Prevalence of Social Dietary and Behavioral Risk Factors of Obesity among Primary School Children in Minia Governorate, Egypt

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Abstract **Introduction:** Childhood obesity is a serious non-communicable public health problem with negative physical, social, and mental health consequences. Factors contributing to childhood obesity are school nutrition, excessive snacks, fast food, lack of physical activity and family behavior. Increasing rates of overweight and obesity in children & adolescents in Egypt signal a very alarming trend indicating an urgent need for development of strategies to address this new problem. **Aim of the Study** to determine the prevalence of overweight and obesity among primary school children in Minia Governorate, Egypt and identify some socio-demographic, dietary and behavioral factors that govern the problem of obesity. **Subjects and Methods:** This is a cross sectional study carried out at public primary schools during the academic year 2014-2015. Cluster sampling technique was used. Students aged 6-12 years old with a total number of 250 students of both sexes were included in the study. Data were collected from the parents of all children through questionnaire including Socio demographic data, life style habits and dietary habits. **Results:** The prevalence of overweight and obesity is relatively high (58.6%) distributed as 34.2% overweight and (24.4%) obese. Obesity is more prevalent among (8 < 10 years) age group, female, rural resident students. More than half of the obese children belong to university educated fathers (54.9%) and mothers (58.2%). Of obese and overweight children, 75.4%belong to professional employee and clerical fathers. Skipping breakfast, regular intake of carbohydrates, dairy, fat and sweat meals were positively significantly associated with obesity, meanwhile high rate of active play (7 times or more per week), low rate of screen time (2 hours or less per day), spending holiday out door and regular intake of fruits and vegetables were negatively significantly associated with obesity. **Conclusion and recommendations:** This study provides further evidence of the increasingly high burden of overweight and obesity among primary school children living in Egypt. Different strategies can be implemented through many approaches to outline some important targets for anticipatory guidance to prevent obesity.

Keywords: obesity, children, socio demographic, Egypt, behavioral

1. Introduction

Prevalence of childhood obesity is rising around the world. The World Health Organization (WHO) has addressed obesity as a global epidemic. There are 155 million (1 in 10) children classified as overweight, and around 30-45 million as obese, worldwide [1]. According to WHO, non-communicable diseases will account for approximately three quarters of all deaths in developing world by the year 2020. The increase in obesity may be particularly rapid in developing countries [2]. The importance of obesity and overweight among children has been highlighted as obesity incidence among adolescents (10 to 18 years) in Egypt is rising rapidly, being reported that overweight represent 11.5% in boys and 15.2% in girls, while obese adolescents are 6.5% in boys and 7.7% in girls [3].

Childhood obesity is currently a major health problem in many countries of the world. Over the last few decades, an epidemic of childhood overweight and obesity occurred worldwide [4]. Overweight affects both the children health and their social integration and these children tend to become obese adults [5]. Children and youth obesity refers to the age and gender specific body mass index BMI scores that are equal to or greater than the 95 the percentile as indicated on BMI charts. A child is considered obese if his/ her BMI exceeds the cut off point for his or her age. Overweight is defined as BMI of 25 to 29.9 [6]. The prevalence of overweight and obesity varies quite considerably in different parts of the world. In Spain, the prevalence of overweight in students aged 6-16 years was 40% [7,8,9]. In the USA the prevalence of overweight

and obesity among children has been reported to be 22% and 11% respectively [10]. Some Middle East and Asian countries have documented a significant increasing rate in the past decade. In Qatar the prevalence of overweight in boys was 28.6% and in girls was 18.9% [11], while in Kuwait it was 30% in boys and 31.8% in girls [12].

In a report from the Egyptian national nutrition institute there is increasing prevalence of obesity among children and adolescents reaching 5.8% among males and 9.7% among females [13]. Also in another report it is mentioned that overweight and obesity affected 1.6% of 2-6 years old, 4.9% of 6-10 years old, 14.7% of 10-14 years old and 13.4% of 14-18 years old children [8].

