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Cross sectional study to assess Malnutrition and associated risk factors among primary school children in Kafr Sakr, Sharqia, Egypt

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ABSTRACT

Background: Malnutrition is considered a global health burden mainly in the developing countries, because of the high prevalence and its undesirable consequences on health. ***Aim:*** Improvement of health and nutrition of school age children and their educational outcome. ***Objective:*** to assess the nutritional status of primary school children in Kafr Sakr, Sharqia, Egypt and to identify the associated risk factors of malnutrition. ***Subject and methods:*** A cross-sectional study conducted among 341 primary school children aged (6-12) years in Kafr Sakr district, Sharqia governorate, Egypt. The assessment done by filling questionnaire about socio-demographic data, clinical examination, laboratory tests for hemoglobin detection and stool examination for all children. ***Results:*** The prevalence of stunting and underweight was 21.4% and 21.9% respectively. Anemia prevalence was 53.1%, parasitosis prevalence was 32.8%, while hair lice prevalence was 10.9%. The results revealed that stunting was significantly associated with underweight, parasitosis and low socioeconomic class. Underweight was significantly associated with anemia, parasitosis and low socioeconomic class. ***Conclusion and Recommendations:*** The present study results showed high malnutrition prevalence among primary school children which is significantly associated with anemia and parasitosis. So, we recommend emphasizing the importance of screening program of anemia and parasitosis with focus on school children.

Keywords: Malnutrition; anemia; parasitosis.

INTRODUCTION

School age represents a dynamic period of physical growth and mental development of the child. It extends from age 6-12 years where the active growth of childhood occurs. School children are the main target to several health problems as malnutrition ,non infectious diseases and infectious diseases as parasitosis [1].

In developing countries, Malnutrition between children is considered a major public health concern that affects the entire child's life aspects not only the physical health, but also extends to the social, mental and spiritual wellbeing [2] .

Malnutrition is defined as a nutrition state in which there is a deficiency or excess of energy, protein and other nutrients leading to measurable side effects on the body functions and the health state [3].

Globally, more than 200 million school age children are under weight and stunted. By the year of 2020, there will be more than one billion school age children suffering from impaired mental and physical development **[4]**.In developing countries, about 48% and 52% of the school age children are underweight and stunted respectively [5]. Malnutrition disorders affect more than 30% of Egyptian School children [6].

Anemia is also a major public health problem that refers to a condition in which hemoglobin concentration is lower than normal. It leads to poor motor and cognitive development in children and loss of adult work productivity [7]. Anemia nearly affects one-fourth of the world's population. Its

prevalence differs significantly by age and sex. It affects about 47% of preschool children, 42% of pregnant women, 30% of non-pregnant women, and 25% of school aged children [8].

Parasitosis is also considered a major public health problem worldwide, where it affects about 3.5 billion individual; 300 million of them are symptomatic, and 50% of them are school children. It affects 56% of the Egyptian school children [9]**.** Parasitosis affects both the children growth and their hemoglobin levels. School age children are mostly affected by intestinal parasites and also suffer the greatest morbidity attributable to these parasites [10]. They are exposed to Suffer from the greatest burden of parasitic infections that is expressed mainly as; nutritional stress with poor appetite ¸ food indigestion ¸ malabsorption ¸ growth impairment and anemia. The synergistic occurrence of parasitosis ¸ anemia and malnutrition has negative consequences on the child growth and development **[11]** So, the assessment of nutritional status is essential for making development towards improving overall health of the school age children[12] **.** The aim of this study is Improvement of health and nutrition of school age children and their educational outcome.

The objectives of the current study are to assess the nutritional status of primary school children in Kafr Sakr, Sharqia, Egypt and to identify the associated risk factors of malnutrition.

SUBJECTS AND METHODS

This is a Cross sectional study was conducted in governmental primary schools in Kafr Saqr district, Sharqia Governorate, Egypt from March to December 2018. The study included 341 students.

Inclusion criteria*:*

Children in primary school in Kafr Saqr district (aged 6-12 years)

Exclusion criteria:

-Children who were suffering from chronic diseases that affect their growth as congenital heart disease, thyroid disease ,renal disease, and diabetes mellitus, children who were taking iron supplementation or anti parasitic medications during the study and Children less than 6years or older than 12 years old were excluded from the study.

