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Prevalence of obesity and overweight among children and adolescents in Minia Governorate, Egypt.

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Obesity and overweight have been recognized as a growing health problem among children. This health problem can affect a child's health, educational attainment, and quality of life. Obese children and adolescents were around five times more likely to be obese in adulthood and are at risk of chronic illnesses. The study aimed to identify the prevalence of obesity and overweight and their risk factors among children between 9 - 14 years of age in Minia governorate, Egypt. A cross-sectional study was conducted on 1524 school children. Weight and height were measured then BMI was calculated using Z score. WHO AnthroPlus software was used to calculate Z score. The prevalence of overweight and obesity was 5.7% and 3.08% respectively. Obesity was more obvious among females (3.28%), public school students (3.4%), and very low socioeconomic class (4.1%). Whereas, overweight was more obvious among males (5.2%), private school students (8.9%), and high socioeconomic class (13.2%). The prevalence of obesity was higher in female 3.28% than male 2.94%. The highest rate of obesity was at the age of 13 years in females and 10 years in males. Lastly, the prevalence of overweight was slightly higher in males 5.2% than females 5%. The highest rate of overweight was at the age of 13 years in females and 14 years in males. The prevalence of obesity and overweight was high among 13–14 years old children in Minia governorate. Overweight and obesity should be more attracted by the Egyptian pediatric population with paying attention to the updated health information

Keywords: Children; Obesity; Overweight; Prevalence; adolescents

INTRODUCTION

The spread of childhood obesity and overweight makes it a serious public health problem in many countries worldwide. Obesity and overweight have been considered major health challenges of the century (Wang & Beydoun, 2007). Recent studies indicate that approximately 20% of school age-children in Europe are overweight or obese. In North America, the percentage reaches 30% (Wang

&Lim, 2012).

It is estimated that in 2016, 124 million children worldwide were obese, and the total number of obese aged between 5–10 years had increased more than tenfold from 1975 to 2016 Abarca-Gómez et al. 2017. During recent years, overweight and obesity have been increasing dramatically in many developing countries, particularly in urban settings and among high socioeconomic status (SES) groups

Many diseases and health issues have been linked to obesity and overweight at a young age. Some of these diseases may appear during childhood as blood pressure disturbances Urrutia-Rojas et al. 2006 while problems such as psychological issues Kalra et al. 2012 and cardiovascular diseases Khader et al. 2011may develop years later during adulthood.

Egypt is one of the developing countries that face a serious health problem regarding overweight and obesity. Egypt has been ranked as the country with the highest rate of overweight and obesity worldwide with a percentage exceeds 35% (19%) of the entire population (Collaborators, 2017). Although overweight and obesity in adults may partially originated from the childhood and adolescence as obese children and adolescents were around five times more likely to be obese in adulthood than those who were not obese (Simmonds et al. 2015), but still accurate estimates of the prevalence of overweight and obesity among this age group are not adequately studied (Wang & Lobstein, 2006).

Moreover, studying the risk factors associated with this phenomenon in Egypt and addressing the unique regional characteristics may help the society and authority to address this problem accurately and direct effort to decrease these factors and hence decrease the prevalence of overweight and obesity in both young and adult population. In a study conducted in 2012, socioeconomic status has been correlated with overweight and obesity, it was reported that the influence of socioeconomic status itself affected by gender, age, and country (Wang & Lim, 2012).

Egypt undergoes rapid socioeconomic and nutrition transitions. These transitions are more evident in the southern area that rapidly changes from rural to urban. Consequently, variations in types of food, levels of schools, and socioeconomic levels have been reported in recent years in southern Egypt.

Therefore, this study was conducted to investigate the prevalence and risk factors of overweight and obesity in Minia governorates, Egypt.

MATERIALS AND METHODS

Ethical approval from the local ethical committee was taken (P.T.REC/012/001831) before the beginning of the study. This study followed the principles of Helsinki Declaration (Association, 2014). A cross-sectional study was carried out on 1524 primary and secondary school-age children (9 – 14 years) in Minia Governorate, Egypt. The purpose was to determine the prevalence of overweight and obesity among children within the previously mentioned age group. Sampling procedures were summarized in figure (1).