Prevalence of obesity not only increases with age, but there is greater likelihood that obesity beginning at early childhood will persist throughout the life span. Dramatic increase in prevalence of childhood overweight/obesity and its resultant co-morbidities such as, heart disease, hypertension, type II diabetes mellitus and early atherosclerosis warrants strong and comprehensive efforts at the preventive level [15].

There are different factors contributing to childhood obesity, such as, schools nutrition, excessive snacks, fast food, lack of physical activity, family behavior, economic and social, and media technologies such as television, internet\computer, and wide spread of video games technology, which negatively affect childhood obesity [16]. Also Fahmi S. and EL- Sherbini A [17] reported that, school teachers play an important role in combating childhood obesity and implementing preventative strategies as children tend to get habits about how they eat when they are young. Combating childhood obesity is considered globally as a health priority.

Early prevention with appropriate interventions is particularly valuable for children at risk. It is here that the potential role of the educational institutions stands undisputed. Schools are probably the ideal medium to acquire knowledge and skills combined with an environment that makes healthy choices possible throughout their lives.

The rapid rise in the rates of overweight and obesity in recent years cannot be attributed to genetic factors. The genetic characteristics of the human population have not changed in the last three decades, but the prevalence of overweight has tripled among school age children during this time [18].

Changing dietary patterns, community design and infrastructure characteristics, sedentary lifestyle and a decline in physical activity are believed to contribute to the world wide obesity epidemic among both adults and children [18].

Dramatic increase in obesity has resulted in a rush to develop and disseminate obesity prevention programs based on theories of behavior change. Identification modifiable risk factors of childhood overweight, may be an important targets.

BMI at age 7 or 8 is a good predicator of obesity. This could provide a useful tool to help in prevention of obesity because it would identify children at risk before the development of obesity which may be more successful and beneficial than treatment of established sever obesity in adolescence or adulthood [19,20].

2. Am of the Work

1. Determine the prevalence of overweight and obesity among primary school children in Minia Governorate.
2. Identify some socio- demographic, dietary and behavioral factors that govern the problem of obesity among primary school children.

3. Subjects and Methods

3.1. Design

This is a cross sectional study.

A) Setting

The study was carried out in primary public schools at Magagah district, Minia governorate, Egypt, during the academic year 2015-2016. Fourteen primary public schools (3 urban and 11 rural school) belong to this district.

B) Sample size

The sample size was calculated to be 200. Data were collected from 250 child.

C) Sampling Technique

Using cluster sampling technique, the students of the study were collected from randomly selected schools (one urban and two rural) district. And take sample of the student of each class in different educational grade within each selected school.

D) Subjects

A total number of 250 students aged 6-12 years old of both sexes was included in the study.

- Inclusion Criteria

Male and female healthy children aged 6-12 years old, from Magaggh district-Minia governorate.

- Exclusion Criteria

Children younger than 6 years old or older than 12 years old, and those with causes of secondary obesity as endocrinal disorders, genetic syndromes, and CNS disorders.

E) Study Tools and Methods

All students were subjected to the following:

- Students were weighed to the nearest one kg, lightly dressed and barefooted.
- Standing height was measured to the nearest one cm, with shoes off, feet together and head in the Frankfort horizontal plane [15].
- The body mass index (BMI) was calculated from a person's weight in kilograms and height in meters (kg/m^2).
- The reliability of measurements of height and weight were assessed by repeated measurement on the same student with an intra class correlation coefficient of >0.95.
- BMI was tabulated according to percentile weight/age and height/age, according to WHO table, 2008.

F) The international age – and gender- specific child BMI cut off – points were used to define over weight and obesity [16].

1- BMI $< 25.0 kg/m^2$ were classified as normal weight and underweight.

2- BMI 25.0 – 29.9 kg/m^2 over weight.
3- BMI ≥30.0 Kg/m^2 obesity.

Data were collected from the parents of all children through a well-designed pre tested validated structured questionnaire (self-administered). The questionnaire was designed including four different parts:

1. The socio-demographic data regarding:
- The age, sex, residence, family pattern, number of family members, number of rooms, father's education, father's occupation, mother's education and mother's occupation.

