Nutritional Status and Some Sociodemographic and Lifestyle Characteristics among A Group of Rural School Children in Fayoum Governorate, Egypt

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Abstract

Background: In low and middle income countries, malnutrition especially among children is an increasing health problem. According to Egyptian national surveys, prevalence of malnutrition in school children is high, however, data is lacking at the regional level. **Objective**: The current study aimed to assess the nutritional status, and identify the socio-demographic and lifestyle factors affecting it among rural school children. **Methods:** A school based cross sectional survey was conducted among rural school children (6-17 years) in Manshit El Gamal village in Tamia district of Fayoum Governorate, Egypt from October 2014 to April 2015. A sample of 736 students was included in the study. Weight, height, and age were used to calculate z-scores of the three different nutritional indicators. Sociodemographic, lifestyles and dietary habits were collected using a pretested interview questionnaire. **Results:** Stunting (HAZ <-2SD), underweight (WAZ<-2 SD), and wasting (WHZ <-2SD) were 34.2%, 3.4% and 0.8% respectively, while over nutrition based on (WHO/NCHS) reference population BMI z-score was 14.9%. Stunting was higher in females 36.2% than males 32.9% though not significant. Whereas, obesity significantly decrease with age and was higher in males 17% than females 12.1% with a significant different in the age group 10-13 years. Age, reduced poultry consumption and escaping breakfast were risk factors for malnutrition, while daily fruit consumption was a protective one. **Conclusion:** Malnutrition is highly prevalent in rural school children of Fayoum governorate in line with the national prevalence and significantly associated with children age, gender, mother's education and regularity of father's work.

Key words: *Anthropometric measures, school children, malnutrition, obesity, nutritional status, sociodemographic, Low and Middle income countries.*
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Introduction

Malnutrition can affect any age group in a community, but infants and young children are the most vulnerable due to their high nutritional requirements for growth and development. Malnutrition is a broad term commonly used as an alternative to under nutrition but it also refers to over nutrition. People are considered malnourished if their diet does not provide adequate calories and protein for growth and maintenance (under nutrition) or if they consume too many calories (over nutrition).[1] Malnutrition among children is a major public health problem especially in developing countries. It affects all aspects of children's health, including physical health, mental, social and spiritual wellbeing[2]. Many developing countries continue to experience poor

child growth rates, high morbidity and mortality with about three million child deaths due under nutrition every year[3]. Malnutrition can be caused by many factors such as; inappropriate food intake, infections, psychosocial deprivation, insanitary environment, lack of hygiene, social inequality and possibly some genetic contribution as well. Reports from different organizations like the World Bank documented that, children who live in households deficient in clean healthy food are more likely to predispose to bad nutrition and health related problems than children from food secure households[4].

Globally, malnutrition among school age children is a major public health problem. More than 200 million school age children are stunted and underweight and if no action is done at this rate, about one billion school children will suffer from impaired physical and mental development by 2020[5, 6].

In Egypt, school children represent more than 20% of total population[7]. Malnutrition disorders affect more than 30% of them; this problem appears to be largely related to poor dietary quality and micronutrient deficiencies. The problem is affecting different age groups and socio-economic status[8]. The 2014 EDHS found that one-quarter of girls and boys aged 5-19 years were overweight, 10 % and 11% of girls and boys respectively were obese[9].

To our knowledge, there is a lack of studies that investigates the nutritional status of school children, especially in rural areas in Fayoum. Based on our literature search, only one study had been conducted focusing on preparatory school children. It explored the attitude of the preparatory school students and teachers concerning obesity and healthy nutritional behaviors[10].

The present study aims to assess the nutritional status and calculate the prevalence of malnutrition among a group of school children living in the rural area of Manshit El Gamal village in Tamia district of Fayoum Governorate Egypt, as well as to explore the possible socio-demographic and lifestyles factors associated with the condition.

Methods

Study design, population and setting: A cross-sectional school based study was conducted among children aged 6 –17, in the rural area: Manshit El Gamal village, in Tamia district of Fayoum Governorate. This rural village was chosen because: a) it represents the typical rural areas in Fayoum, with most of its population working in agriculture and its related industry; b) the village is big enough to include all three levels; primary, preparatory and secondary schools. The village is the largest of ten villages in this district with a population size of 65000 inhabitants, in a district with a population size of about 425000 based on Egypt last census of 2016[11]. The village has five primary, two preparatory and one secondary schools with nearly 12000 children enrolled.

