Asian Nursing Research*, (2016); 10(1): 11-17.
24. Önnarfält J, Erlandsson LK, Orban K, Broberg M, Helgason C, Thorngren-Jerneck K, A family-based intervention targeting parents of preschool children with overweight and obesity: conceptual framework and study design of LOOPS- Lund overweight and obesity preschool study, *BMC Public Health*, (2012); 12:879.
25. West, Felicity, Matthew R. Sanders, Geoffrey J. Cleghorn, Peter S.w. Davies, Randomised Clinical Trial of a Family-based Lifestyle Intervention for Childhood Obesity Involving Parents as the Exclusive Agents of Change, *Behaviour Research and Therapy*, (2010); 48(12): 1170-1179.
26. Shelton, Doug, Kim Le Gros, Lyza Norton, Sue Stanton-Cook, Jane Morgan, and Paul Masterman, Randomised Controlled Trial: A Parent-based Group Education Programme for Overweight Children, *Journal of Paediatrics and Child Health*, (2007); 43(12): 799-805.
27. Savoye M, Shaw M, Dziura J, Tamborlane WV, Rose P, Guandalini C, Goldber-Gell R, Burgert T, Cali A, Weiss R, Caprio S, Effects of a weight management program on body composition and metabolic parameters in overweight children, *Journal of the American Medical Association*, (2007); 297(24): 2697-704.

## CHAPTER VII: CONCLUSION

After conducting the Healthy Habits program to change eating behaviors among Kuwaiti children, we concluded that the program had great impact to prevent and ameliorate childhood obesity as a long-term outcome. Indeed, the Healthy Habits group changed their eating behaviors significantly when compared with the comparison group. Even though their body weight did not decrease greatly, they maintained their weight and grew into it, with the goal of achieving or maintaining normal body weight as they were growing up.

Furthermore, the impact of nutrition education on changing eating behaviors has an extended influence on body compositions. Indeed, the children participating in the Healthy Habits program changed the body composition significantly compared to their baseline and the comparison group. Our findings suggest that children's body fat mass percent might help in the early detection of childhood obesity and in preventing chronic diseases later in life that are related to obesity.

In addition, focus on maternal involvement in this type of intervention to decrease childhood obesity, could make it more successful, thus; mothers become an influential role model in this study. The outcomes of this study showed that maternal support or involvement in the intervention group demonstrated more positive changes compared with other children in the Healthy Habits program. Increasing mothers' awareness and educating them by using text messages and newsletters influenced mothers' eating behaviors, attitudes and beliefs. Indeed, the Healthy Habits program extended the benefits to the participating mothers by improving mothers' eating behaviors significantly.

Further, comparing the fat mass percentage in the current study with other regions' references, showed a skewed curve towards higher values, thus; suggesting that normal references for Kuwait and GCC countries need to be developed for measuring accurate body compositions in our pediatric populations. The larger limitation of this study was a small sample size and the use of a convenience sample.

## CHAPTER VIII: STRENGTHS AND LIMITATIONS

The reported results from this study could be translated into community nutrition and care recommendation for childhood obesity. The present study is the first study to assess the impact of a nutrition education intervention on preventing childhood obesity in Kuwait. The physical activities that were offered by the summer camp made the program more successful in decreasing children body weight. A combination of behavior modification, family intervention, nutrition education and physical activity has the essential fundamentals to launch an effective childhood obesity intervention.<sup>1-5</sup>

The strengths of this study include capturing of food intake (Photographic Food Recall) which is unique in this type of interventions. Other strengths consisted in the study design and that the groups that participated were not significantly different between them. Moreover, measuring body composition among children is rarely done in programs to prevent childhood obesity.<sup>6</sup> The study could be generalized among GCC countries since Kuwait is one of them and they share similar culture, religion and lifestyle.<sup>7</sup> We estimated age- and gender- specific values for percent of body fat, which has not been done previously in the pediatric population in this region. Although this study has many strengths, there are few limitations that reported weak results.

### **Limitation**

#### **Sample Size**

The sample size was smaller than the calculated power sample size = 140. It was also inadequate to be able to build a body fat percent reference in the GCC region. However, it suggested the need to develop this type of specific reference marker for this region, as the Asian reference values were not useful for this population.



## **Randomization**

The summer camps were randomly assigned to the intervention or comparison group. However, The participants were not randomly selected which implies a potential for selection bias, and weakens our significant findings.

## **Method**

Bioelectrical impedance technique is affected by body hydration levels so food, drinks, exercise and illness will affect the accuracy of the results.<sup>8</sup>

## **Follow-up**

There are no follow-up finding in this study yet assessing the long-term outcomes of Healthy Habits program, but it is planned for future research.

## **References**

1. Sacher P, Kolotourou M, Chadwick P, Cole T, Lawson M, Alan Lucas A and Singhal A, Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity, *OBESITY*, (2010); 18(1): S62-S68
2. Gately .PJ, Cooke .CB, Butterly RJ, Mackreth. P, and Carroll S, The Effects of a Children's Summer Camp Programme on Weight Loss, with a 10 Month Follow-up, *International Journal of Obesity*, (2000); 24(11): 1445-452.
3. Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S, Waters E, Interventions for treating obesity in children, *Cochrane Database of Systematic Review*, (2003); 3: CD001872.
4. Spear BA, Barlow SE, Ervin C, Ludwig DS, Saelen BE, Schetzina KE, Taveras EM, Recommendations for treatment of child and adolescent overweight and obesity, *Pediatrics*, (2007); 120: S254–S288.
5. Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, Summerbell CD, Interventions for treating obesity in children, *Cochrane Database of Systematic Review*, (2009); 1(1): CD001872.

6. Koontz MB, Gunzler DD, Presley L, Catalano PM, Longitudinal changes in infant body composition: association with childhood obesity, *Pediatric Obesity*, (2014);9(6):e141-e144.
7. ALNohair S. Obesity in Gulf Countries. *International Journal of Health Sciences*, (2014); 8(1):79-83.
8. Lukaski HC, Johnson PE, Bolonchuk WW, Lykken GI, Assessment of fat-free mass using bioelectrical impedance measurements of the human body, *American Journal of Clinical Nutrition*, (1985); 41(4): 810-817.

## **CHAPTER IX: FUTURE STUDIES**

The Healthy Habits program demonstrated that children's eating behaviors can be improved with a relative short intervention, which has the potential for decreasing childhood obesity as long-term outcomes. This study showed an association between maternal support and changes in maternal nutritional behaviors and those of their children's, including changes in BMI, and health outcomes. Therefore, to have healthy community, mothers should be involved and educated.

Furthermore, we strongly recommend a collaboration with the Ministry of Health and the Ministry of Education to increase awareness among parents and their children about the long-term risks of childhood overweight and obesity. Additionally, we recommend the implementation of this comprehensive program accompanied by physical activities, behavior modification and nutrition education that includes families, not only in camps, but also in schools and at home to decrease childhood obesity, and to prevent adult obesity and its sequelae among their populations.

Future research should consider the fat mass percent as a predictor of obesity among normal children, thus; our findings suggested that a pediatric reference system needs to be developed for Kuwait and the GCC countries, which does not exist at this moment, and using systems that were developed for other populations is not accurate.

**APPENDICES 1: RECRUITMENT'S BROCHURES**



**JULY 2<sup>ND</sup> - AUGUST 31<sup>ST</sup>**  
**MY HEALTHY HABITS**

**Nutrition Education & Physical Activity**

MY HEALTHY HABIT is a summer camp focusing on promoting Healthy Eating Habits and Physical Activities among children.