Social score was calculated and divided to: High, Middle and social standard, guided by 3 parameters; education and work of the mother, education of the father and crowding index (number of family members divided by the number of rooms) with total score 25.
- High social class = Scores from 19-25
- Middle social class= Scores from12-18
- Low social class= Scores from 6-11.

2. The life style habits were considered regarding:
- Presence of active play (player exercise enough to sweat and /or breath hard), its frequency per week.
- Screen time (number of daily hours watching TV or computer)
- Spending leisure time at home.

3. Dietary habits were considered regarding: regular consumption of breakfast and supper, intake and frequency of snacks, and intake of the five food groups (cereals-fruits and vegetables-meats-dairy products-fat and sweets) through last week.

4. Selective food frequency questionnaire: Subjects were asked to indicate how often on average they consumed energy-dense foods (carbohydrate and fat rich foods) over an extended period of time (8).

3.2. Statistical Design

Statistical analysis of the data including data coding, entry, sorting and statistical manipulations were performed. The collected data were tabulated and analyzed statistically using SPSS program version 16. The accepted level of significance in this study was 0.05 ($P<0.05$).

3.3. Ethical Consideration

- An official permission was obtained from the ministry of Education. Communication with the administrators of schools was done to ensure maximum cooperation.
- A written consent from each student parents with an explanation of the purpose of the study and ensuring privacy was considered.

4. Results

Table 1 shows that the prevalence of overweight and obesity was lowest (53.11%) in age group 6 —< 8 years, whereas the highest prevalence was revealed in 8 —<10 years age group (60.7%). It illustrates that the prevalence of overweight and obesity was higher among girls (70.6%), rural residents (60.8%) and students with one parent family (78.3%). The majority of low social class children were overweight (75%). Although there were differences between the different groups regarding different socio demographic aspects yet they are only significant regarding residence, family pattern and social class.

Table 2 shows that more than half of obese children belonged to university educated fathers (54.1%) and mothers (57.4%) while most of the normal weight children belonged to pre university educated fathers (60%) and mothers (70%) (Secondary- preparatory- primary read and write& illiterate). The difference statistically significant regarding mother education and father education also it shows that 75.4% of obese and most of overweight children (80.7%) belonged to professional, employee and clerical fathers and about (62%) of normal weight children belonged to non working mothers. The differences are statistically significant regarding father occupation and mother occupation.

Table 1. Distribution of the studied groups according to some socio demographic characters

BMI Classification Variable	Normal weight (n=100)		Overweight (n=85)		Obese (n=61)		Under weight (n=4)		P. Value
Age (years)									
6 —<8 (n =85)	36	42.4	26	30.6	20	23.5	3	3.5	
8 —<10 (n =84)	33	39.3	31	36.9	20	23.8	0	0	P>0.05
10 — 12 (n =81)	31	38.3	28	34.6	21	25.9	1	1.2	
Sex									
Male (n =123)	51	41.5	40	32.5	29	23.6	3	2.4	P>0.05
Female (n =127)	49	38.6	45	35.4	32	25.2	1	0.8	
Residence									
Urban (n =125)	53	42.4	48	38.4	22	17.6	2	1.6	P<0.05
Rural (n =125)	47	37.6	37	29.6	39	31.2	2	1.6	
Familypattern									
One parent (n =23)	4	17.4	10	43.5	8	34.8	1	4.3	P<0.05
Both parents (n=227)	96	42.3	75	33.1	53	23.3	3	1.3	
Socialclass									
High social class (n =172)	72	41.8	54	31.3	45	26.0	1	0.9	
Middle social class (n=66)	26	39.4	22	33.3	16	24.3	2	3.0	P<0.05
Low social class (n =12)	2	16.7	9	75.0	0	0.0	1	8.3	
Total	**100**	**40.0**	**85**	**34**	**61**	**24.4**	**4**	**1.6**	

Table 2. Distribution of the studied group according to their parent's education and occupation