Sample size:

The total number of school children aged 6-12 years was (30628), By using open EPI(Open Source Epidemiologic Statistics For Public Health) version 3.01updated 6/4/2013 with frequency 34%, and confidence level 95% sample size was (341) students.

Sample technique:

A multistage random cluster sample technique was used to select the study sample. Three schools (clusters) were randomly selected; their names are: (Hanoot, Ali Abdel-Haleem, and Kafr Hammad primary schools). From each school 2 classes (clusters) from different six grades were selected randomly. Around (57) Children were then randomly selected from each class as a cluster. A total number of 341children were thus included in our study.

Tools of the study:

The data were collected by three methods: structural questionnaire, clinical examination and laboratory investigations.

(1)-Structural questionnaire includes:

1-Sociodemographic and socioeconomic data (age, sex, order of birth, family number, number of rooms, parents education and occupation, house hold income) using El Gilany questionnaire [13]**.**

2-Dietary habits and feeding pattern were obtained through adopted questionnaire from Mt (Mount) Washington pediatric hospital Feeding day treatment program family questionnaire (validation was done by translation and back translation and revision by three experts). Dietary habits were studied depending on questions addressed as regard daily and weekly consumption of the common food groups [14].Food types which assessed were (dairy milk products, egg, meat, fish, starchy food, oily food, fruit and vegetables, fresh fruit juice and junk foods). The frequency of consumption of each food item was counted as follow: Never (no time/week), sometimes (1-2/ week), usually (3-4/week), regularly (every day).

(2)-Clinical examination includes:

1-General examination for the presence of: Pallor, jaundice, organomegally,

abdominal pain, itching, nails clubbing, palpitation, and headache.

2-Hair examination for hair lice presence.

3-Anthropometric measures: Body weight and height were measured. School children weights were recorded by using scale to the nearest 0.1 kilogram (Kg). School children were told to wear light clothes and no shoes. Heights were measured to 0.1centimeters (Cm) with a wooden stadiometer placed on a flat surface.

3)-Laboratory investigations:

Include (blood examination for Hb detection and stool analysis).

Pilot study:

The study was carried out on 34 children attending primary schools in Kafr Saqr district to test the questionnaire with the most appropriate terms (as regard understanding, consistency and clarity), It also helped estimation of the time needed for data collection. Those children were excluded from the main study sample. The time needed for filling the questionnaire ranged from (10 to15) minutes.

Field work:

Each school was visited three days per week. The School children were told to collect and deliver samples of their faeces to the school the next day. The team which visited the schools was consisted of : the researcher, nurse and lab technician. Each selected student was interviewed in private room in the school to fill the questionnaire and to be examined clinically, after that the samples were taken to the lab for doing tests. The study was carried out from February to May 2018.

Administrative design:

1-An official permission was obtained from An Institutional Review Board (IRB) at the faculty.

2-Official permission was obtained from the scientific ethical committee of the department.

3-An official permission letter was obtained from faculty of medicine Zagazig University to the pediatric department (the title and objectives was explained to them to ensure their cooperation.

4-Permission from the schools was obtained to allow interviewing the students and examining them.

Ethical consideration:

The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Discussion had been taken with the school directors regarding the purpose and the contents of the data collection tools, and permission was obtained to conduct the study. School children and their parents (guardian) were informed about the objective of the study; they had the right to accept or refuse to participate in the study. An informed written consent was obtained from the parents (guardian).

Data analysis:

Data were checked, entered and analyzed using SPSS version 23 for data processing. The data were presented as frequency and tables. The independent t –test was used to examine the difference in quantitative data. Chi Square test or Fishers exact test, (which over appropriate) was used to examine the differences for qualitative data. Univar ate logistic regression analysis had been used to clarify the independent variables that are significantly related to the outcomes (anemia, parasitic infestation, underweight and stunting) between the children who were involved in the study. ORS (odds ratio) and CIs (confidence intervals) were calculated. For all above-mentioned statistical tests done, the threshold of significance was fixed at 5% level (*P*-value) when;

- *P* value of > 0.05 indicates non-significant results.