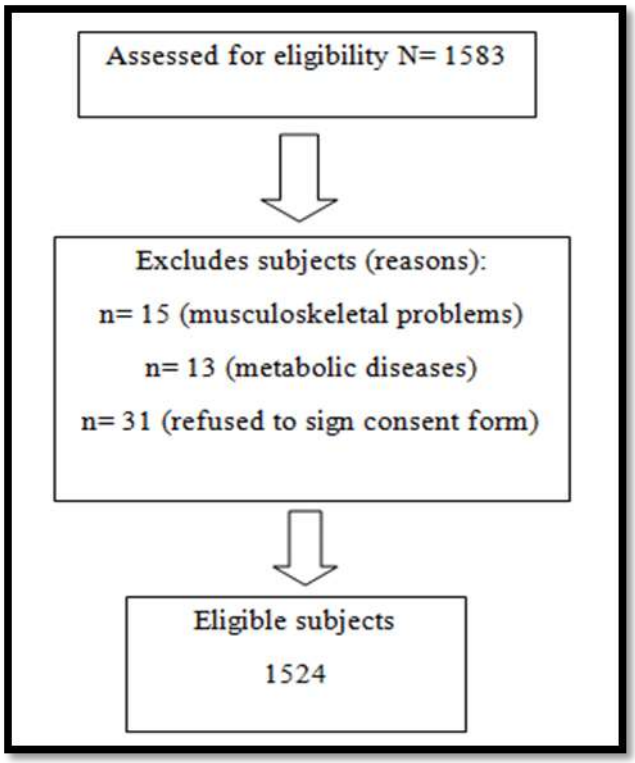

Figure: 1 Flowchart of the recruiting process

Eight schools were randomly selected from Minia governorate private and public schools using simple random sampling. Both genders were included in the study. Data was collected in the period between November 2018 and May 2019. Students' were asked to sign a consent form at the beginning of the study. The official agreement was signed by the manager of each school and authorities in ministry of education.

Collected data included clinical history, Personal data (name, age, and sex) and assessment of the socio-economic standard of

family using a short questions list regarding average family income per year (El-Sherbiney & Fahmy, 1983).

Outcome measures

Weight was measured on a digital electronic scale. The scale was set to zero before the patient was made to stand on the scale and was checked weekly with known calibration weights. Weight measurements were taken with the child wearing little or no outer clothing and no shoes. The weight was approximated to the nearest 100 g Tanamas et al. 2015.

Heightwas measured with a tape measure permanently fixed to a wall or doorframe and the head was held firmly at the top of the board.

Body Mass Index *z*-scores, also called BMI standard deviation (SD) scores, are measures of relative weight adjusted for child age and sex. Data were expressed in terms of standard deviation scores using WHO Anthro-Plus software provided by the WHO website Eastwood et al. 2015.

Statistical analysis

Collected data were recorded, coded, verified and then analyzed using SPSS (v.18; SPSS Inc., Chicago, Illinois, USA) software for Microsoft Windows 7. Data were expressed in the form of mean, standard deviation, and percentage. Data were checked for normality using Shapiro-Wilk test before running any statistical test. In addition, Levene's test was used to assess the equality of variances. Unpaired *t*-test was used to compare independent variables (sex and school) regarding weight, height, and BMI. One way ANOVA was used to compare between socioeconomic classes.

RESULTS

The current study included 1524 children in primary and preparatory schools. The percentage of males (58.01%) was higher than the percentage of females (41.99%). Participants were divided into subgroups according to age. Eleven years subgroup percentage (26.2%) was the highest among all subgroups. The higher number of recruited students were attending public schools (n=1187) and were belonging to the middle socioeconomic class (n=733) (Table 1).

Table 1: Socio-demographic characteristics of the studied sample

Sex n (%)	Age by year n (%)	Socioeconomic level n (%)	School Type n (%)
Males 884 (58.01%)* Females 640 (41.99%)	9 148 (9.7%) 10 327 (21.5%) 11 400 (26.2%)* 12 356 (23.4%) 13 146 (9.6%) 14 147 (9.6%)	High 174 (11.4%) Middle 733 (48.1%)* Low 421 (27.6%) Very low 196 (12.9%)	Public 1187 (77.88%)* Private 337 (22.12%)

n: number, * Higher prevalence

Table 2: Comparison between anthropometric measurements regards sex, and school type

Anthro-pometry	Weight			Height (Hoaglund et al.)			BMI		
	Mean ± SD	*T*	*P*	Mean± SD	t	*p*	Mean± SD	*t*	*p*
Sex **Male** **Female**	37.37±10.16 36.79±10.82	-1.06	0.29	141.99±8.44 142.35±9.34	-0.78	0.44	18.31±3.44 17.89±3.6	-2.3	0.02*
School **Public** **Private**	37.34±10.32 36.37±11.15	-1.5	0.13	142.42±8.25 141.18±10.58	-2.27	0.02*	18.19±3.5 17.92±3.55	-1.25	0.21

* is significant *p*.