Variable	normal weight		Over- weight		Obese		Under weight		P.value*
Groups	No	%	No	%	No	%	No	%	
Fathers 'education									
Illiterate	10	10.0	5	5.9	2	3.3	1	25.00	
read& write	17	17.0	13	15.3	5	8.2	1	25.0	
Primary	4	4.0	3	3.5	2	3.3	1	25.0	P<0.05
Preparatory	10	10.0	3	3.5	3	4.9	1	25.0	
Secondary	19	19.0	21	24.7	16	26.2	0	0	
University	40	40.0	40	47.1	33	54.1	0	0	
Fathers 'occupation									
Not work	2	2.0	0	0.0	0	0.0	0	0.0	
unskilled worker	18	18.0	5	5.9	3	4.9	1	25.0	
skilled worker	27	27.0	11	13.0	12	19.7	0	0.0	P<0.05
employee/clerical	40	40.0	45	53.0	35	57.4	2	50.0	
Professional	13	13.0	24	28.1	11	18.0	1	25.0	
Mothers 'education									
Illiterate	28	28.0	4	4.7	2	3.3	0	0.0	
read&write	8	8.0	8	9.4	2	3.3	0	0.0	
Primary	7	7.0	2	2.4	3	4.9	1	25.0	
Preparatory	5	5.0	5	5.9	4	6.6	2	50.0	P<0.05
Secondary	22	22.0	21	24.7	15	24.5	0	0.0	
University	30	30.0	45	52.9	35	57.4	1	25.0	
Mothers occupation									
not work	62	62.0	15	17.6	20	32.8	2	50.0	
unskilled worker	15	15.0	9	10.6	6	9.8	1	25.0	
Skilled worker	10	10.0	17	20.0	16	26.2	0	0.0	P<0.05
employee/clerical	4	4.0	38	44.7	7	11.5	1	25.0	
professional	9	9.0	6	7.1	12	19.7	0	0.0	
Total	**100**		**85**		**61**		**4**		

Table 3. Distribution of the studied group according to some patterns of daily behavioral activities

Physical activity	The studied group	None obese***		Obese**		P. value
		No.	%	No.	%	
Rate of Active play/week						
Never	(n = 24)	7	6.8	17	11.6	
less than 7times	(n = 94)	15	14.6	79	53.7	P <0.05
7 times	(n =125)	75	72.8	50	34	
more than 7times	(n = 7)	6	5.8	1	0.7	
Screen time (NO. Hours TV or Computer per day)						
1 hr.	(n =18)	13	12.7	5	3.4	
2hrs	(n =143)	71	68.9	72	49	P <0.05
3hrs	(n =18)	2	1.9	16	10.9	
4 or more hrs.	(n = 71)	17	16.5	54	36.7	
Spending holiday At home						
Yes	(n = 84)	5	4.9	79	53.7	
No	(n =18)	12	11.6	6	4.1	P <0.05
Sometimes	(n =148)	86	83.5	62	42.2	
Total		**103**	**100.0**	**147**	**100.0**	

*Obese   = (obese+ overweight)

***Non obese = (normal +underweight).

Table 3 shows that more than 3/4 (78.6%) of none obese had high rate of active play (7 times or more / week) while nearly 2/3 (65.3%) of obese had low rate of active play (less than 7 times or never /week). The majority (68.9%) of none obese students spent 2 hours per day in watching TV or using computer while more than 3/4 of students spent 4 or more hours (36.7%) are obese. More than half(53.7%)of obese group spent holiday in the home.

High rate of active play (7 times or more per week) low screen time (2 hours or less per day) and spending holiday outside home were negatively associated with obesity with statistically significant results.

Table 4 illustrates that more than half of non obese children had breakfast regularly (51%), most of obese children regularly had supper (61%) and most of children (60.4%) had foods or drinks between the main meals were obese.

Table 4 also shows that the majority of children either obese or non obese during the last weak regularly consumed carbohydrates and dairy meals and occasionally consume protein, fat and sweat meals. 24% of non obese children regularly consume fruit and vegetable meals.

Skipping the breakfast meal, regular intake of supper, intake of carbohydrates meals, dairy meals, fat and sweet meals were positively associated with obesity while regular intake of fruits and vegetables was negatively associated with obesity with statistically significant results.