- *P* value of < 0.05 indicates significant results.

-Calculation and scoring of the socioeconomic level was based on the modified social score for family social leveling (Modified by El-Gilany) and had been classified into:

-High social state: Score (63) or more.
-Moderate social state: Score (43-62)
-Low social state: Score (22-42)
-Very low social state: Score (0-21)

-To assess nutrition status of the students, anthropometric measurements were used. Weight, height and age data were used for calculation Z-score. The obtained values were assessed with reference to the (WHO/NCHS) World Health Organization/ National Center for Health Statistics [15].

- Underweight defined as weight for age less than 2SD, While stunted defined as height for age less than 2SD. Students older than 10 years (NO= 113) defined as body mass index for age (BMI/A) z-scores{underweight(<-2SD) or obese (>+2SD)}. Students were classified as anemic if hemoglobin concentration was less than 11.5g/dl [16] .

RESULTS

The mean age of the studied group was (9.1±2) ranged from (6-12), (50.1%) of them are females and (80.1%) are of moderate social class **(table 1).** The prevalence of stunting and underweight in the study group was (21.4%) and (21.9%) respectively, Anemia prevalence was 53.1%, parasitosis prevalence was 32.8%, while hair lice prevalence was 10.9% **(table 2).** Underweight, parasitosis and socio-economic level were the significant predictor risk factors for stunting in the studied group **(table 3).** Underweight was found to be high among students aged below 9, male students and those of low socioeconomic class **(table 4).** stunting, anemia and parasitic infestation were significantly related to underweight **(table 5).**The highly daily consumed food staff by the studied group is starchy food (94.7%) followed by oily food(74.7%) , junk foods(73.6%) then fruit and vegetables(50.1%) **(table6).**

Table (1): socio-demographic characteristics of the studied group (341 students):

Variable	**The studied group(341) mean ± SD (Range) Median**	
Age *(years):*	9.1±2 (6-12) 9	
Variable	**NO(341)**	**%**
Age group		
6-9years	184	53.9%
>9 years	157	46.1%
Sex		
Male	170	49.9%
Female	171	50.1%
Socio-economic class		
Low	43	12.6%
Moderate	273	80.1%
High	25	7.3%

SD: Standard deviation
No: Number

Table (2): Prevalence of Stunting, Underweight, Anemia, Parasitosis and Hair lice in the studied group (341 students):

Variable	NO(341)	%
Stunting		
No	268	78.6%
Yes	73	21.4%
Weight		
Normal	257	75.4%
Underweight	75	21.9%
Overweight	9	2.6%
Anemia		
No	160	46.9%
Yes	181	53.1%
Parasitosis		
Absent	229	67.2%
Present	112	32.8%
Hair lice		
Absent	304	89.1%
Present	37	10.9%

NO: Number

Table (3): Uni-variate analysis (Logistic regression) for the potential risk factors for stunting in the studied group (341students):

Variable	Total (341)	Stunting		Odds ratio	CI	p-value
		No (73)	**Prevalence**			
Age				1.1		
6-9	184	30	16.3		(0.3-5.3)	
9-12	157	43	27.4			0.6
Sex						
Male	170	50	29.4	0.5		
Female	171	23	13.5		(0.4-5.5)	0.9
Socio-economic level						
				2.6		
Moderate and high	298	63	21.1			
Low	43	10	42.9		(1.6-4.8)	**0.003***
Anaemia				1.6		
Absent	160	29	18.1			
Present	181	44	24.3		(1.1-6.7)	0.4
parasitosis				3.1		
Absent	229	51	22.3			
Present	112	22	59.4		(1.2-4.2)	**0.005***
Hair lice				1.5		
Absent	304	36	11.8			
Present	37	37	100.0		(0.7-5.8)	0.09
Underweight				7.3		
Absent	266	8	3.1			
Present	75	65	86.7		(1.2-3.4)	**0.001****

NO: Number
CI: Confidence Interval

Table (4): Comparing weight as regard socio-demographic characteristics of the studied group (341 students):

