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The Influence of Parent's Education, Birth Order and Number of Siblings on Adolescent's BMI

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ABSTRACT

Obesity in adolescents shows high prevalence specially in developing countries. Although birth order and sib size have been mathematically coupled and in spite of their respective effect on both overweight and obesity, they have not been estimated before separately. Moreover, the educational achievement of parents might have impact on their children's nutritional status.

Objective: This study aims to assess how birth order and number of siblings affect adolescent obesity risk and to examine the impact of parent's education on adolescent obesity, the results will indicate which family members may be prioritized for inclusion in adolescent obesity prevention programs.

Methodology: A self-administered questionnaire was used to collect data on individuals aged 10 to 18 years old, including gender, age, birth weight, birth order, number of siblings, lifestyle, and parent's educational level by a self-administered questionnaire completed by an adult member of the family, while measurements of subjects' height and weight were done in the clinic of nutrition and immunity. The CDC's BMI cut-off points were used to classify the subjects as normal (5-84th percentile) and obese (≥ 95th percentile).

Results: Distribution of the number of siblings was different in both groups as regards BMI but statistically insignificant, we found no statistically significant difference on correlating birth order and number of siblings.

Conclusion: Adolescent's BMI were driven by neither the sibling was (younger or older) nor number of their siblings. There was no significant association between parental education and the development of obesity.

Keywords: Sibling; Birth-order; Parental education; Adolescence; Obesity

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INTRODUCTION

Obesity with all its negative effects whether pathological or psychological is considered as a major health problem particularly in adolescence because of its great effect on their whole life as it tends to persist to adulthood [1].

The Middle East is the second largest region in the world in terms of prevalence of obesity after North American countries [2]. Obesity is considered as a global health problem with different etiological factors [3]. Some of them has been associated with many family variables as age and body mass index of the parents, siblings number, child birth order, and socioeconomic level [4].

Few information about how birth order and siblings number may influence obesity among adolescents, so it is useful to evaluate impact of having older or younger siblings as well as the number of siblings on obesity to help in identifying those having high risk [5].

Several studies had been done one of which reported that parental understanding emanating from their level of awareness and level of education, has a great effect on correction of some erroneous food behaviors and such indicating a potential association between parental education with adolescent's obesity and this will help identifying participants in intervention programs for prevention [6].

MATERIALS AND METHODS

The current study was conducted at the Medical Research Centre of Excellence (MRCE) in the clinic of nutrition and immunity, as a part of a project named "early renal injury markers in obese adolescents" numbered 11010142 funded by the national research centre, the cases were 45 adolescents with body mass index above or equal to 85th centile. The control group were 45 age and gender matched adolescents with body mass index below 85th centile.

Inclusion criteria: Both gender adolescents aging 10-18 years old.

Exclusion criteria: Any organic causes of obesity.

Questionnaire Survey

A questionnaire completed by an adult member of the family: Gender, age. In addition, each subject's weight and family data; siblings number, birth order of the subject, and the parent's education level.

Anthropometry

Height and weight were taken to the nearest 0.1 cm and 100 g using the Holtain portable measuring device and a digital seca scale while the participant was barefooted and wearing minimal clothing. Before the examination, the scale was calibrated. At least two physicians conducted each of these measurements; one took the measurements and the other documented the results. It was decided to take the average of two measurements. BMI calculation using the following formula: Weight (kg)/Height (m)^{2}. The Centers for Disease Control and prevention (CDC) BMI cut-off values were used to classify the adolescents as normal. (5-84th percentile) and obese (≥ 95th percentile). The programme AnthroCalc v1.66 Home was used to plot the data on WHO curves [7].

Data Collection

An adult member of the household was interviewed to collect data, the date of birth was used to determine age. Parent's educational levels were divided into four categories: Illiterate, elementary, middle, and high.

Analyzing Data

There were 3 categories for the sibling's number: (1-2), (3-4), and (>4) and 4 groups for birth order: Lone child, oldest child, youngest child, others. Parental education were divided to high, middle, elementary and illiterate. Statistical significance was defined as a p value of less than 0.05. The Statistical Package for the Social Sciences (SPSS) version 16.G was used.

RESULTS

The study group was divided into two equal groups of 45 children each with 31 (34.4%) males and 59 (65.6%) females. According to the WHO growth charts, the case group's cutoff BMI was 85th centile, whereas the control group's cutoff BMI was 85th centile. The average age of the participants was (13.05 ± 2.61) and (12.62 ± 2.6) for case and control groups respectively [8]. Detailed anthropometric data according to BMI percentiles is shown as mean and standard deviation in **Table 1**.

Table 1: Anthropometric data of the study groups.