Study subjects, sampling size, and technique: Calculation of the sample size was through a single proportion formula with the following assumptions: Maximum allowable error was specified as 5 %; the proportion of malnourished school children was 30 % [8,12] and a significance level of 5%. A sample size of at least 640 was calculated by using Epi -Calc 2000. A total 736 school children were enlisted to participate in the study after inflation by 15%.

The students were selected using multistage random technique. One school was chosen randomly from the primary and one from preparatory schools in addition to the only high school in the village in each school, one class per grade was randomly selected. All students in the selected class were included. A total number of 844 students were registered in these classes. Four percent of them were absent during the survey, 2.8% refused to be included in

the study and about 6% of students, from the young age classes in primary schools were excluded due to inability of collecting information from them. The remaining 736 students were included in the study.

Data collection: Sociodemographic, lifestyles and dietary habits data were collected through interviews using a structured questionnaire developed by the researchers based on previous literature review. The following socio-demographic characteristics were collected: sex, age, parents' education and occupation, number of family members, income, and possessions. Lifestyle and dietary habits that play a role in malnutrition were assessed by asking about frequency of regular exercise, smoking, frequency of daily and weekly consumption of red meat, chicken, milk, dairy products, fruit and vegetables.

The questionnaire was pre-tested for clearance and accuracy among 35 students from the same schools and with different study levels and all the required deletion and rewarding were performed before the field study. These questionnaires were excluded from the study.

Under the supervision of the researchers, the questionnaires were filled by three trained social workers 'ra'eedat reefaat' through face to face interview during school year 2014/15 over a period of 9 months from October 2014 to April 2015. Respondents were given a clear introduction explaining the purpose and objectives of study.

Weight and height were measured for each student who completed the questionnaire. Weight was measured to the nearest 0.1 kg through an electronic scale, the children were wearing light clothing and without shoes. Child height was measured to the nearest 0.1 cm using a wooden stadiometer placed on a flat surface. Weight, height, and age data were used to calculate z-scores of the three different nutritional indicators in comparison to the newly published World Health Organization/National Center for Health Statistics (WHO/ NCHS) reference population using the WHO AnthroPlus Software (Version 10.4, 2010)[13,14]. These indicators are: (1) Height –for-age z-score (HAZ) (age range: 5-19 years) to measure stunting. Stunting was defined as (HAZ) < −2SD. (2) Weight-for-age z-score (WAZ) (age range: 5-10 years) to assess if child is underweight up to 10 years old. After 10 years of age, weight-for-age is not a good indicator where the children grow faster during the period of puberty and can be falsely categorized as excess weight. Underweight is defined as (WAZ) < −2 SD. (3) BMI-for-age – z- score (BAZ) (age range: 5-19 years): BMI measures weight in kilogram divided by height in meter square. It is best index for estimating wasting, overweight and obesity in children 10-19 years. (13). Wasting is defined as (BAZ) <-2SD while, BAZ > +2SD was defined as obese, for age- and sex specific *z*-scores, respectively based on the National Center for Health Statistics (NCHS)[14,15].

Ethical consideration: This study was conducted according to the guidelines which approved by Ethics Committee of Faculty of Medicine, Fayoum University. Thorough discussions were undertaken with the school directors regarding the purpose and the contents of the data collection tool, and permission was obtained to conduct the study. Simple explanation about aim of the study was provided to the students to obtain their initial approval. An informed consent including simple explanation about the aim of the study was sent with each student to be signed by the parent/ guardian. The used questionnaires were anonymous.

Data Management, quality: All precautions to ensure quality of the data were performed before, during and after data collection. Training of data

collectors, pretesting of the questionnaire, and standardization of measuring scales of weight and height were undertaken.