	Weight			Total NO (341) %	χ^2	p-value
Age	***Normal*** **No(257) %**	***Underweight*** **No (75) %**	***Over-weight*** **No (9) %**			
6-9years	152 82.6	29 15.8	3 1.6	***184*** 100%	11.4	**0.003***
>9years	105 66.9	46 29.3	6 3.8	***157*** 100%		
Sex						
Male	126 74.1	42 24.7	2 1.2	***170 100%***	8.1	**0.02***
Female	131 83.4	33 19.3	7 4.1	***171 100%***		
socio-economic level						
Low	31 72.1	9 20.9	3 7.0	***43 100%***	11.6	**0.02***
Moderate	202 74.0	66 24.2	5 1.8	***273 100%***		
High	24 96.0	0.0 0.00	1 4.0	***25 100%***		

*Statistically significant difference ($P \leq 0.05$)
NO: Number

Table (5): Comparing weight as regard stunting, anemia, parasitosis and hair lice in the studied group (341 students):

	Normal **No(257) %**	***Underweight*** **No (75) %**	***Over-weight*** **No (9) %**	**Total N0(341) %**	χ^2	**p-value**
Stunting					6.8	
Absent	207 77.2	52 19.4	9 3.4	***268 100%***		
Present	50 68.5	23 31.5	0.0 0.00	***73 100%***		**0.03***
Anemia					16.6	
Absent	134 83.7	20 12.5	6 3.8	***160 100 %***		
Present	123 68.0	55 30.3	3 1.7	***181 100%***		**0.001****
Parasitosis					13.8	
Absent	183 79.9	38 16.6	8 3.5	229 100 %		
Present	74 66.1	37 33.0	1 0.9	112 100 %		**0.001****
Hair lice					2.3	
Absent	231 76	64 21.1	9 2.9	304 100 %		
Present	26 70.3	11 29.7	0.0 0.00	37 100 %		0.3

* *Statistically highly significant difference ($P \leq 0.001$)
NO: Number

Table (6): Food pattern among the studied group (341 students):

Food staff	No	%
Dairy milk products		
Every day	133	39
Usually (3-4/week)	145	42.6
Sometimes (1-2/week)	54	15.8
Never	9	2.6
Meat		
Every day	00	00
Usually (3-4/week)	98	28.7
Sometimes (1-2/week)	241	70.7
Never	2	0.6
Fish		
Every day	00	00
Usually (3-4/week)	17	4.5
Sometimes (1-2/week)	273	80
Never	51	15.5
Fruit and vegetables		
Every day	171	50.1
Usually (3-4/week)	151	44.3
Sometimes (1-2/week)	17	5
Never	2	0.6
Starchy food (rice,macron,etc)		
Every day	323	94.7
Usually (3-4/week)	13	3.8
Sometimes (1-2/week)	5	1.5
Never	0	0
Oily food		
Every day	255	74.7
Usually (3-4/week)	73	21.4
Sometimes (1-2/week)	7	2.1
Never	6	1.8
Junk foods		
Every day	251	73.6
Usually (3-4/week)	83	24.3
Sometimes (1-2/week)	5	1.5
Never	2	0.6

NO: Number

DISSCUSION

Childhood malnutrition in all its forms is a major health concern which is associated with a high rate of mortality in children aged <5 years and lost healthy adult life years [17]. Although it's prevalence is high in developing countries, there are wide variations in the overall prevalence of underweight and stunting, among children across countries [6].

The present study was conducted in governmental primary schools in Kafr Sakr district. (341) students were included in this study.

Stunting is known to measures the cumulative deficient growth associated with the long term factors as inadequate food intake, and poor health conditions resulting from (recurrent infections, unhealthy environment, low socioeconomic status and lack of hygiene) [15]. In Egypt, data shows that there has been an increase in the stunting prevalence among children from 17.6% to 28.9% in recent years [18].

In the present study, prevalence of stunting is 21.4% **(table 2),** which is less than what was stated in a survey conducted earlier

in Fayoum that was 34.2% ***[18].*** It was also less than what was reported in a survey conducted in Beni-Suef Governorate, where the prevalence of the stunted children was 53.2**%** [6]**.** Underweight is usually used as a composite indicator to reflect both acute and chronic under nutrition, However it can't differentiate between them. In the present study, underweight prevalence is 21.9% **(table 2)** which is higher than what was reported from estimated data in Beni-Suef and Fayoum where underweight prevalence was 10.0% and 3.4% respectively [6,19].. This difference may be the result from the fact that the population studied included both urban and rural areas with different sociodemographic characteristics than what is recorded in the present study.