**FIU** | FLORIDA INTERNATIONAL UNIVERSITY



**Dear mom**

**Don't miss the opportunity to let your child to be part of the MY HEALTHY HABITS nutrition education & physical activity summer camp**

**The classes will take place in**

**My Gym**

**No extra charges are required**

Dietitians:

Ghanima Alabdullah

Mashaël Huwaikem

Contact #: 98522366

e-mail:

galab001@fiu.edu

mhuwa001@fiu.edu

Instagram:

@ask\_ur\_nutritionist

My Gym children's fitness center

Discovery mall – Basement

Call now 99114347

Seats are limited

Instagram: @mygymkuwait

www.mygym.com/kuwaitcity



2 يوليو – 31 أغسطس

## MY HEALTHY HABITS

المخيم الصيفي للتعليم الغذائي و العادات الصحية

يهدف البرنامج الى تعليم أبنائكم عادات غذائية صحية بأسلوب ممتع بإتباع منهج أمريكي معتمد أثبتت فعاليته

**FIU** | FLORIDA INTERNATIONAL UNIVERSITY



عزيزتي الام  
لا تفوتك الفرصة لتسجيل  
أطفالك في المخيم الصيفي  
**MY HEALTHY HABITS**

للتعليم التغذوي للأطفال

الموقع

نادي ماي جم

الاشتراك بدون أي رسوم  
إضافية

للإستفسار يرجى التواصل مع  
أخصائية التغذية:  
غنيمة العبدالله  
مشاعل الحويكم

هاتف رقم: 98522366

إيميل:

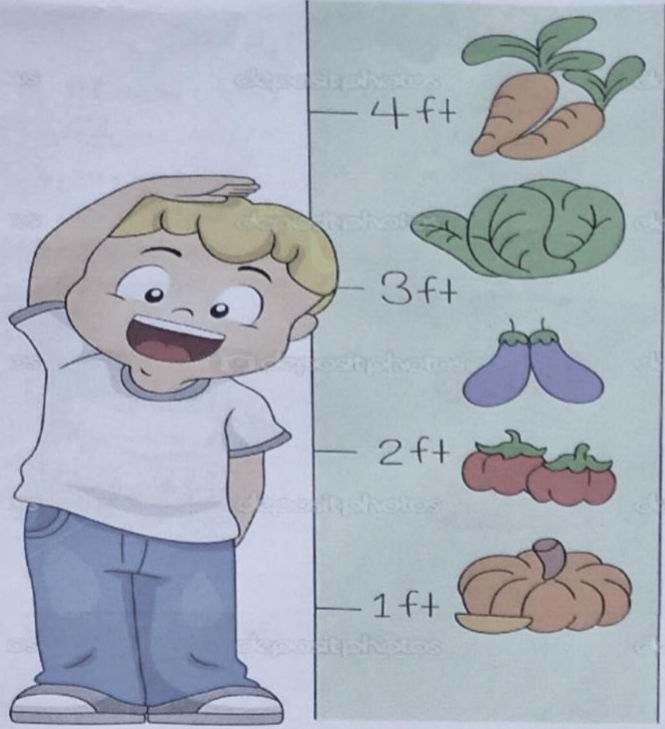
galab001@fiu.edu  
mhuwa001@fiu.edu

إنستجرام:

@ask\_ur\_nutritionist

نادي ماي جم الرياضي للأطفال  
مجمع دسكفري – السرداب  
اتصل على 99114347 الآن  
الأماكن محدودة

إنستجرام @mygymkuwait  
www.mygym.com/kuwaitcity



**2JULY - 31AUGIST**

**WHEN IS THE LAST TIME YOU MEASURED YOUR CHILD'S BMI?**

In cooperation with The Little Gym, children's measurements will be taken for **FREE** by nutritionists to identify the child's weight and nutritional information.

- The measurements will be taken in two stages: the beginning of July and the end of August.
- *What's my Benefit?*
  - Identify your child's BMI.
  - Receive a free child nutrition workshop when taking initial and final measurements.



Dear parent, if your child aged between 6-10 years old and you wish to know his/her BMI and body composition, Participate in our study.

Location  
The Little Gym

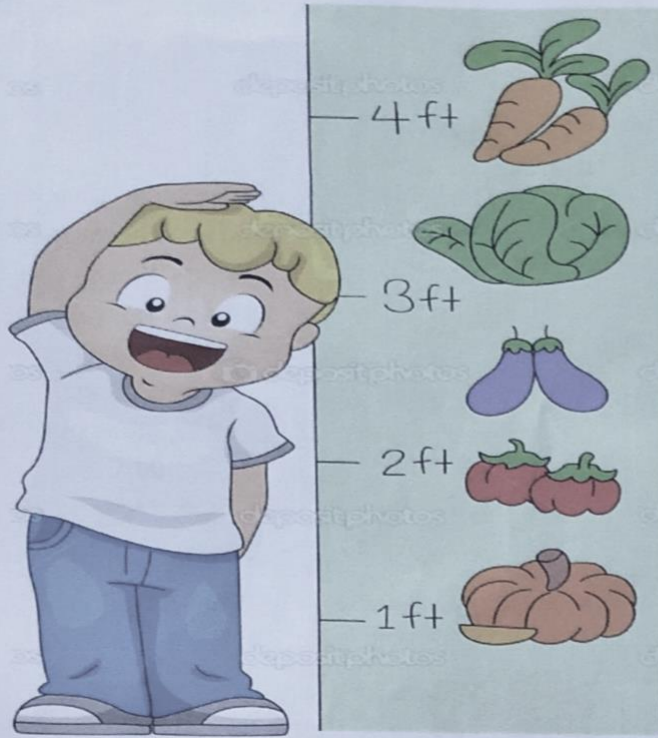
**Hurry up participants are limited**

To register contact dietitian  
Ghanima Alabdullah  
Mashaal Huwaikem  
Phone#:9852236  
Email:  
galaboo@fiu.edu  
mhuwa001@fiu.edu  
Instagram:  
@ask\_ur\_nutritionist

Child's name:

Attendance period:  
Morning / Afternoon

Parent contact number:



## 2 يوليو - 31 اغسطس متى اخر مرة قستي نمو طفلك؟

- بالتعاون مع نادي لتل جم سيتم اخذ قياسات الاطفال من قبل اخصائيات تغذية للتعرف على نسبة وزن الطفل و معلوماته الغذائيه.
- سيتم اخذ القياسات على مرحلتين: بداية شهر يوليو و نهاية شهر أغسطس.
- الفائدة:
  - التعرف على نسبة وزن الطفل بالنسبة لطولة
  - الحصول على ورشة عمل تغذية للطفل مجانية عند اخذ القياسات المبدئية و النهائية.

**FIU** | FLORIDA  
INTERNATIONAL  
UNIVERSITY

The Little  
Gym

عزيزتي الام

اذا كان عمر طفلك ما بين  
**6 - 10** سنوات و أردتي  
معرفة طوله، وزنه، كتلة  
جسمه، و نسبة الدهون  
شاركينا بالدراسة

الموقع  
ذا لتل جم

**التسجيل مجاني**

**سارعي بالتسجيل فالعدد  
محدود**

للاشتراك يرجى التواصل مع  
أخصائية التغذية:  
غنيمة العبدالله  
مشاعل الحويكم

هاتف رقم: **98522366**  
إيميل:

galaboo1@fiu.edu  
mhuwa001@fiu.ed

انستاجرام:

@ask\_ur\_nutritionist

أسم الطفل:

وقت الحضور:  
صباحا | بعد الظهر

رقم هاتف ولي الامر:



## APPENDICES 2: IRB APPROVAL

### Consent/ Assent Forms

FIU IRB Approval	06/14/2017
FIU IRB Expirations	06/14/2018
Renewal FIU IRB Approval	06/25/2018
FIU IRB Expirations	06/19/2019
Renewal FIU IRB Approval	06/15/2019
FIU IRB Expirations	06/19/2022
FIU IRB Number	IRB-17-0197- CR02

FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197



**CHILD ASSENT TO PARTICIPATE IN A RESEARCH STUDY**  
**Promoting healthy eating habits and physical activities among children in Kuwait during summer break.**

**WHY ARE YOU DOING THIS STUDY?**

We would like for you to be in a research study we are doing. A research study is a way to learn information about something. We would like to find out more about the effectiveness of eight-week summer camp to reduce overweight and obesity, and promote Healthy Eating Habits and Physical Activities among children in Kuwait.

**HOW MANY OTHERS WILL BE IN THIS STUDY?**

If you agree to participate in this study, you will be one of 140 children in this research study.

**HOW LONG WILL THE STUDY LAST?**

Your participation will require an hour/day, 2 days a week, for 2 months.