Table 4. Distribution of the studied group according to some dietary habits

Dietary habits	Studied group	None obese (n=104)		Obese (n=146)		P.value
		No.	%	No.	%	
Intake of breakfast at home	Often	53	51	41	28.1	<0.05
	Occasional	18	17.3	30	20.5	
	Never	33	31.7	75	51.4	
Intake of supper	Often	36	34.6	89	61	<0.05
	Occasional	56	53.8	52	35.6	
	Never	12	11.6	5	3.4	
Intake of food or drink between main meals	Yes	82	78.9	125	85.6	>0.05
	No	22	21.1	21	14.4	
Last weekMeals						
Intake of Carbohydrates meals	everyday	87	83.7	109	74.4	<0.05
	Occasional	17	16.3	37	25.3	
Intake of ProteinMeals	everyday	7	6.7	11	7.5	>0.05
	Occasional	91	87.5	129	88.4	
	Never	6	5.8	6	4.1	
Intake of Dairy Meals	everyday	93	89.4	139	95.2	<0.05
	Occasional	11	10.6	7	4.8	
Intake of Fat and Sweet Meals	everyday	5	4.8	66	45.2	<0.05
	Occasional	98	94.2	80	54.8	
	Never	1	1	0	0	
Intake of Fruit and Vegetable Meals	everyday	79	76	46	31.5	<0.05
	Occasional	25	24	100	68.5	
Total		104	100	146	100	

Table 5. Distribution of the students according to frequency of consumption of carbohydrate-rich foods

Studied group carbohydrate-rich foods.		None obese*** (n=104)		Obese** (n =146)		P value*
		No.	%	No.	%	
Bread	≥2/d	93	89.4	122	83.6	<0.05
	1/d	11	10.6	18	12.3	
	5-6/wk.	0	0	6	4.1	
Rice and Macaroni	≥ 2/d	8	7.7	32	21.9	<0.05
	1/d	47	45.2	78	53.4	
	≥1/wk.	49	47.1	36	24.7	
Soft Drinks	≥1/d	8	7.7	16	10.9	>0.05
	>1/wk.	29	27.9	36	24.7	
	≤1/wk.	67	64.4	94	64.4	
Chocolate	≥1/d	6	5.7	23	15.8	<0.05
	≥1/wk.	56	53.8	82	56.2	
	<1/wk.	41	39.5	36	24.6	
	1-3month	1	1	5	3.4	
Cakes and Biscuits	≥ 1/d	18	17.3	71	48.6	<0.05
	≥1/wk.	86	82.7	75	51.4	
Jam and Honey	≥ 1/d	15	14.4	32	21.9	<0.05
	≥1/wk.	81	77.9	104	71.2	
	1-3month	8	7.7	10	6.9	
Halawa&Tehina	≥ 1/d	27	26	31	21.2	<0.05
	≥ 1/wk.	76	73	114	78.1	
	1-3month	1	1	1	0.7	

**Obese = (obese+ overweight)

***Non obese = (normal +underweight).

Table 6. Distribution of the students according to the frequency of consumption of fat-rich foods

The studied group		None obese***		Obese**		
fat-rich foods	Frequency	NO.	%	NO.	%	P value*
Ice cream	≥ 1/d	10	9.6	13	8.9	P>0.05
	>1/wk.	74	71.2	115	78.8	
	<1/wk.	20	19.2	18	12.3	
full cream milk products &High Fat cheese	≥2/d	13	12.5	40	27.4	P<0.05
	1/d	47	45.2	50	34.2	
	>1/wk.	44	42.3	56	38.4	
Butter, Cream& Mayonnaise	≥ 1/d	1	1	22	15.1	P<0.05
	≥1/wk.	30	28.8	90	61.6	
	1-3 months	73	70.2	34	23.3	
Deep fried foods	≥1/d	26	25	33	22.6	P<0.05
	≥1/wk.	72	69.2	107	73.3	
	1-3/mo.	6	5.8	6	4.1	
Pizza	≥1/wk.	32	30.8	68	46.6	P<0.05
	<1/wk.	33	31.7	44	30.11	
	Never	39	37.5	34	23.3	
Processed Meats	≥1/d	10	9.6	19	13	P>0.05
	>1/wk.	15	14.4	15	10.3	
	<1/wk.	79	76	112	76.7	
Chips and fried Snakes	≥ 2/d	12	11.5	28	19.2	P<0.05
	1/d	8	7.7	27	18.5	
	≥1/wk.	84	80.8	91	62.3	