The socioeconomic score was calculated according to the modified Fahmy and El-sherbini Social Score[16].This system includes the following: The overall Social Scoring is classified into four levels - Less than 15: Very Low Social Standards, 15-19: low social standards, 20-24: middle social standards and 25-30: high social standards. The following items are included: (A) Crowding Index (persons per room): <2 = 3, 2- =2, -4 = 5. (B) Occupation for father or mother: Working= 2 and not working = 1. (C) Education for father or mother: Illiterate or read and write=1, Primary=2, Preparatory=4, Secondary=6, University or higher=8. (D) Family income: Yes and Save = 4, Yes=3, Sometimes=2, No=1. (E) Sanitation: All of three (water, electricity and waste disposal) =3, two of three=2, one of three=1.

Regular physical activity was defined as participation in moderate or vigorous activity for ≥ 30 minutes/day at least five days per week[17]. Dietary habits were assessed according to the questions regarding daily and weekly consumption of common food groups[18].

Statistical Analysis

Statistical analyses were performed using the Statistical Package for Social Sciences Version 16.0 for Windows. Means and standard deviations were calculated for bodyweight, stature and BMI (W/H2) across sex and age groups. The z-scores of (<−2SD) was calculated to illustrate WAZ, HAZ and BAZ category of underweight, stunting, and thinness respectively. Comparison of variables distribution across different categories was done using Chi-square test of significance. Logistic regression analysis was used to show predictors of stunted growth, these predictors were expressed by Odds ratio or its 95% confidence interval (95% CI). P value of less than 0.05 was considered statistically significant.

Results

Table 1 shows the study participants' age ranged from 6 years up to 17 years old with 58.3% males. No significant difference detected between males and females regarding age distribution (p = 0.1).

Table (1) Socio demographic characteristics of Study Participants (n=736)

Characteristics	Descriptive
Age in years: *N (%)*	
• 6- 9	205 (27.9)
• 10-13	328 (44.6)
• 14-17	203 (27.6)
Mean ±SD	12.73±2.35
Sex: *N (%)*	
• Male	429 (58.3)
• Female	307 (41.7)
Mother education: *N (%)*	
• Less than secondary education	495 (67.3)
• Secondary and higher education	241 (32.7)
Mother working status: *N (%)*	
• Yes	78 (10.6)
• No	658 (89.4)
Father education: *N (%)*	
• Less than secondary education	429 (58.3)
• Secondary and higher education	307 (41.7)
Father working status: *N (%)*	
• Regular	401 (54.5)
• Irregular	335 (45.5)
No. of family members: *N (%)*	
• ≤5	327 (44.4)
• >5	409 (55.6)
Socioeconomic class of the student: *N (%)*	
• Low and very low	378 (51.4)
• Middle	290 (39.4)
• High	68 (9.2)

More than half of the mothers of the studied sample (67.3%) were below secondary schooling, and almost all of

Table (2): Prevalence of stunting, underweight, wasting and obesity across age groups in relation to sex (n=736)

Age groups (years)	(N)	HAZ		WAZ		BAZ			
		Stunting N (%)	P value	Underweight N (%)	P value	Wasting N (%)	P value	Obesity	P value
6-9	M (123)	19 (15.4)	0.87	3 (2.4)	0.346	2 (1.6)	0.99	37 (30.1)	0.48
	F (82)	12 (14.6)		4 (4.9)		2 (2.4)		21 (25.6)	
10- 13	M (180)	73 (40.6)	0.62			2 (1.1)		30 (16.7)	**0.021***
	F (148)	64 (43.2)				0		12 (8.1)	
14-17	M (176)	49 (38.9)	0.35			0		6 (4.8)	0.99
	F (148)	35 (45.5)				0		4 (5.2)	
Total	M (429)	141 (32.9)				4 (0.9)		73 (17.0	
	F(307)	111 (36.2)	0.35			2 (0.7)	0.99	37 (12.1)	0.063
	Total (736)	252 (34.2)				6 (0.8)		110 (14.9)	

them were housewives, (89.4%). For the fathers, nearly 40% of them had formal education at or beyond secondary school, and 45.4% had irregular work. The majority of participants, (55.6%) were members of large family size (more than 5) with nearly half of participants classified in the low socioeconomic level.

Table 2 shows that the prevalence of stunting (HAZ <-2SD), underweight (WAZ<-2 SD), and wasting (WHZ <-2SD) were 34.2%, 3.4% and 0.8% respectively. Prevalence of over nutrition identified in terms > 2SD for HAZ, WAZ, and BAZ were 0.3%, 4.4% and 14.9% respectively.