**WHAT WILL HAPPEN IN THIS STUDY?**

If you go to The Little Gym summer camp, you will:

1. Answer a questionnaire related to eating habits, physical activities, and screen time before and after the intervention.
2. Take your height, weight, waist circumference, fat mass and fat free mass.
3. Provide photographic food record for three days before and after the intervention.

If you go to My Gym Kuwait summer camp, you will:

1. Answer a questionnaire related to eating habits, physical activities, and screen time before and after the intervention.
2. Take your height, weight, waist circumference, fat mass and fat free mass.
3. Provide photographic food record for three days before and after the intervention.
4. Participate in nutrition education classes (hour/day, 2 days a week, for 2 months).
5. You will do some walking and stretching exercises 40-60 minutes, 3-4 times a week.

**CAN ANYTHING BAD HAPPEN TO ME?**

You may be tired or sore from the extra walking and stretching, but you will have time to rest and given water to drink.

**CAN ANYTHING GOOD HAPPEN TO ME?**

The following benefits may be associated with your participation in this study: learning healthy eating habits and participating in physical activity classes.

**DO I HAVE OTHER CHOICES?**

There are no known alternatives available to you other than not taking part in this study.

<b>FIU IRB Approval:</b>	6/14/2017
<b>FIU IRB Expiration:</b>	6/14/2018
<b>FIU IRB Number:</b>	IRB-17-0197

**WILL ANYONE KNOW I AM IN THE STUDY?**

The records of this study will be kept private and will be protected by the researchers.

**WILL I BE GIVEN ANYTHING FOR PARTICIPATING?**

If you are attending My Gym Kuwait, you will receive a toy from the treasure box for winning a game, answering a question, or for other activities. You will also receive a two free weeks gift card for perfect attendance and providing the required worksheets. You will not be responsible for any costs to participate in this study.

If you are attending The Little Gym, you will receive a toy from the treasure box for answering a questionnaire and taking your measurements. At the end of the study, you will receive a gift for participation. You also will learn healthy eating habits and get some healthy exercise.

**WHAT IF I DO NOT WANT TO DO THIS?**

You do not have to be in this study if you don't want to and you can quit the study at any time.

If you don't like a question, you don't have to answer it and, if you ask, your answers will not be used in the study. No one will get mad at you if you decide you don't want to participate.

**WHO CAN I TALK TO ABOUT THE STUDY?**

If you have any questions about the research study you may contact Ghanima Alabdullah at Nutrition and Food Administration, 98522366, galab001@fiu.edu or Mashael Huwaikem, Mhuwa001@fiu.edu. If you would like to talk with someone about your rights of being a participant in this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

**PARTICIPANT AGREEMENT**

This research study has been explained to me and I agree to be in this study.

\_\_\_\_\_  
Signature of Child Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Child Participant

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date

FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197



### موظقة لفلل لك مشارك في دريل قبجي ة

تشجج عادات لغظي ة لصل ة والنشطة لبي ة لذي الالف الكوي تخلل لعطة لهرفي ة.

لم اذلفعلون هذا لدريل ة؟

نود ان تشارك مع في دريل قبجي ة قروب ه. دريل قبجي ة هي طوق كل موعة مموعةات عن شبيء. نود موعة لاميء حول فحلل ة لمي ة لربي عي ن ادي صفي لك حد من فيادة لوزن ولفن ة، وتشجج عادات الفل للصل ة والنشطة لبي ة لذي الالف الكوي.

كم هال خي ن سويك ونفي مده لدريل ة؟

إذا لقت بخلق لوي ل مشارك في مده لدريل ة س وفتكون واحدة من 140 فل لفي مده لدريل ة لبي ة.

كم متبغرق لدريل ة؟

ش ارلك سبب اس اع في لوي ويري في اليعوع بل مدتش وين.

ما ذاصي حدشفي مده لدريل ة؟

إذا لقت ركشفي ن ادي ذالفل جفس وفتش ارلغي:

- 1- الةة لغى لبيتيان نة قوب عادات الفل، والنشطة لبي ة، وقت الفل تقبل وبع لدريل ة لبي ة.
- 2- قياس طيلك، وزنك، محيط جسرك، اقل ة لدمون، والفل هال خلي ه من لدمون.
- 3- نقي جس جل غظلي جسورل مة 3 لي اقبل وبع لدريل ة لبي ة.

إذا لقت ركشفي ن ادي ماي جم الكوي وفتش ارلغي:

- 1- الةة لغى لبيتيان نة قوب عادات الفل، والنشطة لبي ة، وقت الفل تقبل وبع لدريل ة لبي ة.
- 2- قياس طيلك، وزنك، محيط جسرك، اقل ة لدمون، والفل هال خلي ه من لدمون.
- 3- نقي جس جل غظلي جسورل مة 3 لي اقبل وبع لدريل ة لبي ة.
- 4- لشارك في فصول لتبجيم لكغوي اس اع في لوي ويري في اليعوع بل مدتش وين.
- 5- لشارك في النشطة لربي لذي مة 40 لى 60 قيق ة، 3 لى 4 مرات في اليعوع

لوي لمن أني حدث أي شي عسي وب الريب ة لي؟

قمتش عربل تعجب من لشارك في النشطة لربي ه لكون متفون ق الفترات للراحة وشررب الماء.

لوي لمن أني حدث أي شي عسي وب الريب ة لي؟

تفج عادات الفل للصل ة ولشارك في جس ص للفراط لبي ني.



FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197



**PARENTAL CONSENT TO PARTICIPATE IN A RESEARCH STUDY**  
**Promoting healthy eating habits and physical activities among children in Kuwait during summer break.**

**PURPOSE OF THE STUDY**

You are being asked to give your permission for your child to be in a research study. The purpose of this study is to assess the effectiveness of eight-week intervention at a summer camp to reduce overweight and obesity, and promote Healthy Eating Habits and Physical Activities among children in Kuwait.

**NUMBER OF STUDY PARTICIPANTS**

If you agree to allow your child to participate in this study, he/she will be one of 140 people in this research study.

**DURATION OF THE STUDY**

Your child's participation will require an hour/day, 2 days a week, for 2 months.

**PROCEDURES**

If your child goes to The Little Gym summer camp, he/she will:

1. Answer a questionnaire related to eating habits, physical activities, and screen time before and after the intervention.
2. Take his/her height, weight, waist circumference, fat mass and fat free mass.
3. Provide photographic food record for three before and after the intervention.

If your child goes to My Gym Kuwait summer camp, he/she will:

1. Answer a questionnaire related to eating habits, physical activities, and screen time before and after the intervention.
2. Take his/her height, weight, waist circumference, fat mass and fat free mass.
3. Provide photographic food record for three days before and after the intervention.
4. Participate in nutrition education classes (hour/day, 2 days a week, for 2 months).
5. Your child will have some additional walking and stretching exercises 40-60 minutes, 3-4 times a week.

**RISKS AND/OR DISCOMFORTS**

Your child may become tired, sore, or thirsty from the extra walking and stretching. However, he/she will be closely supervised, and he/she will be given time to rest and water to drink as necessary"

**BENEFITS**

The following benefits may be associated with your child's participation in this study: learning healthy eating habits and participating in physical activity classes.

<b>FIU IRB Approval:</b>	6/14/2017
<b>FIU IRB Expiration:</b>	6/14/2018
<b>FIU IRB Number:</b>	IRB-17-0197

**ALTERNATIVES**

There are no known alternatives available to your child other than not taking part in this study. However, any significant new findings developed during the course of the research which may relate to your child’s willingness to continue participation will be provided to you.

**CONFIDENTIALITY**

The records of this study will be kept private and will be protected to the fullest extent provided by law. In any sort of report we might publish, we will not include any information that will make it possible to identify your child as a subject. Research records will be stored securely and only the researcher team will have access to the records. However, your child’s records may be reviewed for audit purposes by authorized University or other agents who will be bound by the same provisions of confidentiality.

Confidentiality will be broken if the child is being abused and we will immediately inform legal authorities for child safety and protection.

**COMPENSATION & COSTS**

If your child is attending My Gym Kuwait, he/she will receive a toy from the treasure box for winning a game, answering a question, or for other activities. He/she will also receive a two weeks gift card for perfect attendance and bringing back the required paperwork. Your child will not be responsible for any costs to participate in this study.