**Obese = (obese+ overweight)

***Non obese = (normal +underweight).

Table 5 shows that the majority of both groups consume bread twice or more per day, soft drinks one time or less per week, chocolate, cakes and biscuits Jam and Honey, Halawa and Tehina one or more per week. Also it shows that more than half of obese children consume rice and macaroni once per day. This table also illustrates that eating bread, rice and macaroni, chocolate, cakes and Biscuits, Jam and Honey and Halawa Tehina is significantly higher for the obese than the non obese children.

Table 6 shows that the majority of both groups consumed ice-cream, deep- fried foods, chips and fried snakes once or more per week. Most of obese students consumed(full cream milk products& high fat cheese), (butter, cream and mayonnaise) and(chips and fired snakes) once or more per week. Also it shows that consumption of full cream milk products and higher fat cheese, butter, cream, Deep Fried foods, Pizza and chips and fried snacks were statistically significantly associated with obesity.

5. Discussion

Obesity in childhood and adolescence has adverse consequences on premature mortality and physical morbidity in adulthood and is associated with impaired health during childhood itself. Once obesity is established in children it is hard to reverse. Monitoring the prevalence of obesity in order to plan services for the provision of care and to access the impact of policy initiatives is essential [20].

This study revealed that the overall prevalence of obesity was 58.4% distributed as 34% overweight and 24.4% obese. The high prevalence shows Egypt is in a state of increasing childhood overweight.

These results agree with Ezzat, et al., (2011) [21] who found that among primary school, in Alexandria Governorate, Egypt, the prevalence of obesity was 57.8% distributed as 37.4% overweight and 20.4% obese.

On the contrary a study conducted in Damanhur city in El- Behera Governorate, Egypt(2006), revealed that the overall prevalence of overweight was 17.2% and that of obesity was 19.8% with a total of 37% [19]. This difference in rates may reflect the steady rapid increase of the prevalence of obesity due to the rapid social changes in the Egyptian community.

The prevalence of obesity and overweight in other parts of the worlds varies quite considerably. The present study reported higher figures than others. In Greek, the prevalence of overweight among children aged 6-10 years was 25.3% [22].

In Malaysia, the prevalence of overweight and obesity among children aged 9-10 years was 16.3% and 6.3% respectively [23], in India, the prevalence of overweight was reported as 10% among 10-15 years old [24] and in Costarica, the prevalence of overweight and obesity among children aged 7-12 years was 34.5% and 26.2% respectively [25].

Other studies reported higher rates than ours. For example, in study done by Manzoli et al in 2005 in Italy, the prevalence of overweight in students aged 6–16 years was 40.6% [26] and in Spain it was40.0% [4].

The differences may be attributed partially to the effect of genetic, lifestyle and environmental factors and variations in the age groups of the samples and because of different study methods and definitions of obesity and underweight across the various studies [27].

In this study the prevalence rate of overweight and obesity is higher among female subjects. These results agree with Gebre michael and Chere in Addis Ababa, who

found that sex specific prevalence of overweight and obesity shows 7.7% and 3.2% of male participants were obese. For females these rates 12% and 2.5% for overweight and obese respectively [55]. The finding of this study is also consistent with that done in Douala, Cameronin2010, where the prevalence of overweight ranged from 6.4% to 8.2% in boys and from 10.7% to 17.2% in girls, whereas prevalence of obesity ranged from 1.4% to 5.5% in boys and from 2.4 to 8.6% in girls. This may be explained by our society culture in which females spent most of their time at home.

These results also agreed with Tabatabaei et al [28]. In the contrary, they don't agree with other studies. Krasass et al 2004 found the prevalence of obesity was significantly higher in males than females [29], as did Langendijk et al 2003, in Northern Thailand among children aged 7–9 years [30].

