

Contributing Factors to Childhood Overweight and Obesity in Kuwait

Alrashidi, M¹; Shahwan-Ak¹, L; James, J¹& Jones, LK²

Abstract

The increasing prevalence of overweight and obesity in children is a major public health concern in Kuwait. Understanding the contributing factors is key to the development of an effective intervention strategy. This study was designed to identify what factors contribute to overweight and obesity in school-aged children. **Method:** A cross-sectional study, using questionnaires, was conducted with public intermediate school children (girls and boys) and their parents to elicit information related to the children's daily lifestyle. A total of 635 children aged 11-14 years and their parents (N=635) were surveyed and children's height and weight were measured by school nurses to identify their Body Mass Index. **Results:** When classified by BMI, about one quarter of the children (25.5%) were overweight and over one third (36.5%) were classified as obese. Multiple regression model found that the BMI of the male children increased significantly with respect to age if they had overweight siblings, spent time on sedentary activities, and regularly ate food from fast food restaurants. The BMI of the female children also increased significantly with respect to age, having overweight siblings, eating at fast food restaurants and for every time not actively travelling to school. **Conclusion:** The rate of childhood overweight and obesity in Kuwait is currently still high, and Kuwaiti children have been found to be leading unhealthy lifestyles. Involving parents as a part of the solution is an important step in promoting a healthy lifestyle.

Keywords: Risk factors, Overweight, Obesity, Children, and Kuwait

1. Introduction

The problem of childhood overweight and obesity has risen dramatically worldwide over the last decade (World Health Organization, 2014).

¹Discipline of Nursing and Midwifery, School of Health Sciences, RMIT University, PO Box 71, Victoria, 3083, Australia.

²Discipline of Nursing and Midwifery, School of Health Sciences, RMIT University, PO Box 71, Victoria, 3083, Australia. Email: linda.jones@rmit.edu.au, Phone: 0411209169

With the increasing incidence of overweight and obesity, there is an increased risk of developing non-communicable diseases (Kilpi et al, 2014). These diseases are killing around 36 million people every year worldwide (WHO, 2013). In developing countries, the prevalence of childhood and adolescent overweight and obesity has reached alarming levels (Gupta, Shah, Nayyar & Misra, 2013; Musaiger, 2011; Musaiger et al., 2012). A recent review in the Eastern Mediterranean Region (EMR) showed that between 7% and 45% of school children were overweight or obese (Musaiger, 2011). This increasing prevalence is no different in Kuwait. Recent studies have shown that overweight and obesity are indeed prevalent in Kuwaiti, estimating that 30-40% of children and adolescents were overweight or obese (Musaiger et al, 2012; Ng et al, 2011; Zaghoul, 2013; El-Bayoumy, Shady & Lotfy, 2009). In the Eastern Mediterranean Region, which includes Kuwait, the possible contributing factors of overweight and obesity are physical inactivity, urbanization, frequent snacking, sweet beverages, prolonged television watching and body image misperception (Musaiger, 2011).

In Kuwait, the current findings indicate that economic transition has negatively impacted the Kuwaiti population's lifestyle and has adversely influenced Kuwaiti dietary habits (El-Bayoumy, Shady & Lotfy, 2009; Musaiger, 2011). For example, Al Shammari (2007) pointed out that the high economic state of Kuwait has increased food availability and therefore increased caloric intake above the recommended daily requirement. Not surprisingly, recent research shows that about half of Kuwaiti children and one-third of adults consumed more than the recommended energy intake by 78–100% for protein and carbohydrate requirements (Zaghoul et al., 2012). Furthermore, a sedentary lifestyle, such as prolonged television watching and screen time, has been found to be a contributing factor to overweight and obesity in children in Kuwait (Al-Isaet al, 2010).

A current review of the literature indicates that overweight and obesity amongst all ages in Kuwait has reached alarming levels. As a consequence, Kuwait has launched several initiatives through both public and private sectors to help combat overweight and obesity (AL-Nesef, 2009). However, these initiatives have not helped to reduce the rate of overweight or obesity in Kuwait. Recent study findings indicate that the rate of overweight and obesity is still high in the Kuwaiti population (Al-Haifiet al, 2013; El-Bayoumy, Shady & Lotfy, 2009; Musaiger, 2011).

Therefore, this study was designed to provide a clear statement on the possible contributing factors for overweight and obesity in school children in Kuwait by investigating the current situation from the children's perspective and the parent's viewpoint in relation to lifestyle and dietary intake.

