

The Rate of Socioeconomic and Demographic Factors Affecting Body Mass Index (BMI) among Teenagers in Derna City, Libya

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Abstract: Body mass index (BMI) is a commonly used anthropometric measurement to estimate the level of nutritional indices (underweight/overweight) of adolescents and adults. Knowledge of the factors affecting BMI is essential for developing intervention programs. The aim of the present study was to measure BMI and determine the socioeconomic and demographic factors affecting the relative weight of children and to identify the prevalence of underweight among school children in Derna, Material and Methods: Libya aged 10–18 years. The sample of this research included 109 school children from both sexes. A randomized cross-sectional study of students was conducted. Questionnaire was used to collect the socioeconomic and demographic status of the participants. BMI (weight/height², kg/m²) was measured and used as index of relative weight Centers for Disease Control. Data were analyzed using SPSS version 24. Result: A value of $P < 0.05$ was interpreted as statistically significant. The results show that the prevalence of underweight among schools age children was 11.0% and effect some selected socio- demographic variables are significant on the nutritional status of Libyan children. Height, Weight and BMI are positively related with age, gender and father's occupation ($p < 0.05$) and negative relation between the level of parent's education, family member, family income, meals per day and food source over the nutritional status ($p > 0.05$). Conclusion: Also the results suggest that younger age children were likely to be underweight than other children. Effect some selected socio-demographic variables are significant on the nutritional status of Libyan children. Height, Weight and BMI are positively related with age, gender and father's occupation. This study will help local governments, educators and community groups develop programs to assist underweight children in schools.

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Introduction

The world population is believed to have reached over 6.6 billion (1). Children are a particularly unique period in life because children comprise one-fifth to one-quarter of the world's (2). The children are the future, they need nutritional and health care to prevent them from developing nutrition-related diseases especially in children as a result of unbalanced diets being more susceptible and quicker to develop symptoms (3). Body Mass Index (BMI)

is a person's weight in kilograms divided by the square of height in meters. For children BMI is age- and sex-specific and is often referred to as BMI-for-age. In children, a high amount of body fat can lead to weight-related diseases and other health issues and being underweight can put one at risk for health issues. Children BMI expressed as a percentile, which can be obtained from either a graph or a percentile calculator. Normal or healthy weight status is based on BMI between the 5th and 85th percentile on the CDC growth chart (4). Nutrition status (BMI) of children influenced by many factors of which socioeconomic status and demographic factor. Socioeconomic status (SES) is defined as a measure of one's combined economic and social status and tends to be positively associated with better health (5). In this study focus on particular age group of the children, the second decade of life, it is an important physical growth period which affected by inadequate or inappropriate food intake due to economic and social disadvantage. This study provides comparable and useful data to build on a plan of action to prevent and control underweight established in Libya especially among children and adolescents and combat the comorbidities associated with underweight. That this study will stimulate researchers in other cities to carry out similar study to compare underweight

Material and Methods

Study design and Place of the Study

A randomized cross-sectional study of 109 adolescent students living in the Derna region of Libya was conducted.

Sample

A total 109 school children aged between 10 to 18 years old (25 boys and 84 girls). Data were collected from March to May 2018. All enrolled subjects were interviewed using a structured questionnaire inquiring by the Participants to assess their socio-demographic characteristics (age, sex, family members, parent's education, and job and Family income).

Anthropometric Measurements

Height and weight of each child were measured according to the methods described below. Children were weighed on personal Seca scales. Weight was recorded to the nearest 0.1 kg. Height was measured using a stadiometer attached to scales to the nearest 0.5 cm. Weight and height were measured with the children barefooted and lightly clothed.

Take high and weight

Weight Measuring Procedures

- Scale is set at zero reading.
- Scale is set on firm surface, preferably uncarpeted floor. Student removes shoes and heavy outer clothing such as sweater, jacket, and vest and empties pockets.
- Student steps on center of the platform, with back toward the scale, both feet on platform, and stands still.
- Read weight value to nearest ¼ pound or 0.1 (1/10) kilogram
- Record weight immediately on data form before child gets off scale

Height Measuring Procedure

- Student removes shoes. Student removes hair ornaments, buns, braids to extent possible.
- Student stands on footplate portion with back against stadiometer rule (cut out feet can be placed in position to assist the student). Bring legs together, contact at some point (whatever touches first). Knees not bent, arms at sides, shoulders relaxed, feet flat on the floor.
- Back of body touches/has contact with stadiometer at some point. Body in straight line (mid-axillary line parallel to stadiometer).

Head in appropriate position – check Frankfort plane, Lower headpiece snugly to crown of head with sufficient pressure to press hair.

Statistical Analysis Data were first entered in an Excel file and then results were expressed as mean and standard deviation. Chi square, were calculated to analyse data using SPSS version 24. A value of $P < 0.05$ was interpreted as statistically significant.