If your child is attending The Little Gym, he/she will receive a toy from the treasure box for taking his/her measurements and answering a questionnaire. At the end of the study, your child will receive a gift for participation and a nutrition education session if he/she participate in the initial and end measurements. Your child will not be responsible for any costs to participate in this study.

**MEDICAL TREATMENT**

Routinely, FIU, its agents, or its employees do not compensate for or provide free care for human subjects in the event that any injury results from participation in a research project. If your child becomes ill or injured as a direct result of participating in this study, contact your regular medical provider. If you have insurance, your insurance company may or may not pay for these costs. If you do not have insurance, or if your insurance company refuses to pay, you will be billed. Funds to compensate for pain, expenses, lost wages and other damages caused by injury are not routinely available.

**RIGHT TO DECLINE OR WITHDRAW**

Your child’s participation in this study is voluntary. Your child is free to participate in the study or withdraw his/her consent at any time during the study. Your child’s withdrawal or lack of participation will not affect any benefits to which he/she is otherwise entitled. The investigators reserves the right to remove your child from the study without your consent at such time that they feel it is in the best interest.

**RESEARCHER CONTACT INFORMATION**

If you have any questions about the purpose, procedures, or any other issues relating to this research study you may contact Ghanima Alabdullah at Nutrition and Food Administration, 98522366, galab001@fiu.edu or Mashaal Huwaikem, Mhuwa001@fiu.edu.

<b>FIU IRB Approval:</b>	6/14/2017
<b>FIU IRB Expiration:</b>	6/14/2018
<b>FIU IRB Number:</b>	IRB-17-0197

**IRB CONTACT INFORMATION**

If you would like to talk with someone about your child’s rights of being a subject in this research study or about ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

**PARTICIPANT AGREEMENT**

I have read the information in this consent form and agree to allow my child to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. I understand that I will be given a copy of this form for my records.

\_\_\_\_\_  
Signature of Parent/Guardian

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Parent/ Guardian

\_\_\_\_\_  
Printed Name of Child Participant

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date



FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197



### مؤلفقة لوليين للشراكسي دريس قبخية

تشجيع لعادات لغنظية لصحبة والشهظة ليهي ؤلدى الظاملفي الكويتخلل لعطة لهرهية.

### لغرض من لدرسة

نود بلينذل لاسبالمؤلفق لشاركه ظلللفسي دريس قبخية. لغرض من هذه لدريلس ؤقهيغبلخية دريس قبخية حت هك مبهية بلريبع فسين ادي صغيفي للاح من زيادة للوزن وليس في ؤتشجيع عادات الكلل للصحبة والشهظة ليهي ؤلدى الظاملفي الكويت.

### عدد من لشاركون في لدرسة

إذالفتتؤلفق غيى لاس ماحل ظلللكلل لشاركون في هذه لدريلس ؤسريكون واحداً من 140ش صغيفي هذه لدريلس ليهيية.

### مدة لدريلس

سريهطب من هلك لشاركون لمدتس اع في يوم، 2 في اهي اليبوع لمدتس هوين.

### إجراءات

إذا لنترك ظلللفسي ادي ذالئل جفيس وفسيش ارلفسي:

- 1- الةلة غيى بلقيا ان نيق قب عادات الكلل، والشهظة ليهيية، ووقت للارش ؤقبل وبعد لدريلس ليهيية.
- 2- قياس طيله، وزن، محيط خصره، لقللة لاد مون، و اللقللة لخلية من لاد مون.
- 3- نقي يمسه جل غنظي صرورل مدة 3 في اقبل وبعد لدريلس ليهيية.

إذا لنترك ظلللفسي ادي ماي جم للفي نغس وفسيش ارلفسي:

- 1- الةلة غيى بلقيا ان نيق قب عادات الكلل، والشهظة ليهيية، ووقت للارش ؤقبل وبعد لدريلس ليهيية.
- 2- قياس طيله، وزن، محيط خصره، لقللة لاد مون، و اللقللة لخلية من لاد مون.
- 3- نقي يمسه جل غنظي صرورل مدة 3 في اقبل وبعد لدريلس ليهيية.
- 4- فصول للتعقيم للتعذوي بع اع في ليوم ويوم في اليبوع لمدتس هوين.
- 5- الرشظة لريغني ؤلمدة 40 الى 60 قيقية، 3 الى 4 مرات في اليبوع

### لمخاطر و/أو لهريقات

قحيش عر ظلللفسي ليعب من لتماموين لريغني ه لركن س وفتلكون قالك مرط ؤتلقا اءاء لتماموين لريغني لفسا ادي صريلات و بلض استلكون قالفنترات للراحة وشرب لماء.

FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197

#### فوائد

لبيوطد لتالي فق متفكون م بتب طبش اركة ال طالفسي هذه الدرلس بتبهم عادات الكل الص حية ولاش ارك في حصص للشاط ليني.

#### لبيوطد

لتنفور تي قبطل معرفه لفلدك خلف ان الميش ارك في هذه الدرلس. ومع لك سريت احلكم معرف تتطور تي قبطل م همه جي دقتت بوق بلبحث ق متب بوق بربغ، طلف لفسى مو طرلة لاش اركة .

#### لسية

سجلت هذه الدرلس شيتفون سية وروفتفون محية لى وصى حنين ص بغي القلون. ولن يتب بشر م موم انتقت بحل من لام لمن لتعرف بغي طلف لفسى ح الرشن القبطل للبحث. سريت بتخ زين. جلت للبحث شيتفون أمن فوق طفسوق للبحث يت لمن من الطلع بغي لجلسى ومع لك ي لمن لتبعر ضل جلت طلك ل غراض دراجعة لجريل انتب لاج معة لافيس وبله للبحث أو لوك له الخين مع لتزام ميبفيس اتمام لسية.

سريت فمسخ لسية اذتخر ضرل لال طلل ليداء وروفتفون غورا ال لطلات القلوي قس لمة لال طلل و ح حية.

#### لتعويض و لتفاه

اذ كان طلف لفسى ارك في ن ادي ماي جم لك هيت س وفتفون طلف لفسى من صرن دوق للفرز جي فوس مال مر باقة، ا بته بغي سوال، أو غير ه من الشطة. وروفتفون جل طلف الكرت هي لبيو عمن محل لال حضور لتفلي وتغير الوراق لام طيبه، لنيكون طلك م وول عن ايتك لفلش ارك في هذه الدرلس.

اذ كان طلف لفسى ارك في ن ادي ذلتل جم، س وفتفون جل بغي لفسى من صرن دوق للفرز لاش ارك في اذ القليلات و ال حبة بغي البيتي ان. وروفتفون جل طلف ا بغي هي في ن طله الدرلس طلك ارك في للبحث، طلف اس وفتفون جل بغي و رش تفلي بتغذوي محية اذ اش ارك في القليلات ال بيه و لن هني. لنيكون م وول عن ايتك لفلش ارك في هذه الدرلس.

#### اعلج لطبي

بشركل روكيني، اجم قلو ردا لال حلية، وك له ه، أو مو طني ه لتعوض اوتفول لارعية لام حية طلك ارك في حية ان أي جريل تتبج عن لاش ارك في شرو ع بغي. اذ ا لمصاح طلك مويضا أو جريل القتي حة مبلش رلك ارك في هذه الدرلس، تو طرل مع طبيك لال معاد. اذ كان لال ايتا مين، قوتق ومشركه لال ا مين لال خص قك أوقد لتبخل هذه لتك لفل. اذ ا لنيك لنيك تامين، أو اذ فم ششركه لال ا مين لال خص قك انتفع سريت م حليلتك. ولتنفور بشركل روكيني ال موال لال لزم لتف تعويض عن اللم والتفقات وال جور للفقودة وال ضرار الأخرى للناجمة عن الصربة.

#### لح قفي فمض اوس حب

ش اركة ال طالفسي هذه الدرلس تتطو حية. ي حقل طلك لاش ارك في الدرلس أو ال نين ح ابغي أي قبتدق اء الدرلس. لش حاب طلك أو عدم ش اركه لنيوشر بغي أي لبيوطد لتي يتق ا ه. للام حوق لال قفي بلبيح اذ طلك من الدرلس دون لال حصول بغي موقلت لفسى ح الش عور م مبلض لني لني حاده.