Prevalence of underweight according to WHO 2007 reference was higher in boys as compared to girls, 9.2% and 5.5% respectively [20]. The sex specific prevalence of underweight was higher in our study which revealed that the prevalence of underweight in boys as compared to girls, (2.4%)male and (0.8%)female.

Possibly, this may be explained by the different patterns of growth weight in respect to age and sex, to the different nutritional behavior or to other life style related factors between the two sexes especially in developing countries as boys are likely to have more opportunities for exercise playing and recreation, whereas girls may suffer from restrictions of social mobility as they grow older [11]. The difference might also in part be explained by different study methods and definition of obesity and underweight across various studies [27].

One key characteristic of the family that is associated with childhood obesity is family structure. Researches find that children who live in two- parent families are less likely to be obese than children who live in single parent family [31].

The results of the current study agree with this. It revealed that the majority of the students with one parent are overweight and obese (43.5%) and (34.8%) respectively. Also this could be attributed to the more social and psychological adjustment of the both parent families which is reflected on the healthy dietary habits compared with single parent families.

The current study revealed that there are changes in the pattern of the 50th percentile of BMI charts regarding the different age groups. This may reflect and could be explained by the changes in growth rates and growth spurt among different age groups. These results were also confirmed by others [21,32,33].

In developing countries, the transition from rural agrarian to urban economies has accelerated the appearance of obesity, and is accompanied by shift in overall health burden from infectious disease and under nutrition to chronic diseases such as cardiovascular disease, cancer and diabetes [34].

This is evident in this study which showed that the majority of the obese students reside in rural areas which can be explained by the increased urbanized influences on rural areas due to improved accessibility to urban adjacent. But this is not in agreement who found that obesity was less prevalent in rural students which may be contributed to the fact that rural life style and dietary habits there may be adjusted factors of weight among rural residents [19].

Socioeconomic status seems to be a factor in obesity. Some socioeconomic factors influence quality and quantity of consumed food through varied income and food habits [36].

The current work revealed that regarding the social class it was found that the majority of low social class children were overweight (75%) with statistically significant differences regarding social class among different groups.

This doesn't agree with Fernald, et al. and others [37,38,39,40] who mentioned that body mass index was significantly higher in the highest social standard group. They stated that in developed countries obesity seems to be more common among poorer communities while in low income developing countries, obesity was associated with higher socioeconomic status, whereas among lower socioeconomic status, under nutrition was more likely to be a problem.

This can partly be explained by the fact that both the rich and poor can afford energy-rich food. The rich can buy expensive foods with higher energy content while the poorer consume foods with high starch content to provide a cheap, bulky and satisfying meal. The level of physical activity will be reduced in both the rich due to motorized transportation and mechanization and the poor, due to the inability to afford club membership.

Parents' level of education is one of the determinants of the prevalence of obesity. For the developing countries, the higher the level of parents' education, the higher will be the prevalence of overweight and obesity [41]. This come in accordance with the results of this study where more than half of the obese children belonged to university educated fathers (54.1%) and mothers (57.4%).

These results could be explained by the fact that the highly educated parents can get better chances for work and consequently a persistent source of money. The higher domiciliary income the family gains from parent's work increases their purchasing power, which may be directed mostly towards food in addition to the more sedentary style of living [42].

Parents' occupation and employee status are other social factors that were found to influence the prevalence of overweight and obesity. This study revealed that higher occupational classes were significantly associated with obesity. This could be explained by the fact that more work chances achieved by mothers raises the economic level and increases the purchasing power of the family. In addition, less time is spent indoors, the chances of consumption of healthy home-made meals will decrease in addition to the lack of attention to the children during mother's absence which increases the opportunity of intake of snacks and outdoor meals which are rich in fat and sugar [43].

As the problem of obesity continues, the child becomes more inactive and a vicious circle is formed which promotes further obesity [44]. Not only are obese children physiologically different from children of normal weight, but they also have demonstrated significant emotional differences, they tend to have a poor self-image which make them less likely to get involved in games and sports [45].