	Case (n=45)	Control (n=45)
Age	13.0 ± 2.61	12.62 ± 2.6

BMI	30.55 ± 5.61	17.22 ± 2.71
BMI centile	98.3 ± 2.68	34.4 ± 28.16
Wt	73.41 ± 18.26	37.39 ± 10.68
Wt centile	96.26 ± 4.8	27.43 ± 25.0
Ht	154.16 ± 10.65	146.0 ± 13.0
Ht centile	51.5 ± 28.89	32.6 ± 28.74

Characteristics of the sample studied showed that most of the non-obese (70.5%) had 1-2 siblings compared to (55.6%) of the obese. On the other hand, more than one third of the obese (37.8%) had 3-4 siblings compared to less than quarter of the non-obese (20.5%).

The distribution of the number of siblings was different in both groups but statistically insignificant (p-value 0.349) as shown in **Table 2**.

Table 2: Comparing BMI as regards number of siblings.

No. of total siblings	Obese	Non-obese	P-value[a]	P-value[b]
None	1 (2.20%)	1 (2.30%)	1	0.349
1-2	25 (55.60%)	31 (70.50%)	0.423	
3-4	17 (37.80%)	9 (20.50%)	0.117	
>4	2 (4.40%)	3 (6.80%)	0.655	

Note: [a]P-value using *Chi-square* to compare between obese and non-obese groups.

[b]P-value using crosstab *Chi-square* to comparison between all groups.

As regards level of education, middle level was the most encountered in our study group with a percentage of (39.5%) and (43.2%) of obese siblings *vs.* (48.8%) and (45,5%) of non-obese siblings in fathers and mothers respectively.

Although, the frequency of obese child (n=11) was almost the triple of non-obese (n=4) for the mothers with elementary education but the difference is statistically insignificance (P-value=0.07) (**Table 3**).

Table 3: Comparing BMI with parental educational level.

	No. of total siblings	Obese	Non-obese	P-valuea	P-value[b]
Father educational level	High	15 (34.90%)	16 (37.20%)	0.857	0.436
	Middle	17 (39.50%)	21 (48.80%)	0.516	
	Elementary	3 (7.00%)	3 (7.00%)	1	
	Illiterate	8 (18.60%)	3 (7.00%)	0.132	
Mother educational level	High	7 (15.90%)	14 (31.80%)	0.127	0.127
	Middle	19 (43.20%)	20 (45.50%)	0.873	
	Elementary	11 (25.00%)	4 (9.10%)	0.071	
	Illiterate	7 (15.90%)	6 (13.60%)	0.782	

Note: [a]P-value using *Chi-square* to compare between obese and non-obese for each group.

[b]*P-value using crosstab Chi-square to comparison between all groups.*

In **Table 4**, we tried to examine the possible correlations between the adolescent's BMI and their birth order and number of siblings, where we found no statistically significant difference between either of them and BMI. This suggests that adolescent's BMI (weight) were driven by neither the sibling was (younger or older) nor number of their siblings.

Table 4: Correlation of BMI with birth order.

Parameters	*r	P value
BMI with order	-0.094	0.382
BMI with no of total siblings	-0.032	0.764

Note: *r=Correlation coefficient (Spearman correlation). P>0.05 is considered not significant.

DISCUSSION

Obesity is an increasing health problem growing rapidly all over the world and is considered one of the most prevalent hazards to public health as childhood obesity usually track to adulthood and also obesity is linked to subsequent chronic disease as hypertension, cardiovascular and metabolic diseases [9]. Prevalence of obesity was 6.0 to 26.6% among males and 4.6 to 17.3% among females according to WHO European childhood obesity monitoring Initiative reports for 2008 [10]. Children in the Middle East and Eastern Europe had the highest prevalence of obesity, with adolescents residing in Kuwait and Qatar having a higher rate of overweight and/or obesity [11].

Obesity is a multi-factorial disorder with different etiological factors, several studies have indicated that obesity in adolescents are linked to family causes including both, genetic and environmental effects, among these environmental factors, parental overweight, dietary habits, and socio-economic status come to be contributed to childhood obesity [12].

The mean ages of the studied group was 13.0 ± 2.61 years and their mean BMI was 30.55 kg/m^2 with BMI SDS ± 5.61. They were age and gender-matched with 45 non-obese children whose mean age was 12.62 ± 2.6 years and mean BMI was 17.22 kg/m^2 with BMI SDS ± 2.71. After an informed written consent, an adult member of the family was asked to fill out a questionnaire.

Our study aimed to assess how birth order and siblings number affect adolescent's obesity risk and to examine the impact of parent's education on adolescent's obesity, the results will indicate which family members may be prioritized for inclusion in adolescent obesity prevention programs.