#### معلومات لتو طل لبحث



FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197



**MOTHER CONSENT TO PARTICIPATE IN A RESEARCH STUDY**  
**A quasi experimental trial to promote healthy eating habits and physical activities among children in Kuwait during summer break.**

**PURPOSE OF THE STUDY**

We would like for you to be in a research study we are doing. A research study is a way to learn information about something. The purpose of this study is to assess the effectiveness of eight-week intervention at a summer camp to reduce overweight and obesity, and promote Healthy Eating Habits and Physical Activities among children in Kuwait.

**NUMBER OF STUDY PARTICIPANTS**

If you agree to participate in this study, you will be one of 70 women in this research study.

**DURATION OF THE STUDY**

Your participation will last for 2 months.

**PROCEDURES**

If you participates in this study, we will ask you to do the following things:

1. Participate in nutrition education classes (receiving nutritional education messages though What's app and email).
2. Answer a questionnaire related to your eating habits and demographic characteristics before and after the intervention.
3. Take your height and weight to calculate your BMI.

**RISKS AND/OR DISCOMFORTS**

There are no known risks related to participation to this study.

**BENEFITS**

The following benefits may be associated with participation in this study: learning healthy eating habits and your impact on your children eating habits.

**ALTERNATIVES**

There are no known alternatives available to you than not taking part in this study. However, any significant new findings developed during the course of the research which may relate to your willingness to continue participation will be provided to you.

**CONFIDENTIALITY**

The records of this study will be kept private and will be protected to the fullest extent provided by law. In any sort of report we might publish, we will not include any information that will make it possible to identify you as a subject. Research records will be stored securely and only

<b>FIU IRB Approval:</b>	6/14/2017
<b>FIU IRB Expiration:</b>	6/14/2018
<b>FIU IRB Number:</b>	IRB-17-0197

the researcher team will have access to the records. However, your records may be reviewed for audit purposes by authorized University or other agents who will be bound by the same provisions of confidentiality.

**COMPENSATION & COSTS**

There are no rewards will be received for your participation. You will not be responsible for any costs to participate in this study.

**RIGHT TO DECLINE OR WITHDRAW**

Your participation in this study is voluntary. You are free to participate in the study or withdraw your consent at any time during the study. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigators reserve the right to remove you from the study without your consent at such time that they feel it is in the best interest.

**RESEARCHER CONTACT INFORMATION**

If you have any questions about the purpose, procedures, or any other issues relating to this research study you may contact Ghanima Alabdullah at Nutrition and Food Administration, 99191232, galab001@fiu.edu or Mashael Huwaikem, Mhuwa001@fiu.edu.

**IRB CONTACT INFORMATION**

If you would like to talk with someone about your rights of being a subject in this research study or about ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

**PARTICIPANT AGREEMENT**

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. I understand that I will be given a copy of this form for my records.

\_\_\_\_\_  
Signature of participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Participant

\_\_\_\_\_  
Printed Name of Child Participant

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date





FIU IRB Approval:	6/14/2017
FIU IRB Expiration:	6/14/2018
FIU IRB Number:	IRB-17-0197

لمم المشارة

---

لمم المظلل المشارة

---

التاريخ

---

توقيع الشخص الذي حصل على هذه المنطقة

---



**APPENDICES 3: SOCIO-DEMOGRAPHIC QUESTIONNAIRE**

### Sociodemographic Characteristics

Date: -- / -- / ----

Phone number:

E-mail:

#### INFORMATION RELATED TO THE CHILD:

Child's name:

Date of birth: -- / -- / ----

Nationality:

- Kuwaiti
- Non-Kuwaiti

Gender:

- Male
- Female

Rank in the family:

- First child
- Second child
- Third child
- Forth child or more

Does your child suffer from any chronic disease, physical disability, or syndrome? If yes please mention

- Yes, suffering from .....
- No

Does your child suffer from any food allergy?

- Yes, allergic to .....
- No

Did your child participate in any nutrition education classes? If yes provide name of the course, date, and duration.

- Yes
- NO

Name:

Date:

Length:

How do you categorize the child weight?

- Underweight
- Normal
- Overweight
- Obese

If you child is a girl, did she start her period? If yes since when?

- Yes, Since when.....
- No

**INFORMATION RELATED TO THE MOTHER:**

Date of birth: -- / -- / ----

Marital status:  Married  Divorced  Widow

Height:

Weight:

Nationality:  Kuwaiti  non-Kuwaiti

Number of children:  1  2  3  4 or more

Educational level:

High school or below  2 year diploma  Bachelor degree  Postgraduate

Working status:  Working  Housewife

Total family income:  < 2000 KD  2000 – 3000 KD  > 3000 KD

Do you have a nanny?  Yes  No

Did you participate in any nutrition education classes? If yes provide the name of the course, date, and duration.

Yes  NO

### الخصائص الاجتماعية و الديموغرافية

تاريخ: -- / -- / ----

رقم الهاتف:

البريد الإلكتروني:

#### المعلومات المتعلقة بالطفل:

اسم الطفل:

تاريخ الميلاد: -- / -- / ----

الجنسية:

الكويتية

غير الكويتية

الجنس:

ذكر

أنثى

ترتيب الطفل في الأسرة:

الطفل الأول  الطفل الثاني  الطفل الثالث  الطفل الرابع أو أكثر

هل يعاني طفلك من أي مرض مزمن أو إعاقة جسدية أو متلازمة؟ إذا كانت الإجابة نعم الرجاء ذكرها  
 نعم، يعاني من.....  
 لا

هل يعاني طفلك من أي حساسية غذائية؟

نعم، حساسية من.....

لا

هل شارك طفلك في أي دورة لتعليم التغذية؟ إذا كانت الإجابة نعم، ما هو اسم الدورة ، تاريخها ، ومدتها.

نعم  لا

اسم الدورة: التاريخ: مدة الدورة:

كيف تصنف وزن طفلك؟

لديه نقص بالوزن

طبيعي

لديه زيادة بالوزن

سمين

إذا كانت الطفلة المشاركة فتاة، هل بدأت دورتها الشهرية؟ إذا كان الجواب نعم منذ متى؟

نعم، منذ متى ..  
 لا

لمعلومات لا يتبقى قبالم:

تاريخ الميلاد: -- / -- / ----

الحالة الاجتماعية:

متزوجة  مطلقة  أرملة

الطول: الوزن:

الجنسية:  كويتي  غير كويتي

عدد الأطفال:

أو أكثر

المستوى التعليمي:

الثانوية العامة أو أقل  دبلوم  بكالوريوس  الدراسات العليا

حالة العمل:

موظفة  ربة منزل

إجمالي دخل الأسرة:

أقل من 2000 دك  2000 - 3000 دك  أكثر من 3000 دك.

هل لديك مربية؟

نعم  لا

هل شاركت في أي دورة لتعليم التغذية؟ إذا كانت الإجابة نعم، ما هو اسم الدورة ، تاريخها ، و مدتها.

نعم  لا

اسم الدورة: التاريخ: مدة الدورة:

**APPENDICES 4: HEALTHY HABITS QUESTIONNAIRE (MODIFIED)**

# Healthy Habits Survey

**Directions: For the following questions, place an “x” in the ONE box that best represents your answer. There are no right or wrong answers.**

1. Yesterday, how many times did you eat/drink dairy, such as milk, yogurt, or cheese?
  - None
  - 1 time
  - 2 times
  - 3 or more times
2. Yesterday, how many times did you eat fresh, frozen, dried or canned fruit? (Do not count fruit juice)
  - None
  - 1 time
  - 2 times
  - 3 or more times
3. Yesterday, how many times did you eat fresh, frozen, or canned vegetables? (Do not count French fries or potato chips)
  - None
  - 1 time
  - 2 times
  - 3 or more times
4. Yesterday, how many times did you eat French fries or chips? Chips are potato chips, tortilla chips, corn chips, or other snack chips.
  - None
  - 1 time
  - 2 times
  - 3 or more times
5. Yesterday, how many times did you eat whole grains, such as whole grain bread, whole grain tortillas (not corn or white flour tortillas), whole grain pasta, or whole grain crackers?
  - None
  - 1 time
  - 2 times
  - 3 or more times
6. Yesterday, how many times did you eat lean protein, such as beef, chicken, fish, beans, peanut butter, eggs, nuts, or seeds? (Do not include fried meat)
  - None
  - 1 time
  - 2 times