Double malnutrition problem was reported among the participants. The problem of stunting is shown from height for age distribution in (figure 1) where the curve is skewed to the left to WHO world standard normal distribution curve. Obesity is seen in BAZ distribution (figure 2) where the curve is slightly skewed to right to WHO world standard normal distribution curve.

In relation to gender, the prevalence of stunting was slightly lower in the age group 6-9 but higher in the other two older age groups and with an overall of 36.2% in females and 32.9% in males, although no significant difference was detected. Whereas, obesity prevalence was higher in males 17% than females 12.1% in the study, the difference was statistically significant in the age group 10-13 years (table 2).

Table (3): Prevalence of stunting, underweight, wasting and obesity in relation to age groups

Age groups (yrs)	HAZ	BAZ	
	Stunting N (%)	Wasting N (%)	Obesity N (%)
6-9	31 (15.1)	4 (2.0)	58 (28.3)
10-13	137 (41.8)	2 (0.6)	42 (12.8)
14-17	84 (41.4)	0	10 (4.9)
Total	252 (34.2)	6 (0.8)	110 (14.9)
P value	**<0.001**		**<0.001**

The percent of stunting showed significant difference between age groups (p <0.000). The prevalence of stunting was (15%) in age group 6-10 years compared to (41.4%), (41.8%) in age groups 10-13, and 14-17 respectively. The obesity prevalence was significantly higher in young age group 6-9 years (28.3%) in comparison with older age groups (p<0.001); the percent of obese student was (12.8%) in the age group 10-13 years old, and (4.9%) in the older age 14-17 years old (table 3).

Stunted growth was significantly higher in absence of mother education, irregular work of the father, large family size more than or equal to 5 and low socioeconomic standard. While obesity was significantly higher when the father had a high educational level (secondary or

Table (4): Socio demographic factors with, stunting and obesity among study participants

Obesity(110)		Stunting (252)			
P	N (%)	P	N (%)		
0.66	76 (15.4)	**0.00**	192 (38.8)	No (535)	Mo. EDU
	34 (14.1)		60 (24.9)	Yes (201)	
0.37	101 (15.3)	0.18	220 (33.4)	No (658)	Mo. Work
	9 (11.5)		32 (41.0)	Yes (78)	
0.00	50 (11.7)	0.73	144 (33.7)	Less than SEC (427)	Fa. EDU
	60 (19.4)		108 (35.0)	SEC (309)	
0.01	3 (11.4)	**0.04**	151 (37.6)	Irregular (335)	Fa. Work
	72 (17.9)		101 (30.2)	Regular (401)	
0.09	57 (17.4)	**0.04**	99 (30.3)	< 5	Fam. size
	53 (13.0)		153 (37.4)	≥ 5	
0.09	46 (12.2)	**0.04**	142 (37.6)	Low/ very low (378)	SE level
	52 (17.9)		95 (32.8)	Middle (290)	
	12 (17.6)		15 (22.1)	High (68)	

above) and when having regular work (table 4).

Table 5 showed that percent of stunted children was significantly higher in participants with poultry consumption less than three times per week 45.9% than participants with three or more poultry consumption 32.2% (p value: 0.005) In addition, stunting was significantly higher with infrequent fruit consumptions 37.8% than daily fruit consumption 28.3%, ($p < 0.001$), escaping breakfast ($p < 0.05$) . Whereas, the prevalence of obesity was significantly higher with 'eating while watching TV' ($P < 0.001$).

Table 6: Results of the stepwise logistic regression to study the factors associated with stunting and obesity showed that older age, rare poultry consumption and escaping breakfast were reported as 'stunting' risk factors with OR (95% CI); 1.27 (1.17-1.37), 2.19 (1.4-3.4) and 2.3 (1.07-5.03) respectively. In the same time, daily fruit consumption was a protective factor from stunting with OR 0.614 (0.439-859). For obesity, male gender, and father's regular work were significant predictors of obesity with OR 1.553 (1-2.4) and 2.217 (1.4-3.5), while age was a protective factor from obesity with OR 0.753 (0.688-0.824859).