The effect of physical inactivity and sedentary behavior was also explored in this study. This study reported that the obese children were more likely to have low level of active play than non-obese (68.6% and 21.2% respectively) and obese children were reported to have high screen time than non-obese (47.5% and 18.3% respectively). These results are in agreement with Anderson et al., [18]. Spending too much time watching T.V might increase the risk for developing obesity, but obese children might also increase the time watching T.V.as a consequence of their weight status, thus the time children spent watching T.V. might displaces time spent in physical activity [1]. This may give more chance to promote intake of unhealthy foods while watching T.V. [46,47,48,49].

In the contrary, other studies mentioned the fact that none of physical activity and sedentary behavior variables predicted over weight or obesity [50].

Children who don't eat breakfast, are more likely to consume unhealthy foods during the day which induces the development of overweight [51].

The current study showed that more than half of non obese children have breakfast regularly (51%). This agrees with other studies which have shown that skipping breakfast is associated with having a higher BMI and obesity [52]. Eating more calories earlier in the day may cause satiety for longer period. The habit of eating meals outdoors and even the intake of sandwiches to school were found to increase significantly the risk of obesity [53].

Another study showed that eating breakfast regularly was found to be protective for overweight. When binary logistic regression was done eating breakfast regularly has significant association [54].

It is well-known that snacking between meals lead to weight gain, particularly if what is eaten is unhealthy snacks, energy-dense, nutrient-poor food products such as sweets and beverages which are high in sugar, carbohydrates and fat [46,47].

The current study showed that intake of food or drink between main meals was reported in 85.6% of obese children. This is in accordance with other studies which found that the risk of obesity was significantly higher among those who eat between meals compared to those who did not eat [54].

In the current study there were statistically significant higher differences between the obese and non obese regarding consumption of most of the selected energy dense food items. These results were in agreement with a conducted study in Damanhur city among primary school children [21].

In a study in Alexandria conducted by Tanaghoin 2004 [54] no significant differences were found between the obese and non - obese in patterns of energy – dense food items consumption.

Our study showed that the majority of both groups consume bread twice or more per day, soft drinks one time or less per week, chocolate, cakes and biscuits Jam and Honey, Halawa and Tehina one or more per week. Also it showed that more than half of obese children consume rice and macaroni once per day. It also illustrated that eating bread, rice and macaroni, chocolate, cakes and Biscuits, Jam and Honey and Halawa and Tehina was significantly higher for the obese than for the non obese children. A study conducted in Addis Ababa (2007) in primary school children showed the same results. From those food items ever bought by students, chocolate, ice cream and cake showed significant association with overweight. But in logistic regression analysis only ice-cream revealed significant association [55].

6. Conclusion

This study provides further evidence of the increasingly high burden of overweight and obesity among primary school children in Egypt.

The prevalence of overweight and obesity was relatively high. Obesity is more prevalent among (8 -<10 years) age group, female, rural students. More than half of the obese children belong to university educated fathers and mothers About 3/4 of obese and overweight children belong to professional employee.

The prevalence of overweight was found to be high even comparable with the global prevalence. Among the factors identified are unhealthy dietary pattern like preferring sweet foods, eating breakfast irregularly, ice cream and frequent snacking are strongly associated with overweight.

Physical inactivity was also revealed as an important factors impacting on the risk of obesity in children. If primary preventive measures is not taken immediately, prevalence of overweight and obesity among children, might increase rapidly in the coming few years.

7. Recommendations

- The findings suggest a need for development of school based intervention program to increase the level of awareness of ill effects of obesity and to target all obese organic lifestyle factors during childhood and obesity related risk behavior for counseling before adverse habits are established.

- promoting active lifestyles and healthy diets should be a national public health priority. There is a need of longitudinal study to investigate the relationship between vegetable intake and overweight and/or obesity.

- Because early interventions on modifiable risk factors are likely to decrease the rate of childhood obesity, educational programs about obesity and associated health consequences should start early in childhood so as prevent the increasing prevalence of childhood obesity in Egypt.

- There must be a multispectral approach from the government, school authorities and parents to introduce polices and guidelines to help children to live healthy life like school canteen policy, healthy food practices, inclusion of health related topics in curriculum and introduction of compulsory physical training classes.

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