Interaction by Sibling Birth Order and Number of Siblings

In our study, there were no statistically significant interactions by sibling birth order suggesting that adolescent's obesity was not driven by whether the sibling was younger or older.

As regards relation of birth order with obesity, we found no significant correlation and these findings are congruent with a research that that showed no link between obesity and firstborn children compared to children born in other birth orders, concluding that a higher risk of obesity is explained by the absence of siblings rather than birth order [13]. While others studies reported that increased adiposity and overweight is linked with older siblings others showed that youngest children showed significantly increased ORs for overweight [14,15].

In our study we found no association between adolescents obesity and number of siblings and this came in accordance with a study that did not found any relation between siblings number and adolescents overweight and another one done later which found no significant influence of having siblings on overweight [16,17].

Although, our findings were not statistically different but results were comparable and this might be explained as an additional child may serve as an extra burden on the family and thus decrease availability of healthy food, resulting in increasing the incidence of obesity particularly in families with low educational level. Another explanation is that the presence of multiple siblings may decrease chance of regularity in sports in terms of abundance of money and time.

It is also known that a single child's mother is more interested in persuading her child to eat healthy food and participate in active play and may be an incentive for the mother to increase the time allocated to physical activity rather than a mother with several children. These suggestions did not agree with a study that indicated that a larger number of siblings, regardless of each individual sibling's activity level, promotes active long-term lifestyles [18].

Interaction by Parental Education

Parent's education level did not appear to be a significant predictor of obesity in adolescents may came to the small sample size. The current study demonstrated that there was no significant association between parental education and the development of obesity, where most of our children whether obese or non-obese had fathers with middle education (39.5%) (48.8%) respectively and had also mothers with middle education (43.2%) (45.5%) respectively, moreover, although, the number of obese child was triple that of non-obese for the

mothers with elementary education but the difference is statistically insignificance.

These results came in accordance with a study that did not find significant relationship between parental education level and weight gain, similar results could be seen for the status of maternal educational. Studies showing that maternal education had a greater impact on adolescent's obesity than the paternal one as young children actually spend more time with their mothers and that mothers are more involved with their children concerning diet intake and participating in physical activities [19].

A study reported that parental education was inversely associated with child overweight and others discovered that children whose parents had a low educational level had a higher rate of overweight and/or obesity.

Some studies have found that a higher educational level of the parents can lead to higher incomes and thus increased food availability and consumption in the home. On the contrary it may be related, with improved child care and enhanced nutritional knowledge [20].

In several studies, there was a positive effect of higher education for parents on weight gain in children in countries with higher economic status, which is stronger with fathers compared to mothers than low economies, where higher parental education is associated with higher probability that their children are obese.

There are many possible explanations for these differences. First of all, diet practices and healthy food intake lifestyle as reducing both of caloric intake, fat consumption, and regular physical exercise are more in the higher economy.

One more explanation is cultural and social norm discrepancies between high and low educational parents as in some developing countries, an obese child is seen as a "healthy child", with adequate rich unhealthy food, these more educated families moving to a higher social environment and have greater access to motorized transportation, engage less in active travel, coupling these with minimal knowledge about the health risks associated with obesity, along with lack of awareness of the need of keeping a healthy body weight and participating in suitable amounts of physical exercise explain the positive relationship between parental education level and child BMI in low-income nations.

An Iranian study found a relation between maternal high educational level and risk of adolescents overweight. Although, this came in accordance with some developing countries studies but was different to others in Western European countries where parental education, especially the maternal had a prophylactic effect against children's obesity. This might be owing to the varying influences of social and economic risk variables in different nations.

Family, friends together with all types of media are good influencers on teens, so parental education may influence eating behavior and thus adolescent's obesity.

CONCLUSION

These findings may be useful for researchers working in obese prevention programs to consider that it is equally useful to involve either younger or older siblings in targeting adolescent's weight related behaviors and it is also the case in involving adolescents with multiple siblings.

To reduce the risk of obesity in the following generation and eliminate socioeconomic health inequalities, preventive community and school-based interventions should begin early.

ETHICAL APPROVAL

According to the ethical standards of the world medical association (declaration of Helsinki) approval number 16130, each child's care provider gave written informed consent to take part in the research. The medical ethical committee of the national research center gave its approval to the research.

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CONFLICTS OF INTEREST

There are no conflicts of interest stated by the authors.

LIMITATION OF THE STUDY

The limited size of our sample may have prevented us from detecting interaction even if it exists. Another limitation of the study was taking parental education only for correlation with adolescent's obesity rather than taking socioeconomic status as a whole including parental occupation, family income for this correlation.

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