Result

The demographic characteristics of the study participants are shown in Table 1 of the 109 adolescents who participated in the study; the mean age of study participants was 14.0 ± 2.6 years. Over half (53.2%) were 14–18 years old. The proportion of girls (77.1%) was higher than boys (22.9%). Over half 78% of participants had 4 or more family members, while 22 % had 4 or less family members. Over half (57.8%) of the head of household had education was university level. The occupation of the father included government employee (95.4%), and the rest were not employed. The annual family income for a majority (90.8%) of the families was

more than 500 LYD approximately half) 45 %)of participates eating 3 meals per day and over half (70.6%) of foods were from supermarket source.

Table 1 Demographic characteristic of children and their families

Demographic	frequency	Percentage %
Age		
10-14	58	53.2%
15-18	51	46.8%
Gender		
Boy	25	22.9%
Girl	84	77.1%
Family size		
<4 person	24	22%
≥4 person	85	78%
Education level (mother)		
Primary	11	10.1%
High	45	41.3%
University	35	48.6%
Education level (father)		
Primary	10	9.2%
High	36	33%
University	63	57.8%
Father Occupation		
Working	104	95.4%
Not working	5	4.6%
Family income		
250- 300 DL	2	1.8%
350-400 DL	5	4.6%
450-500 DL	3	2.8%
More than 500 DL	99	90.8%
Meal / day		
2 meals	33	21.1%
3 meals	49	45%
4 meals	37	33.9%
Food source		
From produced	32	29.4%
From market	77	70.6%
Both	32	29.4%

Regarding the anthropometric measurements of pupils under study are illustrated in table 2, 66.1% had BMI in the normal weight category, 11.0% in the underweight category, 13.8% in the overweight category and 9.2% category as obese. It could be revealed that over half of children were healthy -weighted and about 11.0% of children were under weight. When data was analyzed by gender, the proportion of normal weight males (68.0%) was higher than that of females. In contrast, the proportion of overweight and obesity female were higher than that of males and equal proportion (24.0%) of males and females were classified as underweight. When age group analyzed data, the proportion of 10-14 year olds in underweight category was (13.8%) lower than the proportion of 15–18 year olds. In contrast, the proportion of 10–14 year olds in the overweight category was (86.0%) higher than the proportion of 15–19 year olds as shown in table 3.

Table 2 BMI categories

BMI	Number	Percentage %
Under weight	12	11.0%
Healthy weight	72	66.1%
Over weight	15	13.8%
Obesity	10	9.2%
Total	109	100%

Table 3 Body weight categories by gender and age as determined by Body Mass Index

Characteristic	Gender		Age	
	Male	female	10-14	15-18
Under weight	24.0%	24.0%	13.8%	47.8%
Healthy weight	68.0%	65.5%	62.7	62.7%
Over weight	4.0%	16.7%	86.0%	19.6%
Obesity	4.0%	10.7%	8.8%	9.8%

Table 4 Relation between nutritional status of participates and soico- demographics factors.

Characteristic	Under weight	Healthy weight	Over weight	Obesity	P-value
Age					
10-14	13.8%	62.7%	86.0 %	8.6%	0.04
15-18	47.8%	62.7%	19.6%	9.8%	
Gender					
Male	24.0%	68.0%	4.0%	4.0%	0.04
Female	24.0%	65.5%	16.7%	10.7%	
Family size					
<4 person	9.4%	66.7%	12.5%	14.2%	0.62
≥4 person	16.7%	65.9%	14.1%	10.6%	
Education level (mother)					
Primary	18.2%	36.6%	1.0%	18.2%	0.45
High	6.7%	64.4%	20.0%	8.97%	
University	13.7%	67.9%	11.3%	7.5%	
Education level (father)					
Primary	10%	36.5%	1.0%	10%	0.39
High	5.6%	66.7%	22.2%	5.6%	
University	14.3%	80.0%	11.1%	11.1%	
father's occupation					
Working	9.4%	67.7%	15.6%	7.3%	0.05
Not working	23.1%	53.8%	1.0%	12.1%	
Family income					
250- 300 DL	1.0%	30.0%	1.0%	50%	0.56
350-400 DL	20.0%	60.0%	1.0%	20%	
450-500 DL	1.0%	87.1%	1.0%	1.0%	
More than 500 DL	11.1%	65.7%	15.2%	8.1%	
Meal / day					
2 meals	8.7%	60.9%	21.7%	8.7%	0.87
3 meals	12.2%	65.3%	14.3%	8.2%	
4 meals	10.8%	70.3%	8.1%	10.8%	
Food source					
From market (purchased)	66.2%	14.3%	10,0	9.1%	0.98
Both	12.5%	65.6%	12.5%	9.4%	

Data presented in Table 4 demonstrated body weight difference between males and females is significant ($p < 0.05$); also Difference between younger and older children is significant ($p < 0.05$) that means positive correlation was noted between both gender and age with body weight. The results showed the underweight proportion of participates were 16.7 % had 4 or more family members while 66.7 % had 4 or less family members were healthy weight .Regarding to father's occupation there is highly significant correlation with body weight ($p < 0.05$) whereas the proportion of underweight was 9.4% when father employ and 23.1% when father was not employ.