- 3 or more times
7. Yesterday, how many times did you drink any punch, sports drinks, or other fruit-flavored drinks? (Do not count 100% juice or diet drinks)
- None  
 1 time  
 2 times  
 3 or more times
8. Yesterday, how many times did you drink any regular (not diet) sodas or soft drinks?
- None  
 1 time  
 2 times  
 3 or more times
9. Yesterday, how many times did you eat doughnuts, cookies, brownies, cakes, or candy?
- None  
 1 time  
 2 times  
 3 or more times
10. How often do you eat breakfast?
- 7 days per week  
 5-6 days per week  
 3-4 days per week  
 1-2 days per week  
 0 days per week
11. How often are you physically active for at least 60 minutes per day or more? (This includes activities such as exercise, sports, running, walking, dancing, etc.)
- 7 days per week  
 5-6 days per week  
 3-4 days per week  
 1-2 days per week  
 0 days per week
12. How often do you help plan family meals at home?
- 7 days per week  
 5-6 days per week  
 3-4 days per week  
 1-2 days per week  
 0 days per week

**Directions: For the following questions, place an “x” in the box that represents the ONE answer that you think is correct.**

13. It is lunch time and Sara has the following items in her lunch box: an apple, a carton of chocolate milk, yogurt, and grilled chicken. How many **different** food groups are in Marty’s lunch box?
- 1



- 2
  - 3
  - 4
14. Fruits and vegetables are good sources of vitamins. True or false?
- True
  - False
15. How many minutes of physical activity do you think you should get each day to be healthy?
- At least 15 minutes each day
  - At least 30 minutes each day
  - At least 60 minutes each day
  - At least 90 minutes each day
16. Why is physical activity good for kids?
- Helps keep you from getting sick
  - Helps you pay attention in school
  - Builds healthy bones and muscles to keep you strong
  - Gives you energy
  - All of the above
17. Which food does **NOT** belong in the grain group?
- Waffle
  - Macaroni
  - nuts
  - Oatmeal
18. Which food does **NOT** belong in the vegetable group?
- Broccoli
  - Carrot
  - Cabbage
  - Pear
19. Which food does **NOT** belong in the fruit group?
- Strawberries
  - Corn
  - Pineapple
  - Watermelon
20. Which food does **NOT** belong in the protein group?
- Fish
  - Chicken
  - Potato
  - Beef
21. Which food does **NOT** belong in the dairy group?
- Cheese
  - Cracker
  - Laban
  - Yogurt

22. How many total cups of fruit and vegetables combined should you eat each day?
- Less than 2 cups
  - At least 2 cups
  - At least 3 cups
  - At least 4 cups
23. How many cups should you have from the dairy group each day?
- 1 cup
  - 3 cups
  - 4 cups
  - 5 cups
24. An example of a whole grain is:
- Oatmeal
  - Potato Chips
  - White rice
  - White bread

**Directions: For the following questions, place an “x” in ALL boxes that represent ALL answers you think are correct.**

25. Which of the following would be a healthy choice for a snack? Check ALL that apply.
- Fruit and yogurt
  - Sports drink and cheese puffs
  - Whole grain crackers and cheese
  - Apple and peanut butter
  - Fruit juice and potato chips
26. Why is breakfast important? Check ALL that apply.
- Helps you learn
  - Gives you energy
  - Makes you lazy
  - Helps keep you from getting sick
  - Helps you think and concentrate

**Directions: For the following questions, place an “x” in the box that represents how sure or not sure you are that you can complete each action.**

27. How sure are you that you can be physically active every day?
- Very sure
  - Somewhat sure
  - Not sure at all
28. How sure are you can identify a healthy meal?
- Very sure
  - Somewhat sure
  - Not sure at all
29. How sure are you that you can choose a healthy meal at home?
- Very sure

- Somewhat sure
  - Not sure at all
30. How sure are you that you can choose a healthy meal at school?
- Very sure
  - Somewhat sure
  - Not sure at all
31. How sure are you that you can choose a meal with all five food groups?
- Very sure
  - Somewhat sure
  - Not sure at all
32. How sure are you that you can choose a healthy meal when your friends do not?
- Very sure
  - Somewhat sure
  - Not sure at all
33. How sure are you that you can *plan* a meal with at least three different food groups in it? (Remember, food groups include protein, vegetables, fruits, grains, and dairy)
- Very sure
  - Somewhat sure
  - Not sure at all
34. How sure are you that you can choose a healthy snack?
- Very sure
  - Somewhat sure
  - Not sure at all
35. How sure are you that you can choose to be physically active instead of playing a video game, watching TV, playing on the computer, or spending time on a mobile device?
- Very sure
  - Somewhat sure
  - Not sure at all
36. How sure are you that you can eat breakfast every morning?
- Very sure
  - Somewhat sure
  - Not sure at all
37. If you are not VERY SURE that you can eat breakfast every morning, why are you not very sure you can eat breakfast every morning? Check ALL that apply.
- No time to eat breakfast
  - Trying to lose weight

- I am not hungry at breakfast time
- I do not like the food that is available to eat
- Another reason
- This question does not apply to me; I am VERY SURE that I can eat breakfast every morning

الاسم:  
استبيان العادات الصحية

التعليمات: للأسئلة التالية، ضع علامه "X" في المربع الذي يمثل أفضل إجابتك. لا توجد اجابات صحيحة أو خاطئة.  
اختر اجابة واحدة فقط

1. يوم أمس، كم مرة كنت تأكل / تشرب الألبان، مثل الحليب واللبن والجبن؟  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر
2. يوم أمس، كم مرة كنت تأكل الفاكهة الطازجة، المجمدة، المجففة أو المعلبة؟ (لا تحسب عصير الفاكهة)  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر
3. يوم أمس، كم مرة كنت تأكل الخضار الطازجة، والمجمدة، أو المعلبة؟ (لا تحسب البطاطا المقلية أو الشبس)  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر
4. يوم أمس، كم مرة كنت تأكل البطاطا المقلية، الشبس، البفك، او النانتشوز؟  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر
5. يوم أمس، كم مرة أكلت الحبوب الكاملة، مثل خبز اسمر، معكرونة سمراء، او بسكوت النحالة؟  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر
6. يوم أمس، كم مرة كنت تأكل البروتين الخالي من الشحم، مثل لحوم البقر والدجاج والأسماك البقوليات وزبدة الفول السوداني والبيض والمكسرات، أو البذور؟ (لا تشمل اللحوم المقلية)  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر
7. يوم أمس، كم مرة كنت تشرب أي عصائر، المشروبات الرياضية، أو غيرها من المشروبات السكرية؟ (لا تشمل عصير الطبيعي 100% أو المشروبات الدايت)  
 ولا مرة  
 1 مرة  
 2 مرة  
 3 أو أكثر

8. يوم أمس، كم مرة كنت تشرب أي من المشروبات الغازية مثل الكولا و السفن ...؟ ( لا تشمل مشروبات الدايت)

ولا مرة

1 مرة

2 مرة

3 أو أكثر

9. يوم أمس، كم مرة كنت تأكل الكعك، الكوكيز، الدونت، الشوكولاته، أو الحلوى؟

ولا مرة

1 مرة

2 مرة

3 أو أكثر

10. كم مرة تتناول وجبة الإفطار (الريوق)؟

7 أيام في الأسبوع

6-5 أيام في الأسبوع

4-3 أيام في الأسبوع

2-1 أيام في الأسبوع

0 أيام في الأسبوع

11. كم مرة كنت نشطة جسديا لمدة 60 دقيقة على الأقل يوميا أو أكثر؟ (وهذا يشمل أنشطة مثل ممارسة الرياضة،

والجري، والمشي، والرقص، وما إلى ذلك)

7 أيام في الأسبوع

6-5 أيام في الأسبوع

4-3 أيام في الأسبوع

2-1 أيام في الأسبوع

0 أيام في الأسبوع

12- كم مرة تساعدون على تخطيط وجبات عائلية في المنزل؟

7 أيام في الأسبوع

6-5 أيام في الأسبوع

4-3 أيام في الأسبوع

2-1 أيام في الأسبوع

0 أيام في الأسبوع

التعليمات: للأسئلة التالية، ضع "x" في المربع الذي يمثل إجابة واحدة تعتقد أنها صحيحة.