2. Methods

A cross-sectional study was conducted in 12 public intermediate schools, of which six were boys' schools and six were girls' schools. The schools were selected from six provinces in Kuwait. Two schools, one boys' school and one girls' school, were randomly targeted in each of the following provinces, namely Al-Asimah, Al-Farwaniyah, Al-Ahmadi, Al-Jahrah, Mubarak al-Kabir and Hawalli.

2.1. Inclusion and Exclusion Criteria

All children who provided signed parents' consent forms were included in the study. Exclusion criteria were applied to children who did not provide a signed consent form by their parents. To justify the chosen sample population (children aged 11 to 14), it is important to refer to the research observations presented by Tremblay and Frigon (2005), who suggest that young adolescents have the greatest need for consideration because they experience significant physical, psychological and biological changes. Moreover, a study by Amin et al. (2008) identifies that school children in grade five and older are at a good age to participate in research studies as they are able to communicate effectively.

2.2 Research Instruments

A total of 960 envelopes were distributed to the students who were aged from 11 to 14 years (480 boys and 480 girls) to take home. The envelope contained the parents' information sheets written in plain language explaining the study; the parents' consent forms that needed to be signed by the parents; and two questionnaires, one for the parent and one for the students.

2.2.3 Students' Questionnaire

The questionnaire for the students comprised three parts: a demographic profile, eating habits and physical exercise. The Adolescent Behaviours, Attitudes and Knowledge Questionnaire (ABAKQ) (Mathews et al, 2009) was adapted to elicit information on the eating habits and physical activities of the youth.

2.2.4 Parents' Questionnaire

Given that the Saudis and Kuwaitis share the same religion, language and culture, the parents' questionnaire was adopted from Hashemi's Saudi study (2009). The parents' surveys elicited information about their children including physical activities, sedentary lifestyle, daily food and beverage intake.

2.3 Anthropometric Measurements

Dessinioti & Zouboulis (2014. P, 295) stated that "Body Mass Index (BMI) is one of the most accurate ways to measure obesity in practice". Body Mass Index is calculated as the ratio of body weight to the square of body height (kg/m²) (Dessinioti & Zouboulis, 2014.). In this study children's BMI was identified according to the World Health Organizations (WHO, 2007), definition which state that boys and girls aged between 5 and 19 are considered to be overweight at the 85th centile (+1 SD) and obese at the 97th (+2 SD) (Onis et al., 2007).

Registered nurses from the Health Department measured the children's height and weight. Female nurses measured the height and weight of female students and male nurses measured the male students. The involvement of the nurses was important because they were trained to accurately measure height and weight and calculate the BMI scores of the students.

The measurements were taken by the nurses in a private classroom in the school to ensure confidentiality and privacy to the child. The children were admitted one by one to the assigned private room to have their measurements taken. The measurement results were not shared with the children or with anyone else at the school. Ethics approval was obtained from the Human Research Ethics Committee at RMIT University and the Kuwait Ministry of Education.

3. Data Analysis

In this study, the descriptive analysis involved the computation of frequency distributions (counts and percentages) of the responses to the children's questionnaires and the parent's questionnaires.

In addition, SPSS version 20.0 was utilised for the analyses. The statistical tests used were Cramer's V coefficients, multifactorial analysis of variance (ANOVA), Scheffé post hoc test, Levene's Test, Herein, Stepwise multiple regressions to predict the children's BMI (kg/m^2) using dichotomous, ordinal, or interval level responses. The final multiple regression model contained statistically significant predictors (indicated by $p < .05$ for the t -test statistics).

4. Results

A total of $N = 635$ children and 635 parents provided responses to the questionnaires, the response rate being 66.1%. The frequency distributions of the children's age and body weight characteristics, classified by sex, are summarized in Table 1. The male-female ratio was almost 1:1, with $N = 298$ (46.93%) male children, and $N = 337$ (53.07%) female children. The children's ages ranged from 11 to 14 years, but most children ($N = 414$, 65.20%) were 13 or 14 years old; with a mean of 12.89 ± 1.04 (SD) years old.

The results indicated that 25.5% ($N = 162$) of the children were overweight, comprising a quarter of the entire sample, of which 46.9% ($N = 76$) were male (76), and 53.1% ($N = 86$) were female. Over one third of the participants, 36.5% ($N = 232$) were classified as obese, of which 48.3% ($N = 112$) were male and 51.7% ($N = 120$) were female.