Furthermore, when increase the level of education of the parents the percentage of healthy weight of participates were higher and underweight was most commonly observed with children whose both parents have primary

level of education but the difference in BMI as related to level of parent's education was insignificant ($p > 0.05$). Moreover, an annual family income of 400- 500 LYD and more than 500 LYD were related to an increased participates healthy weight compared to an annual family income of (200-300 LYD) on other hand the proportion of obesity of participates were 50% when family income was 200-350 LYD and the relationship between family income and BMI was insignificant ($p > 0.05$).

Discussion

In this study the prevalence of underweight among schools age children was 11.0% which similar to what found in the study by Syahrul (2016) in Indonesia (11) and significantly lower than that found in the study by Yetubie (2010) in Ethiopia which was 27.2% (12) the difference in the underweight prevalence maybe attributed to income difference in the two locations.

Libya had low prevalence of overweight and obesity were similar what seen by Musaiger (2012) which said the lowest prevalence of overweight was reported an Algeria (13.4%) followed by Syrian (19.7%) and Kuwaiti (20.8%) adolescents (13) the high prevalence of overweight and obesity among some Arab countries, especially in Kuwait, could be due to rapid nutrition transition, which started earlier in Kuwait than in other countries. In general the proportion of overweight and obesity among females were higher than that of males this was similar what found in the study by Yetubie (2010) in Ethiopia (12) which said underweight was more prevalent in males than females the difference in proportion may related to the difference in timing of puberty muscular tissue and dietary habit between males and females.

The higher prevalence of obesity among males compared to females in some Arab countries may be related to the difference in timing of puberty muscular tissue, and dietary habits between boys and girls related to the difference in timing of puberty, From a study done in Derna it was concluded that the proportion of younger age in underweight category was lower than the proportion of older age that was similar in the study by Sodjinou (2008) in urban (14) and positive correlation ($p < 0.05$) was noted between both gender and age with body weight this findings agree with the findings by Yetubie (2010) in Ethiopia (12).

Who stated that difference between males and females is significant also between younger and older adolescents is significant. Regarding to food source and its relationship with BMI, it could be noticed that the majority of children (66.2%) recorded high food supermarket source consumed classified as underweight that was similar reported in the study by Yetubie (2010) in Ethiopia who stated 66.7% (12) but the relationship was not statistically significant.

This study showed negative relationship between BMI and level of parents education i.e underweight is most commonly observed with children, whose both parents have primary level of education this was similar with finding of other study by Mladenova in 2015 (15). Moreover, an annual family income of 400- 500 LYD and more than 500 LYD were related to an increased participates healthy weight compared to an annual family income of (200-300 LYD). on other hand the proportion of obesity of participates were 50% when family income was 200-350 LYD this was similar what reported in study by Moschonis (2010) (16) which said lower-annual family income was associated with an increased children overweight and obesity are inversely related to the consumption of energy-dense foods, such as fats and sweets, full-fat meat, dairy products, etc. On other side the obesity is occur among children, who eat three and more meals per day, compared to those who are having two meals per day But the correlation between eating 2 or more than 3meals per day, were not statically significantly with body weight ($p > 0.05$). This was similar what found in stud y by Mladenova in 2015 (15). The underweight is most commonly seen among families with four and more children this was similar what reported in the study by Mladenova in 2015 (15). However, there was no significant difference ($p > 0.05$) between family size and BMI. Moreover .The occupation of the father show positive correlation ($p < 0.05$) with BMI and the proportion of underweight was 9.4% when father employ and 23.1% when father was not employ this differences in the proportion of underweight may related to amount of food consumed by children.

The results show that the prevalence of underweight among school age children was 11.0% in Derna - Libya and effect of some selected socio-demographic variables are significant on the nutritional status of Libyan children. Height, weight and BMI are positively related with age, gender and father's occupation on other side negative relation between the level of parent's education, family member, family income, meals per day and food source over the nutritional status. however, the results suggest that Younger age children were likely to be underweight than other children.

Conclusion and recommendations

This study provides comparable and useful data to build on a plan of action to prevent and control underweight established in Libya especially among children and adolescents and combat the comorbidities associated with underweight. We hope that this study will stimulate researchers in other cities to carry out similar study to compare underweight. A plan of action to prevent and control obesity should be urgently established in the Arab countries, especially among children and adolescents to combat the comorbidities associated with obesity.

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