Discussion

Malnutrition is highly prevalent among children in low and middle income countries. However, wide variations exist in the overall prevalence of underweight, stunting and wasting among children across countries[19-22]. In a study conducted in governmental school in rural region in India the prevalence of stunting was 32% and underweight was 70%[20]. In Nigeria, the prevalence of stunting was 17.4% among public and private school children aged 5 - 19 years old[21], and 19.8% among urban school children[22], whereas, in Turkey, only 5.7% of children were stunted[23]. This variability across different nations can be explained by the social, demographic, economic, nutritional intake and culture differences between them[21, 24].

The 2014 Egyptian demographic and health survey (EDHS) report showed that chronic malnutrition is continuously increasing since 2000, with a double burden of under and over nutrition (9). In the present study, prevalence of stunting, underweight and wasting among school children in Fayoum was high; (34.2%), (3.4%) and (0.9 %) respectively (table 2, figure 1). Although the prevalence of stunting was high it was less than the one reported in a survey conducted earlier in Beni-Suef Governorate, where the prevalence of the underweight and stunted was (10%) and (53.2%) respectively[19]. This difference may be due to the fact that the population studied included both urban and rural areas with poorer sociodemographic characteristics

Table 5: Dietary habits and lifestyle factors with stunting and obesity among study participants

Obesity (110)		Stunting (252)			
P value	N (%)	P value	N (%)		
0.486	91 (14.6) 19 (17.1)	**0.005**	201 (32.2) 51 (45.9)	Yes (625) No (111)	Eating poultry at least three times per week
0.608	90 (15.0) 20 (14.7)	0.93	208 (34.7) 44 (32.4)	No (600) Yes (136)	Eating fish at least once weekly
0.481	60 (14.2) 50 (16.0)	0.512	141 (33.3) 111 (35.6)	Yes (424) No (312)	Eating milk& dairy product at least once daily
0.310	46 (16.7) 64 (13.9)	**0.008**	78 (28.3) 174 (37.8)	Yes (276) No (460)	Eating fruits at least once daily
0.075	46 (18.2) 64 (13.3)	0.279	80 (31.6) 172 (35.6)	Yes (253) No (483)	Eating Vegetables at least once daily
0.250	11 (15.7) 99 (14.9)	0.590	26 (37.1) 226 (33.9)	Yes No	Regular Exercise
0.109	76 (14.7) 22 (12.9) 12 (29.4)	**0.045**	178 (34.6) 65 (38.0) 9 (17.6)	Yes (514) Sometimes (171) No (51)	Escaping breakfast
0.008	40 (21,6) 62 (13.3) 8 (9.3)	0.109	63 (34.1) 168 (36.1) 21 (24.4)	Yes (185) Sometimes (465) No (86)	Watching TV while eating

than what is recorded in our study. However further investigations is needed to understand the complete picture and map the different economical, nutritional and social factors affecting nutritional status among Egyptians.

In relation to gender, our findings showed that females had higher number of stunting and underweight than males (table 2) but not statistically significant. These results are different from the EDHS one, which was conducted on the never-married female and male youth and young adults (10 to 19 years). The EDHS, showed that males (5%) were more underweight than females (3%) in the age group (10 - 19 years), with higher prevalence in Upper Egypt and frontier Governorates as well as in rural areas[25]. However, these findings are similar to Bhargava et al (2015), reported that, females were more stunted, underweight and wasted than males especially in rural schools in India[4], and to the results of Beni-Suef survey for the age group (10-14 years) where stunted female were 65.3% compared to 59.9% for males[19]. This may have an explanation in the cultural preference of boys over girls in rural areas which might translate into a better chance of adequate food.

Stunting was significantly associated with low education of mother, irregularities of father's work, large family size and low socioeconomic standard (table 4), similar to the finding in Sudan and Nigeria[21,26,27]. Other factors such as age, sex, birth order of the child, mud floor of the house ,religion, mother's age were reported to be significantly associated with an increased risk of stunting among school children and their parents in Ethiopia[28]. Some of these factors were included in our study but didn't show significant association which reflect the variability of the risk factors for malnutrition across different regions.