The two-way ANOVA results showed that there was a significant difference in the BMI values of children when grouped according to age ($F = 6.28$, $p < 0.05$). However, its effect size was only 0.029, indicating that 2.9% of the total variation in the BMI of children could be accounted for by age. On the other hand, the mean BMI difference between males and females was not proven to be significant, with an almost negligible effect size of 0.02%.

Table 1: Children's age and Body Weight Characteristics by Sex

		Sex					
		Female		Male		Total	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Age (Years)	11	57	16.91	22	7.38	79	12.44
	12	76	22.55	66	22.15	142	22.36
	13	90	26.71	93	31.21	183	28.82
	14	114	33.83	117	39.26	231	36.38
	Total	337	100.00	298	100.00	635	100.00
BMI Categories	Underweight	17	5.04	20	6.71	37	5.83
	Normal	114	33.83	90	30.20	204	32.13
	Overweight	86	25.52	76	25.50	162	25.51
	Obese	120	35.61	112	37.58	232	36.54
	Total	337	100.00	298	100.00	635	100.00

According to the children's characteristics reported in the parents' surveys, the majority of the children ($N = 574, 90.4\%$) lived with both parents, and the mothers of about half of the children ($N = 294, 46.3\%$) stopped breastfeeding when the child was 3-6 months old. There were no significant associations between the BMI categories of the children and with whom the children lived (Cramer's $V = 0.07, p > 0.05$) or with the age when the mother stopped breastfeeding (Cramer's $V = 0.11, p > 0.05$).

The socio-demographic characteristics of the parents who participated in the survey are summarized in Table 2. About half of the fathers ($N = 302, 47.6\%$) and mothers ($N = 313, 49.3\%$) reported a professional employment status. Nearly half of the fathers ($N = 288, 45.3\%$) and mothers ($N = 312, 49.1\%$) had a Bachelor or postgraduate degree. The majority of the parents ($N = 377, 59.4\%$) were classified in the highest family income group, with a net monthly income > 1000 KD.

Table 2: Parents' Socio-Demographic Characteristics

		Father		Mother		Family	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Employment Status	Professional	302	47.6	313	49.3		
	Semi-Professional	175	27.6	39	6.1		
	Skilled	4	0.6	4	0.6		
	Semi-Skilled	1	0.2	0	0.0		
	Unskilled	2	0.3	0	0.0		
	Commercial	20	3.1	1	0.2		
	Pension	97	15.3	44	6.9		
	Dead	11	1.7	0	0.0		
Level of Education	Missing	23	3.6	234	36.9		
	No High School	137	21.6	114	18.0		
	High School	197	31.0	197	31.0		
	Bachelor Degree	227	35.7	289	45.5		
	Postgraduate Degree	61	9.6	23	3.6		
Net Monthly Income (KD)	Missing			12	1.9		
	1 < 500					24	3.8
	2 = 500-750					72	11.3
	3 = 750-1000					142	22.4
	4 > 1000					377	59.4
	Missing					20	3.1

Cramer's V coefficients and corresponding p -values between the socio-demographic categories of the parents and the BMI categories of their children indicate a significant association was found at $\alpha = 0.05$, with respect to the father's educational level (Cramer's $V = 0.12$, $p < 0.001$). This categorical association arose because the proportion of obese children whose father's educational level was less than high school (69, 50.36%) or high school (75, 38.07%) was greater than the proportion of obese children whose father's educational level was either a Bachelor degree (63, 27.75%) or a postgraduate degree (19, 31.15%).

4.1 Relationships between Parents' BMI and Children's BMI

The parents' weight was also reported, with the results indicating that nearly half of the fathers ($N = 264$, 41.6%) and over a third of the mothers ($N = 222$, 35.0%) were overweight. Nearly one third of the fathers ($N = 172$, 27.1%) and mothers ($N = 206$, 32.4%) were classified as obese.

The relationship between the BMI of the children and their parents is visualized using scatter plots in Figures 1 and Figure 2. The scatter plots reflect that the BMI of the children was positively (though very weak) correlated with the BMI of their fathers, (Pearson's $r = 0.146$, $p < 0.05$), indicating that 2.1% (R^2) of the total variation in the children's BMI could be explained by their father's BMI. Also, the BMI of their mothers (Pearson's $r = 0.169$, $p < 0.05$) was significantly and directly (though very weak) correlated to the children's BMI, indicating that 2.8% (R^2) of the total variation in children's BMI could be accounted for by the mother's BMI.