Table 3: Comparison between anthropometric measurements regards socioeconomic standard

Anthropometry	Weight		Height		BMI	
	F-value	P-value	F-value	P-value	F-value	P-value
Socioeconomic High Middle Low Very low	4.44	0.004*	5.94	0.001*	15.61	0.000*

* is significant *p*.

Table4: Distribution of BMI/Z scores regarding sex, schools, socioeconomic status:

Factors BMI/Z	BMI *Z* score class [*N* (%)]			
	Mild malnutrition	Normal	Over-weight	Obese
Sex Male Female	 36/884 (4.07%) 60/640 (9.37%)	 776/884 (87.78%) 527/640 (82.34%)	 46/884 (5.20%)* 32/640 (5.0%)	 26/884 (2.94%) 21/640 (3.28%)*
School Public Private	 86/1187 (7.2%) 10/337 (3%)	 1013/1187 (85.3%) 290/337 (86.1%)	 48/1187 (4.0%) 30/337 (8.9%)*	 40/1187 (3.4%)* 7/337(2.1%)
Socioeconomic High Middle Low Very low	 0/174 (0%) 40/733 (5.5%) 30/421 (7.1%) 26/196 (13.3%)*	 146/174 (83.9%) 620/733 (84.6%) 375/421 (89.1%)* 162/ 196 (82.7%)	 23/174 (13.2%)* 44/733 (6%) 11/421 (2.6%) 0/196 (0%)	 5/174 (2.9%) 29/733 (4%) 5/421 (1.2%) 8/196 (4.1%)*

* Higher prevalence

Table 5: Prevalence of obesity based on sex and age

			Sex			
	Both Sexes		Male		Female	
	N	Prevalence (%)	N	Prevalence (%)	N	Prevalence (%)
All age	47	3.08%	26	2.94%	21	3.28%
9	0	0%	0	0%	0	0%
10	19	5.8%	9	5%*	10	6.8%
11	7	1.75%	5	2%	2	1.33%
12	7	1.96%	7	3.33%	0	0%
13	11	7.53%	2	2.06%	9	18.36%*
14	3	2.04%	3	3.12%	0	0%

Obesity defined according to World Health Organization as BMI Z score > 2SD

Table 6: Prevalence of overweight based on sex and age

			Sex			
	Both Sex		Male		Female	
	N	Prevalence (%)	N	Prevalence (%)	N	Prevalence (%)
All age	78	5.7%*	46	5.2%	32	5%
9	9	6.08%	7	13.7%	2	2.06%
10	4	1.22%	4	2.22%	0	0%
11	10	2.5%	10	4%	0	0%
12	6	1.6%	6	2.85%	0	0%
13	27	18.4%	1	1.03%	26	53.06%
14	22	14.96%	18	18.75%	4	7.84%

Overweight defined according to World Health Organization as 2SD > BMI Z score > 1SD

Males did not differ significantly from females regarding weight (p=0.29) and height (p=0.44), but there was a statistically significant difference between them regarding BMI/ Z score (p=0.02). Public school students did not differ significantly from private school students regarding weight (p= 0.13) and BMI/Z score (p=0.21), but they differ regarding height (p=0.02).

There was a statistical significant difference between socioeconomic classes (P<0.05) regarding anthropometric measures.

The sample was classified according to BMI/Z score into four categories according to WHO. These categories were distributed according to sex, schools, and socioeconomic classes. The prevalence in the next table was expressed as the number of observations in relation to the whole number of the subgroup. Obesity was more obvious among females (3.28%), public school students (3.4%), and very low socioeconomic class (4.1%). Whereas, overweight was more obvious among males (5.2%), private school students (8.9%), and high socioeconomic class (13.2%).

The overall prevalence of overweight in the entire sample was 5.7%. The prevalence was higher in males 5.2% with regards to the total number of the sample especially among 14 years male students. In addition, obesity prevalence in females was 5% especially among 13 years female students.

The overall prevalence of obesity in the entire sample was 3.08%. The prevalence was higher in females 3.28% with regards to the total number of the sample especially among females aged 13 years. In contrast, obesity prevalence in males was 3.28% especially students aged 10 years.