As the children grow, they become more active and need more energy, which make them more liable for under nutrition[29]. In Mwaniki and Makokha

Table 6: Forward stepwise logistic analysis of predictors of stunting and obesity

Obesity			Stunting		
OR (95% CI)	**P value**	**Predictors**	**OR (95% CI)**	**P value**	**Predictors**
0.753 (0.688-0.824)	**< 0.001**	Age	1.27 (1.17-1.37)	**< 0.001**	Age
1.553 (1.0-2.4)	**0.05**	Male sex	2.19 (1.4-3.4)	**< 0.001**	Poultry At least 3 times per week, yes.
2.217 (1.4-3.5)	**0.001**	Regular father work	0.614 (0.439-0.859)	**0.004**	Daily fruit consumption
			2.3 (1.07-5.03)	**0.033**	Escaping breakfast

(2013) study, stunting was increased with age and inadequate energy intake (30). Meat consumption was a protective factor according to Dror and Allen (2011). They reported that eating foods from animal source not only reduced stunting but also improving other anthropometric indices and reduced the morbidity and mortality among undernourished children[31]. Our finding was in line with their study. In the multivariate analysis increasing age, rare poultry consumption and escaping breakfast were risk factors while daily fruit consumption was a protective factor from stunting (tables 5, 6)

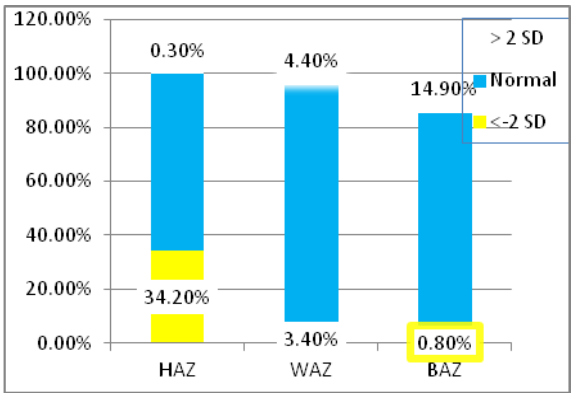

Figure (1): Nutrition assessment of study participants in terms of HAZ, WAZ, BAZ

In addition to under nutrition, Egyptian youth suffer from over nutrition as well with more one third of the age group (5-19 years) either overweight or obese[32]. In our study, the prevalence of obesity was 14.9%, and males tended to be more obese than females in different age groups (table 2). Furthermore, higher prevalence of obesity was positively associated in the age group of (6-9 years) with male gender as well as regularity of father's work which translate into a good socio-economic status in our results. (table 4) It confirms previous studies' results which reported a positive association with male gender as well as middle socio-economic status and highlight that Fayoum governorate follows the same trend regarding factors of obesity[33-36].

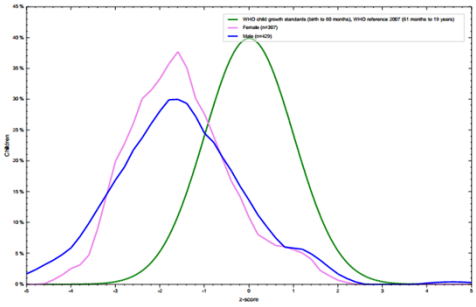

Figure (2): Height for age (HAZ) distribution for study group compared to standard reference population

Conclusion and recommendations

The rural school children in Fayoum governorate are characterized by the high prevalence of stunting in girls and the obesity in boys follow the general trend reported in other studies conducted in Egypt and other countries with similar profile (low to middle income). These findings may be explained by the effect of extension of cultural preference for boys over females in upper Egypt governorates especially in rural areas,

since Fayoum is one of the Upper Egypt Governorates and mostly rural, and the beliefs that, males are the working group and they are helping their families in earning their living. Double burden of under nutrition and over nutrition is high in Fayoum and are significantly associated with factors such as, age, sex, reduced animal protein intake, as well as father occupation following the same results in other areas of Egypt as well as other similar countries. Further studies are needed to address factors that showed effect on nutritional status in other regions but weren't included in our study.

Limitations of the study

Due to limited resources of this study, only rural areas of Fayoum were covered. Different results might be present in urban areas. Despite our effort to reduce confounding factors, some other factors such as birth order, religion and the housing condition weren't studied which may affect the results.

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