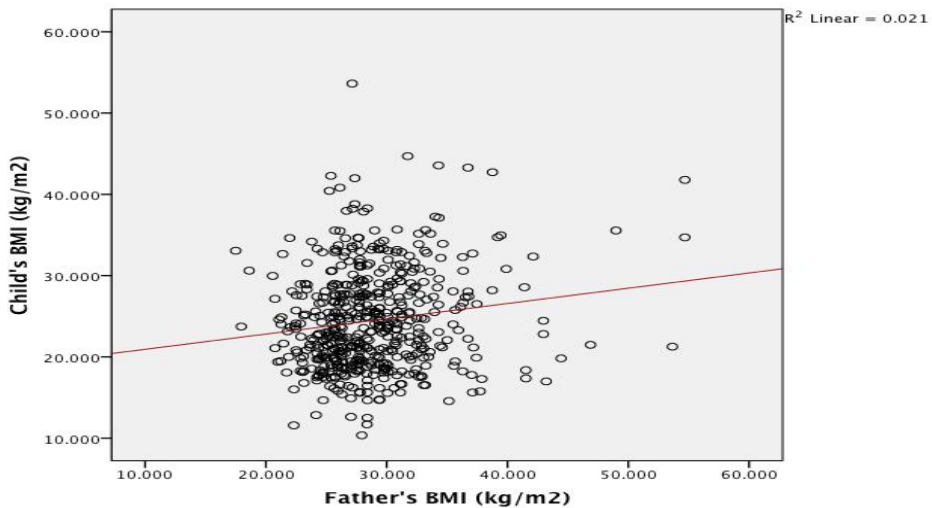


Figure 1: Relationship between BMI of Father and Child

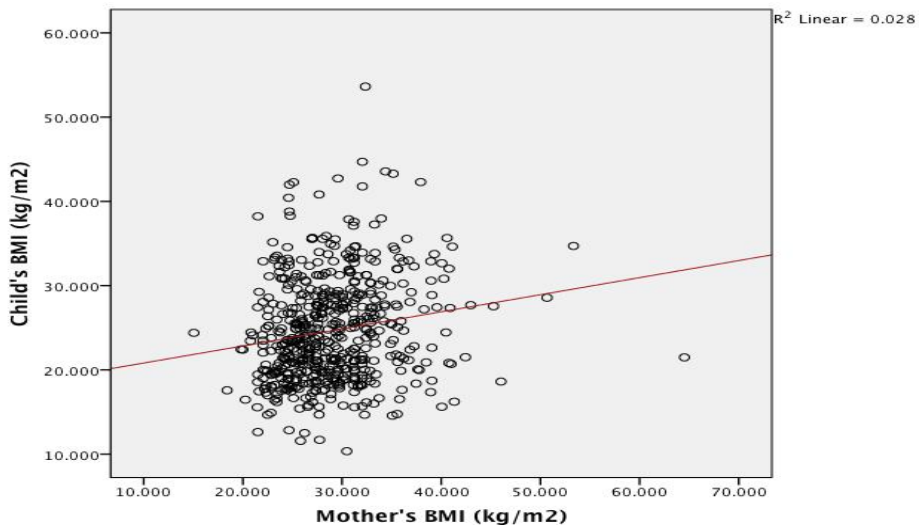


Figure 2: Relationship between BMI of Mother and Child

4.2 Family History of Disease

The frequency of the family history of diseases is summarized in Table 3. The most prevalent diseases reported by the families were diabetes ($N = 230$, 36.2%), high blood pressure ($N = 186$, 29.3%); asthma ($N = 159$, 25.0%) and joint problems ($N = 142$, 22.4%). The result of Cramer's V coefficients between the family history of disease and the children's BMI categories indicate that a family history of high cholesterol (Cramer's $V = 0.13$, $p < 0.05$) and diabetes (Cramer's $V = 0.13$, $p < 0.05$) were significantly associated with the children's BMI categories. The implication of these associations is that the proportion of overweight and obese children with a family history of high cholesterol and diabetes were greater than for normal and underweight children.

Table 3: Family History of Disease

Disease	Score	N	%
Diabetes	1	230	36.2
High Blood Pressure	1	186	29.3
Asthma	1	159	25.0
Joint Problems	1	142	22.4
High Cholesterol	1	109	17.2
Other Health Problems	1	90	14.2
Heart Disease	1	57	9.0
Sleep Apnea	1	24	3.8

Table 4: Prediction of Male Children's BMI (kg/m^2) based on the male children's survey

Predictor	Un-standardized Coefficients	SE	Standardized Coefficients	T	P	VIF
Constant	9.97	4.01		2.49	.013	
Age (Years)	0.97	0.31	0.17	3.12	.002	1.02
How many hours per day spent watching TV or videos?	1.11	0.51	0.12	2.17	.031	1.02