DISCUSSION

In the present study, more than 8 % of the studied age groups were either overweight or obese. The prevalence of obesity and overweight was 3.08% and 5.7% respectively. Obesity was higher among females while overweight was higher among males. The highest percentage of obesity was recorded in 14 years old males and 13 years old females while overweight was highest among 10 years old males and 13 years old females. Moreover, there were no statistically significant differences between public and private school students regarding BMI, but the percentage of overweight was higher in private schools and obesity higher in public schools.

The underlying mechanism of overweight and obesity still not well understood. However, it's confirmed that these phenomena occur when energy intake exceeds energy expenditure due to the decreased physical activity and increased intake of energy-dense foods (high in fat and sugars; low in vitamins, minerals, and other healthy micronutrients) Hafez et al. 2004

In addition, the environmental and genetic factors, lifestyle preferences (e.g., quality of life), and cultural environment seem to play major roles in the rising prevalence of obesity worldwide (Khairy et al., 2016). Epidemiological data suggest that the length of sleep in children has been decreased over the last half-century, with increasing rates of overweight and obesity. The problems concern both the short-time sleep and its quality, leading to fatigue, excessive daytime sleepiness, headaches, problems with concentration (problems with learning) that can all affect both the consumed foods (higher calorific value and quantity) and reluctance toward physical activity (Ogilvie & Patel, 2017).

Up to the authors' knowledge, No similar studies were conducted to investigate the prevalence and risk factors of obesity and overweight in Minia governorate. However, three cross-sectional studies were conducted in different geographical regions in Egypt.

Abdelkarim et al. 2017 conducted a study on a group of students aged from 6 – 11 years old who attended schools in one of the southern Egyptian governorates (Assuit). They also investigated the association between physical fitness and changes in BMI of the students. According to Abdelkarim's study, a high prevalence rate for both overweight and obesity 11.24% and 12.28% respectively. Moreover, they found that physical fitness measures were all inversely related to BMI Abdelkarim et al. 2017.

Another study was conducted for the same purpose by Talat et al. They focused on the students within a northern governorate (Sharkia) (Talat & El Shahat, 2016). The age group in this study (12- 15 years) was relatively the highest compared to our study and that conducted by Abdelkarim et al. A questionnaire was used to record student socioeconomic status and dietary habits. The results of this study showed the highest prevalence rate of obesity (20%) which was more obvious in older students (14 – 15 years) which comes in agreement with the results of the recent study.

In contrast, the highest rate of obesity was at the age of 7– 8 years in a study conducted by

Badawi and his colleagues in 2013 to estimate the prevalence of overweight and obesity among primary school children whom age between 6 and 12 years in Port Said city to estimate risk factors of obesity and overweight, defined by BMI.

The comparison between the three previously mentioned studies and ours showed that the prevalence of overweight and obesity was lower than that found in all previous studies. This finding may be attributed to the difference in the number of the sample. The current study sample was the highest with a total of 1524 students. Moreover, the cultural and regular habits regarding feeding and physical activities may differ from region to another due to the difference in access to fast food, children's playgrounds.

The controversy noticed regarding the age at which the prevalence of overweight and obesity increase may be described in line with the characteristics of the study population. It has been demonstrated that children in their growing childhood and preadolescent age show different attitudes and nutritional behaviors varying from having serious concerns about their weight and shape to denial and reduction of symptoms Dmitrzak-Węglarz et al. 2019.

In our study, school type had no effect on overweight and obesity may be due to the fact that children with different socioeconomic levels attend both types of schools. It's not uncommon for high socioeconomic level children to join public schools. On the other hand, children belong to middle socioeconomic level may join private schools. This may decrease the influence of the school type on the prevalence of overweight and obesity as was evident in our sample.

Due to the bad impact of childhood overweight and obesity on health Juonala et al. 2011; Kelsey et al. 2014, regular screening for overweight and obesity profile among school-age children in different regions of Egypt. Moreover, related risk factors as eating habits, activity level, psychological status, and socioeconomic levels should be clearly identified. Authorities should develop policies to increase awareness of children and families and to direct them to a healthier lifestyle that avoid the determined risk factors.

CONCLUSION

This study found that about 8% of children and adolescents (9-14years) in Minia governorate were overweight or obesity. Risk factors of obesity and overweight were age and low socioeconomic status.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

AUTHOR CONTRIBUTIONS

RMK developed the idea. HMH developed research design, scientific Writing. MIA performed the practical part. ESM reviewed statistical design and manuscript. RMK and ESM conducted the statistical analysis and wrote the results section. All authors read and approved the final version.

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