13. قد حان وقت الغداء و سارة لديها الاطعمة التالية في حقيبة الغداء: تفاحة، حليب الشوكولاته، روب، والدجاج

المشوي. كم عدد المجموعات الغذائية المختلفة في هذه الحقيبة ؟

1

2

3

4

14 - تعتبر الفواكه والخضروات مصادر جيدة للفيتامينات. صحيحة أو خاطئة؟

صح

خطأ

15. كم عدد دقائق النشاط البدني التي تعتقد أنك تحتاج إليها يوميا لتكون صحي؟

15 دقيقة على الأقل كل يوم

30 دقيقة على الأقل كل يوم

60 دقيقة على الأقل كل يوم

90 دقيقة على الأقل كل يوم

16. لماذا النشاط البدني جيد للأطفال؟

يساعدك على ان لا تصاب بالمرض

يساعدك على الانتباه في المدرسة

يبني عظام وعضلات صحية لتصبح قوي

يعطيك طاقة

كل ما سبق

17. ما هي المواد الغذائية التي لا تنتمي الى مجموعة الحبوب؟

وافل

معكرونة

مكسرات

شوفان

18. ما هي المواد الغذائية التي لا تنتمي إلى مجموعة الخضار؟

بروكلي

جزر

ملفوف

كمثرى (عرموط)

19. أي طعام لا ينتمي إلى مجموعة الفاكهة؟

فراولة

ذرة

أناناس

بطيخ

20. ما هي المواد الغذائية التي لا تنتمي إلى مجموعة البروتين؟

سمك

دجاج

بطاط

لحم

21. ما هي الأغذية التي لا تنتمي في مجموعة الألبان؟

جبن

بسكوت

لبن

روب

22. كم العدد الكلي لأكواب الفواكه والخضار يجب أن تأكل كل يوم؟

- أقل من 2 كوب
- على الأقل 2 كوب
- على الأقل 3 أكواب
- على الأقل 4 أكواب

23. كم عدد الاكواب التي يجب أن تتناولها من مجموعة الألبان كل يوم؟

- 1 كوب
- 3 أكواب
- 4 أكواب
- 5 أكواب

24 – اي طعام يعتبر من الحبوب الكاملة:

- شوفان
- شيس
- رز ابيض
- الخبز الأبيض

التعليمات: للأسئلة التالية، ضع "x" في المربعات التي تمثل جميع الإجابات التي تعتقد أنها صحيحة.

25. أي من الخيارات التالية سيكون خيارا صحيا لتناول وجبة خفيفة؟ اختر جميع الاجابات الصحيحة.

- الفواكه والزبادي
- مشروب رياضي وبفك
- بسكوت بالنخالة وجبن
- تفاحة و زبدة الفول السوداني (peanut butter)
- عصير الفواكه و شيس

26. لماذا الإفطار (الريوق) مهم؟ اختر جميع الاجابات الصحيحة.

- يساعدك على تعلم
- يعطيك الطاقة
- يجعلك كسول
- يساعدك على ان لا تصاب بالمرض
- يساعدك على التفكير والتركيز

التعليمات: للأسئلة التالية، ضع علامة "x" في المربع الذي يمثل مدى تأكدك أو عدم تأكدك من أنه يمكنك إكمال كل إجراء.

27. ما مدى تأكدك من أنك يمكن أن تكون نشطة جسديا كل يوم؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

28. ما مدى تأكدك من مقدرتك على التعرف على الوجبات الصحية؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق



29. ما مدى تأكدك من نك يمكن أن تختار وجبة صحية في المنزل؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

30. ما مدى استعدادك لاختيار وجبة صحية في المدرسة؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

31. هل أنت متأكد من أنك تستطيع أن تختار وجبة مع جميع المجموعات الغذائية الخمسة؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

32. هل أنت متأكد من أنك يمكن أن تختار وجبة صحية عندما يختار أصدقائك وجبات غير صحية؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

33. هل أنت متأكد بمقدرتك لتخطيط وجبة تحتوي على ما لا يقل عن ثلاث مجموعات غذائية مختلفة؟ (تذكر أن المجموعات الغذائية تشمل البروتين والخضار والفواكه والحبوب والألبان)

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

34. ما مدى تأكدك من أنك تستطيع اختيار وجبة خفيفة صحية؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

35. ما مدى تأكدك من أنه يمكنك اختيار النشاط البدني بدلا من تشغيل لعبة فيديو أو مشاهدة التلفزيون أو اللعب على الكمبيوتر أو قضاء الوقت على جهاز جوال؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

36. ما مدى تأكدك لتناول وجبة الإفطار كل صباح؟

- متأكد جدا
- متأكد إلى حد ما
- غير متأكد على الإطلاق

37. إذا لم تكن متأكدًا من أن يمكنك تناول وجبة الإفطار كل صباح، لماذا أنت لست متأكدًا بأنه يمكنك تناول وجبة الإفطار كل صباح؟ اختر جميع الاجابات الصحيحة.

- لا وقت لتناول وجبة الإفطار

- محاولة لانقاص وزني
- أنا لست جائعا في وقت الإفطار
- لا أحب الطعام الذي يقدم في وجبة الافطار
- سبب آخر
- هذا السؤال لا ينطبق علي. أنا متأكد جدا أن يمكنني تناول وجبة الإفطار كل صباح

**APPENDICES 5: GENERAL NUTRITIONAL KNOWLEDGE AND BEHAVIOR  
QUESTIONNAIRE FOR ADULT (MODIFIED)**

## Knowledge

1. If one should pay attention to the body weight of a child, it is preferable to substitute pasta by rice
  - RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
2. Whole meal bread contains apart from fiber also more other nutrients than white bread
  - RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
3. It is preferable that child below the age of 4 take whole fat milk rather than semi-skimmed milk
  - RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
4. Fruit juice contains as much sugar as cola.
  - RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
5. Spreadable fats such as margarine and butter should be avoided from an early age.
  - RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
6. A bottle of smoothie is a complete replacement for 200 g fruit and/or vegetables
  - RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
7. Fruit and vegetables deliver us the same nutrients
  - RIGHT

- I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
8. When the child consume fish, it should preferably be low fat fish
- RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
9. Daily milk strawberry beverages instead of milk is not advised
- RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know
10. It is recommended that preschool child drink 1 l of water daily
- RIGHT
  - I think it is right
  - I think it is wrong,
  - WRONG
  - I do not know

### Behavior

- 1. Eat fruits**
  - None
  - 1 time/day
  - 2 times/day
  - 3 or more times/day
- 2. Eat vegetables**
  - None
  - 1 time/day
  - 2 times/day
  - 3 or more times/day
- 3. Eat whole grains**
  - None
  - 1 time/day
  - 2 times/day
  - 3 or more times/day
- 4. Eat lean protein**
  - None
  - 1 time/day

- 2 times/day
  - 3 or more times/day
- 5. Eat/drink dairy foods/drinks**
- None
  - 1 time/day
  - 2 times/day
  - 3 or more times/day
- 6. Eat French fries or chips**
- None
  - 1 time/day
  - 2 times/day
  - 3 or more times/day
- 7. Drink sweetened beverages (pop, punches, sport drink, etc.)**
- None
  - 1-2 time/day
  - 3-4 times/day
  - 5 or more times/day
- 8. Eat doughnuts, cookies, brownies, cakes, candy**
- None
  - 1-2 time/day
  - 3-4 times/day
  - 5 or more times/day
- 9. Eat breakfast**
- 0 days/week
  - 1-2 days/week
  - 3-4 days/week
  - 5-6 days/week
  - 7 days/week
- 10. Help plan family meals at home**
- 0 days/week
  - 1-2 days/week
  - 3-4 days/ week
  - 5-6 days/week
  - 7 days/week

Self-efficacy

**1. Identify a healthy meal at home**



a. (Kushari)



b. (Chicken pan)



c. (khubz orooq)

**2. Choose a healthy meal at work**



a.