Adjusted $R^2 = 4.9\%$ ($F = 8.29$, $p < 0.001$)

The multiple regression models for the male children were found to be statistically significant ($F = 8.29$, $p < 0.001$). Only a small proportion of the variance in BMI (Adjusted $R^2 = 4.9\%$) was explained, reflecting limited clinical/practical significance. The two predictors were: (a) the age of the male children (from 11 to 14 years); and (b) how many hours per day the male children spent on sedentary activities, such as watching TV, videos or DVDs (5 = Every day, 4 = Every second day; 3 = Two times a week; 2 = Once a week; 1 = Less than once a week). Based on the standardized regression coefficients, the age of the children ($\beta = 0.17$) was found to be a more important predictor of BMI than time spent on sedentary activities ($\beta = 0.12$). Using the unstandardized regression coefficients, the model predicted that, on average, the BMI of the male children: (a) increased by 0.97 kg/m^2 for every unit (1 year) increase in their age, and (b) increased by 1.11 kg/m^2 for each unit of time (hour per day) that the children spent on sedentary activities.

Table 5: Prediction of Female Children's BMI (kg/m^2) based on the female children's survey

Predictors	Unstandardized Coefficients	SE	Standardized Coefficients	T	P	VIF
Constant	9.478	4.86		1.95	.05	
Age	1.185	0.37	0.19	3.20	< 0.01	1.02
Walk to or from school?	-0.611	0.25	-0.14	-2.44	.02	1.02
Eat food from a takeaway/month?	0.625	0.30	0.12	2.07	.04	1.02

Adjusted $R^2 = 8.0\%$ ($F = 5.95$, $p < 0.001$)

The model for the female children was also found to be statistically significant ($F = 5.95$, $p < 0.001$), but only a small proportion of the variance in BMI (Adjusted $R^2 = 8.0\%$) was explained, reflecting limited clinical/practical significance. The three significant predictors were: (a) the age of the female children (from 11 to 14 years); (b) how much time in the last 5 days the female children had walked to or from school (from 0 to 10); and (c) how often the female children ate food from takeaway restaurants (1 = Once/month, 2 = 2-3 times/month, 3 = Once/week, 4 = 2-3 times/week, 5 = Most days). Based on the standardized regression coefficients, the age of the children ($\beta = 0.187$) was found to be the most important predictor of BMI, walking to school ($\beta = -0.142$), and eating food from takeaway restaurants ($\beta = 0.121$).

Using the unstandardized regression coefficients, the model predicted that, on average, the BMI of the female children: (a) increased by 1.185 kg/m² for every unit (1 year) increase in their age; (b) decreased by -0.611 kg/m² for every time they had walked to or from school in the last 5 days; and (c) increased by 0.625 kg/m² for every 1 point increase in the 5-point score for eating food from takeaway restaurants.

Table 6: Prediction of Male Children's BMI (kg/m²) using the Parents' Questionnaire

Predictor	Unstandardized Coefficients	SE	Standardized Coefficients	T	P	VIF
Constant	15.69	4.76		3.295	< 0.01	
Age	0.68	0.33	0.11	2.057	.03	1.01
Does your child have any overweight/obese siblings?	3.85	0.77	0.27	5.036	< 0.001	1.03
How often does your child eat out at fast food restaurants during the week?	1.53	0.38	0.21	4.009	< 0.001	1.02
How many hours per day does your child spend watching TV	1.06	0.22	0.25	4.756	< 0.001	1.02

Adjusted $R^2 = 22.9\%$ ($F = 21.59$, $p < 0.001$)

The model to predict the BMI of the male children, based on the parents' questionnaire, was found to be statistically significant ($F = 21.59$, $p < 0.001$). A moderate proportion of the variance in BMI (Adjusted $R^2 = 22.9\%$) was explained, reflecting clinical/practical significance. The four significant predictors were: (a) the age of the children (from 11 to 14 years); (b) if the children had overweight siblings (1 = Yes, 0 = No); (c) how often the children ate food from takeaway restaurants (scored from 1 to 5); and (d) how many hours per day the children spent watching TV (scored from 0 to 5). Using the unstandardized regression coefficients, the model predicted that, on average, the BMI of the male children: (a) increased by 0.68 kg/m² for every unit (1 year) increase in their age; (b) increased by 3.85 kg/m² for every overweight sibling; (c) increased by 1.53 kg/m² for every 1 point increase in the 5-point score for eating food from takeaway restaurants; and (d) increased by 1.06 kg/m² for every hour of watching TV.

Table 7: Prediction of Female Children's BMI (kg/m²) using the Parents' Questionnaire

Predictor	Unstandardized Coefficient	SE	Standardized Coefficient	T	P	VIF
Constant	8.75	3.95		2.22	0.03	
Age	1.07	0.28	0.20	3.79	< 0.001	1.00
Does your child have any overweight/obese siblings?	2.44	0.67	0.19	3.65	< 0.001	1.03
How often does your child eat out at fast food restaurants during the week?	1.43	0.39	0.17	3.68	< 0.001	1.05

Adjusted $R^2 = 19.7\%$ ($F = 19.67$, $p < 0.001$)

The model for the female children, based on the parents' questionnaire, was also found to be statistically significant ($F = 19.67$, $p < 0.001$). A moderate proportion of the variance in BMI (Adjusted $R^2 = 19.7\%$) was explained, reflecting clinical/practical significance. The three significant predictors were: (a) the age of the children (from 11 to 14 years); (b) if the children had overweight siblings (1 = Yes, 0 = No); and (c) how often the children ate food from takeaway restaurants (scored from 1 to 5). Using the unstandardized regression coefficients, the model predicted that, on average, the BMI of the female children: (a) increased by 1.07 kg/m² for every unit (1 year) increase in their age; (b) increased by 2.44 kg/m² for every overweight sibling; and (c) increased by 1.43 kg/m² for every 1 point increase in the 5-point score for eating at fast food from restaurants.

5. Discussion

This study was conducted to identify the possible factors contributing to overweight and obesity in children aged 11-14 years in Kuwait. Food and eating habits, physical and sedentary activities, socio-demographic characteristics, the relationship between parents' characteristics and children's BMI, family history of disease, prevalence of obesity and overweight in parents and the relationship between parents' BMI and children's BMI were all examined.

Based on the BMI measurements drawn from the sample of 635 children, 25.5% were overweight and 36.54% were classified as obese. The prevalence of overweight and obesity in children and adolescents was reported previously in Kuwait, showing that 50.5% of boys and 46.5% of girls were overweight or obese (Al-Haifi et al., 2013). In relation to Kuwait's neighbours, in Saudi Arabia, the prevalence of overweight was 20.8% in girls and 19.5% in boys, whereas obesity was 14% in girls and 24.1% in boys (Al-Hazzaa et al., 2014); in Bahrain, 29.5% and 36.8% of boys and girls, respectively, were overweight or obese (Musaiger et al., 2014); and in the United Arab Emirates, 14.7% of children and adolescents were overweight and 18.9% were obese (Al Junaibi, 2012). In developed countries such as the United States of America, 17.3% of school children were overweight and 19.4% were obese (Moreno et al., 2013). In the European region, statistics on Spain, Italy, Belgium, Greece, Czech Republic, Hungary, Ireland, Latvia, Lithuania, Malta, Norway, Cyprus, Portugal, Slovenia, and the Republic of Macedonia show that the rate of overweight ranges between 18% to 50% for girls and 18% to 57% for boys (Wijnhoven et al., 2014). Findings from the current study and other studies agree that overweight and obesity are serious public health issues internationally.

The results from this study indicate that the majority of children ate from fast food restaurants and pursued sedentary activities (e.g., watching TV, videos, and spending time on the computer, tablet, and phone every day of the week), of which the number of hours spent playing video games was found to be a significant factor associated with the BMI categories of the children (Cramer's $V = 0.27$, $p < 0.001$). In addition, fathers with a low level of education was found to be significantly associated with the children's BMI (Cramer's $V = 0.12$, $p < 0.001$). Also, a family history of high cholesterol (Cramer's $V = 0.13$, $p < 0.05$) and diabetes was strongly significantly associated with children's overweight and obesity (Cramer's $V = 0.13$, $p < 0.05$). The BMI of the male and female children also increased significantly with respect to age ($F = 19.67$, $p < 0.001$), having overweight siblings ($F = 19.67$, $p < 0.001$) and eating food from takeaway restaurants ($F = 21.59$, $p < 0.001$). However, a sedentary lifestyle was significant for male children only ($F = 8.29$, $p < 0.001$), while walking to or from school was found to be significant for female children only ($F = 5.95$, $p < 0.001$).

In general, overweight and obesity occurs as a result of an imbalance between energy intake and energy expenditure (WHO, 2014).