b.



c. ( Chinese food)

**3. Choose a healthy when friends don't**



a. (Burger lettuce wrap with grilled sweet potatoes)



b. (Beef Shawarma)



c. (Grilled burger with chips)

**4. Choose a meal healthy with all five food groups**



a. (Fattah humus with eggplant)



b. (Margug)



c. (Majboos)

**5. Plan a meal with at least three different food groups**



a. (Margug)





b. (Mutabaq zubadi)



c. (Majboos)

**6. Choose a healthy snack**



a. (veggies with Hummus)



b. (Mahllabia with nuts)



c. (Gers Ogailey)

**7. Eat breakfast every morning**

- a. Always
- b. Sometimes
- c. Rarely

اسئله ثقافيه

إذا كان يجب الانتباه إلى وزن جسم الطفل ، فمن الأفضل استبدال المعكرونة بالأرز

- أ- صواب
- ب- أعتقد أنه صحيح
- ج- أعتقد أنه من الخطأ،
- د- خطأ
- هـ- لا اعرف

يحتوي خبز الوجبة الكاملة بصرف النظر عن الألياف أيضًا على مواد مغذية أخرى أكثر من الخبز الأبيض

- أ- صواب
- ب- أعتقد أنه صحيح
- ج- أعتقد أنه من الخطأ،
- د- خطأ
- هـ- لا اعرف

يفضل أن يأخذ الطفل دون سن الرابعة حليبًا كامل الدسم بدلاً من اللبن الخالي الدسم

- أ- صواب
- ب- أعتقد أنه صحيح
- ج- أعتقد أنه من الخطأ،
- د- خطأ
- هـ- لا اعرف

عصير الفاكهة يحتوي على الكثير من السكر مثل الكولا

- أ- صواب
- ب- أعتقد أنه صحيح
- ج- أعتقد أنه من الخطأ،
- د- خطأ
- هـ- لا اعرف

يجب تجنب الدهون القابلة للدهن مثل المارجرين والزبدة منذ سن مبكرة

- أ- صواب
- ب- أعتقد أنه صحيح
- ج- أعتقد أنه من الخطأ،
- د- خطأ
- هـ- لا اعرف

زجاجة من عصير هو بديل كامل ل ٢٠٠ غرام من الفاكهة و / أو الخضروات

- أ- صواب
- ب- أعتقد أنه صحيح
- ج- أعتقد أنه من الخطأ،
- د- خطأ
- هـ- لا اعرف

الفاكهة والخضروات توفر لنا نفس العناصر الغذائية

- أ- صواب  
ب- أعتقد أنه صحيح  
ج- أعتقد أنه من الخطأ،  
د- خطأ  
ه- لا اعرف

عندما يأكل الطفل السمك ، يفضل أن يكون السمك قليل الدسم

- أ- صواب  
ب- أعتقد أنه صحيح  
ج- أعتقد أنه من الخطأ،  
د- خطأ  
ه- لا اعرف

لا ينصح بتناول مشروبات فراولة الحليب يوميا بدلاً من الحليب

- أ- صواب  
ب- أعتقد أنه صحيح  
ج- أعتقد أنه من الخطأ،  
د- خطأ  
ه- لا اعرف

يوصى بأن يشرب طفل ما قبل المدرسة 1 لتر من الماء يومياً

- أ- صواب  
ب- أعتقد أنه صحيح  
ج- أعتقد أنه من الخطأ،  
د- خطأ  
ه- لا اعرف

أسئله سلوكية

هل تتناول الفواكه

- أ- كلا  
ب- 1 مرة / يوم  
ج- مرتين / يوم  
د- 3 مرات أو أكثر / يوم

هل تتناول الخضروات

- أ- كلا  
ب- 1 مرة / يوم  
ج- مرتين / يوم  
د- 3 مرات أو أكثر / يوم

هل تتناول الحبوب الكاملة

- أ- كلا  
ب- 1 مرة / يوم  
ج- مرتين / يوم

د- ٣ مرات أو أكثر / يوم

هل تتناول البروتين الخالي من الدهون

أ- كلا

ب- 1 مرة / يوم

ج- مرتين / يوم

د- ٣ مرات أو أكثر / يوم

هل تتناول وتشرب الألبان ومشتقاتها

أ- كلا

ب- 1 مرة / يوم

ج- مرتين / يوم

د- ٣ مرات أو أكثر / يوم

هل تتناول البطاطا المقلية أو رقائق البطاطا (الشيبس)

أ- كلا

ب- 1 مرة / يوم

ج- مرتين / يوم

د- ٣ مرات أو أكثر / يوم

هل تتناول المشروبات الغازية ( ومشروبات الطاقة الخ

أ- كلا

ب- 1 مرة / يوم

ج- مرتين / يوم

د- ٣ مرات أو أكثر / يوم

هل تتناول الدونات، الكوكيز، الكعك، البروانيز، الحلوى

أ- كلا

ب- 1 مرة / يوم

ج- مرتين / يوم

د- ٣ مرات أو أكثر / يوم

هل تتناول وجبة الإفطار

أ- ولا يوم / أسبوع

ب- يوم الى يومين أيام / أسبوع

ج- ٣ إلى ٤ أيام / أسبوع

د- ٥ الي ٦ أيام / أسبوع

هـ- ٧ أيام / أسبوع

هل تعمل خطة الوجبات العائلة في المنزل

أ- ولا يوم / أسبوع

ب- يوم الى يومين أيام / أسبوع

ج- ٣ إلى ٤ أيام / أسبوع

د- ٥ الي ٦ أيام / أسبوع

هـ- ٧ أيام / أسبوع

أسئلة الكفاءة الذاتية

تحديد وجبة صحية في المنزل



كشري

أ



صينية دجاج

ب



خبز عروق

ج

اختيار وجبة صحية في العمل



أ



ب



اكل صيني

ج

اختيار صحية مع أصدقاء عندما هم لا



البرجر المشوي بلفافات الخس مع البطاطا الحلوه المشويه

آ



شاورما اللحم

ب



البرجر المشوي مع الشيبس

ج

اختيار وجبة صحية مع جميع المجموعات الغذائية الخمسة



فتة الحمص والبانجان

آ



مرفوق

ب



مجبوس

ج.

خطة وجبة مع ما لا يقل عن ثلاث مجموعات غذائية مختلفة



مرقوق

آ



مطبق زيبيدي

ب



مجبوس

ج

اختيار وجبة خفيفة صحية



آ



مهلبيه

ب



قرص عقيلي

ج

تناول وجبة الإفطار كل صباح

ا. دائما

ب. بعض الأحيان

ج. نادرا



## VITA

### MASHAEL HUWAIKEM

Born, Jeddah, Saudi Arabia

2005-2010	B.S., Clinical Nutrition King Saud University Riyadh, Saudi Arabia
2010- 2011	Intern Dietitian Jeddah, Riyadh, Saudi Arabia
2011- 2012	Intensive English Second Language Courses Miami, Florida
2013- 2015	M.S., Dietetics and Nutrition Florida International University Miami, Florida
2016	Graduate Assistant Florida International University Miami, Florida
2015 - 2019	PhD Candidate Dietetics and Nutrition Florida International University Miami, Florida

### PUBLICATION AND PRESENTATIONS

- Mashaël Huwaikem, Adriana Campa, The Feasibility of a Nutrition Education Intervention Supported by Mothers in Children Participating in Summer Camps in Kuwait, ASN 2018, Boston, Massachusetts, 2018.
- Mashaël Huwaikem, Adriana Campa, A Nutrition and Physical Activity Intervention among Children participating in Summer Camps in Kuwait to Prevent Overweight and Obesity, Graduate Student Appreciation Week, Miami, Florida, 2017.
- Padidah Haddadian, Mashaël Huwaikem, Joan Vaccaro, Gustaavo Zarini, Fatam Huffman, Physical Activity, Sedentary Behavior, and Obesity in U.S. Children Ages 6–12, Experimental Biology, San Diego, California, 2017.
- Mashaël Huwaikem, Adriana Campa, The Perceived Impact of Moving to United States on Eating Habits among College Students from Countries Gulf Cooperation Council GCC Students, Experimental Biology, San Diego, California, 2016.