Several studies have identified a positive relationship between obesity and certain factors such as higher family income (Al Alwan, Al Fattani, & Longford, 2013), cultural influences on physical activity and eating habits (Green et al., 2003), genetic factors (Wang et al., 2013), a sedentary lifestyle due to spending more than two hours per day on screen time (Herman et al., 2014), media advertising affecting food preferences (Boyland & Halford, 2013), fast food consumption (Poti et al., 2014), and high sugar content beverage consumption (Malik et al., 2013).

In the present study, the parents' demographic data, such as occupation, level of education, family income, marital status, body weight and duration of breastfeeding were investigated. The results indicate that only a father's low educational level (Cramer's $V = 0.12$, $p < 0.001$) was found to have a significant association, ($\alpha = 0.05$) with the children's BMI.

Previous research has identified that children whose parents have a low education level have a higher risk of being obese (Lamerz et al., 2005; Lazzeri et al., 2011; Bingham et al., 2013). The findings of these studies are consistent with this study, as the results revealed that the proportion of obese children whose fathers had an education level less than high school or high school was greater than the proportion of obese children whose fathers had an educational level of Bachelor degree or postgraduate degree. Similarly, Larson & Story's (2009) findings show that a population with a high level of education is more likely to choose healthy food than a population with a low level of education. This could lead to the conclusion that educated people are more likely to be aware of the benefits of eating healthy food and have the capacity to provide it to their children.

The study also found that a family history of high cholesterol and diabetes are significantly associated with children's overweight and obesity. This association of a family history has been well documented with children body weight (Sorof & Daniels, 2002; Chen et al., 2010; Epstein et al., 2001). Reilly & Kelly (2010) identified that individuals who are overweight or obese in childhood are more likely to have adverse health consequences during adulthood. In addition, Moussa et al. (1999) identified a family history of chronic diseases, such as diabetes mellitus, bone disease and respiratory problems are factors associated with child obesity in Kuwaiti children. However, in this study, the family health history indicated that most of the parents reported only one or two diseases in their families, of which diabetes and high blood pressure were the most prevalent.

The proportion of overweight and obese children with a family history of high cholesterol and diabetes was greater than the normal weight and underweight children.

Interestingly, the findings from this study indicated there was no statistical significance between parents' BMI and children's BMI, while having an overweight sibling was found to be an associated factor for both female and male children. A similar study on American children indicated that having an obese sibling was more strongly associated with child obesity than having obese parents (Pachucki et al., 2014). Likewise, a previous study in Kuwait also found that having an obese sibling was a contributing factor for overweight and obesity in Kuwaiti male children aged 6-10 years (Al-Isa et al., 2010). Granich et al. (2010) state that friends, siblings and parents play a role in shaping a child's lifestyle, such as playing video games or engaging in physical activity. There is, therefore, a documented relationship between child obesity and parents (Boutelle et al., 2012), siblings (Pachucki et al., 2014) and friends (Maximova et al., 2008).

The current study revealed that a sedentary lifestyle, in terms of television watching, video games and spending time on the computer was a significant contributing factor for male but not female children. Previous studies indicate that the sedentary behavior of adolescents of either sex was not a significant factor in Kuwait (Al-Haifi et al., 2013), or in Saudi (Al-Hazzaa et al., 2012). However, in contrast to these studies' findings, a cross-sectional study of adolescents in Saudi Arabia indicated that there was a positive relationship between the weight of male and female adolescents and sedentary lifestyle (Al-Nuaim et al., 2012). However, looking more closely at children's sedentary lifestyle, a review of the research provides evidence that increasing any type of sedentary behaviour is associated with decreasing physical activity and increasing the body mass index of children and adolescents aged between 5 to 17 years (Tremblay et al., 2011). Consequently, the time children spend on sedentary and physical activities should be considered in any strategies aiming to combat the problem of overweight and obesity.

Interestingly, walking to and from school was found to be a significant factor for female children only.

Not surprisingly, previous studies in Arab countries have reported that women in Arabic countries are restricted in their practice of outdoor activities due to cultural beliefs and traditional barriers (Alqout & Reynolds, 2014; Henry, Lightowler & Al-Hourani, 2004; Badran & Laher, 2011; Ali, Baynouna & Bernsen, 2010). Furthermore, children across the globe face common problems in walking to and from school, including personal safety and distance (Center for Disease Control and Prevention, 2002; Zhu, & Lee, 2009). As a result of these problems, several studies have reported a positive correlation between children who do not actively travel to school and overweight in China (Li et al., 2007), in Portugal (Silva & Lopes, 2008), and in France (Klein-Platat et al., 2004). Moreover, the literature suggests that children with a healthy body weight are those who walk to or from school (Lubans, Boreham, Kelly & Foster, 2011; Davison, Werder & Lawson, 2008). Supporting this suggestion, Cooper et al. (2005) pointed out that children who walk to or from school are classified in a higher physical activity category than those who use transport to travel to school.

A positive correlation between fast food consumption and children's weight status for both genders was a significant finding and is consistent with previous studies (Al-Haifi et al., 2013; Washi & Ageib, 2010; Collison et al., 2010; Andreyeva, Kelly & Harris, 2011; Fraser et al., 2012). A recent study identified the effect of fast food consumption on the total energy intake of children and adolescents showing that the consumption of fast food was associated with an increased intake of sugar (5.71-16.24 g), total fat (7.03-14.36 g) and saturated fat (1.99-4.64 g), for children and adolescents and protein (7.94 g) and sodium (396.28 mg) for adolescents (Powell & Nguyen, 2013). Likewise, Wellard, Glasson & Chapman, (2012) identified that the consumption of fast food is associated with a 30% excess of sugar, sodium and saturated fat above the daily recommendations for all children. Furthermore, adolescents who eat fast food frequently are more likely to consume unhealthy foods and gain body weight than those adolescents who do not eat fast food frequently (Fraser et al., 2011). In addition, previous research has proposed that food advertising on television aimed at children is significantly associated with higher levels of fast food consumption (Andreyeva, Kelly & Harris, 2011). Moreover, a study by Goris et al. estimated that television food advertising contributed to the prevalence of obesity in children aged six to eleven in Australia, Great Britain, Italy, the Netherlands, Sweden and the US.

This study found that, had these children not been exposed to food advertising on television, 16% - 40% of US children, 10 – 28% of Australian and Italian children and 4 – 18% of children in Great Britain, Sweden and the Netherlands who have been classified as obese would not be so (Goris et al., 2010). Therefore, banning fast food advertising could help to reduce the consumption of fast food by Kuwaiti children.

Finally, the age of children was predicted to be a risk factor as the results indicated that as the children's age increased, their weight also increased. The BMI of both female and male children varied significantly with respect to age ($F = 2.464$, $p < 0.001$). The 11-year old children had the lowest BMI ($M = 22.79$, $SD = 5.34$) and the 14-year old children had the highest BMI ($M = 25.55$, $SD = 6.16$). This result is consistent with previous studies in Kuwait (Al-Qaoud & Prakash, 2009; Al-Isa & Moussa, 1999). For instance, Al-Qaoud & Prakash (2009) identified that children of four years and older in Kuwait were at a higher risk of becoming overweight or obese than children below four years of age. Another study in Kuwait of adults found that obesity increased with age, the results showing the heaviest weight (mean BMI of 33.8) at age 60 years and older (Al-Kandari, 2006). To further explain age as a risk factor for overweight and obesity in the Kuwaiti population, a comparison is made of overweight and obesity in children and adults.

In the current study, overweight and obesity in children was 25.51% and 36.54%, respectively. In contrast, previous studies have shown that overweight and obesity in adults in Kuwait was 80.4% and 47.5%, respectively (Al Rashdan, & Al Neseif, 2010). The findings of this study and previous studies clearly indicate that for the Kuwaiti population, living in unhealthy contemporary environment has led to an increase in the rate of overweight and obesity in Kuwait. Garduño-Díaz & Garduño-Díaz (2014) point out that the Kuwaiti populations have access to an unlimited amount of food, sugars, trans fats and limited outdoor activity, all these factors contribute to an obesogenic environment in Kuwait.

In conclusion, the main strength of this study was its involvement of all Kuwait provinces, both female and male children's heights and weights were measured to obtain their Body Mass Index (BMI) and a total of 635 parents and their children were surveyed. In addition, this study has provided clear evidence of the contributing factors to overweight and obesity in children in Kuwait.

Therefore, the decision makers in Kuwait should consider the findings of this study in relation to devising strategies to target the problems of overweight and obesity in children.

6. Limitations

This study was limited to intermediate classes in public schools with school children aged 11 to 14 years old. Further studies involving private schools and primary and secondary school children are needed.

7. Recommendation

The findings of this study give rise to various recommendations. Firstly, it is recommended that children and their parents increase their knowledge of healthy food, that children's screen time is decreased and their physical activity is increased by encouraging Kuwaiti children to walk to and from school as an important step in reducing the incidence of overweight and obesity.

Conflict of interest

The authors declare that they have no conflict of interest.

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