A study was conducted in the governmental school in rural region in India estimated that the prevalence of stunting was 32% and underweight was 70% [20]**.** In Turkey, only 5.7% of children were stunted [21]. In Nigeria, the prevalence of stunting and underweight was 17.4%, 19.8% respectively, among school children. This difference can be the result of their social, demographic, economic, nutritional intake, and culture differences between them [22].

The present study estimated that 53.1% of the examined students were anemic **(table 2).** Although anemia prevalence is high, it is less than what was reported in a survey conducted earlier in in a three Egyptian governorates, namely, Fayoum, BeniSuef, and Minia; where the prevalence of anemia was (59.3%) [23]. . This finding is higher than other related studies done in developing countries. In Uganda, more than one third of the children were anemic [17]. It was (35.8%) among Saudi Arabia female aged 6-12 years and (36.4%) among Vietnamese school age children [24] . The high prevalence reported in the present study may be related to high rate of parasitic infection and poverty between the study population that result in poor access to adequate diet and proper health care.

The prevalence of parasitosis in current study is (32.8%) (table 2),which is lower than parasitosis prevalence in Egypt (It was estimated to affect 56% of school children)[25]. This is similar to data reported from a survey among school children in Dakhalia where prevalence of intestinal parasitic infection was 37% [25] . On contrast, the prevalence of parasitic infection among school children in Gondar, Ethiopia was lower than our results (22.7%) [26]. Differences in behavioral, hygienic, environmental or climatic conditions may be the cause of variations in the prevalence of infection.

The present study showed that parasitosis (stunting is more 3.1 time in students with parasitosis), underweight (stunting is more 7.3 time in underweight students) and socioeconomic class (stunting is more 2.6 time in low Socioeconomic class) were the most significant predictor of stunting **(table 3).** This is in contrast with previous studies in Egypt, China, Peru and Tanzania, which demonstrated that parasitosis was the only significant predictor of stunting[11].

The results showed that children above age of 9 years were more stunted than those < 9 years but with no statistical significance **(table 3).** This is in agreement with previous studies [11] .This is may be due to inadequate nutrient intake and increase requirement because of increase growth rate.

In relation to gender, our findings revealed that there is no significant difference reported in stunting prevalence **(table 3),** while underweight was significantly higher in males (24.7%) than females (19.3%) **(table 4)**. These results are similar to the EDHS one (Egypt Demographic and Health Survey), which was conducted on the never-married female, male youth and young adults (10 -19 years). The EDHS study showed that males (5.0%) were more underweight than females (3.0%) in the age group (10–19 years), with higher prevalence in Upper Egypt, frontier governorates and in rural areas [27] .However, in Fayoum survey it has been reported that females were more underweight than males[18].Bhargava et al. reported that females were more stunted and underweight than males especially in rural schools in India [28] .This may be explained by the cultural preference of boys over girls in rural areas which might translate into a better chance for adequate food

The results showed that underweight was high among students of low socioeconomic class **(table 4).** It is found to be significantly associated with anemia (30.3 of anemic students are underweight) **(table 5).** Parasitosis results in poor appetite and decrease food intake leading to decrease the growth rate [11] . This is in agree with the result of the present study where underweight is significantly associated with parasitosis (33.0 of students with parasitosis are underweight) **(table 5).**

The finding of this study showed that the contribution of starchy foods, oily food and junk foods was higher than that of dairy milk products, meat, fish, fruits and vegetables **(table 6);** this is in agreeing with a study conducted in Nigeria, where starchy food was the major stable food of the people. That's may be due to lack of nutritional knowledge of the students, high price of food and low/moderate socioeconomic status. Such scenario could impact on the children's nutritional status [29] .

The findings are similar to a study done in the Eastern Mediterranean Region [EMR], which reported a relatively low consumption of vegetables and fruits in most of the developing countries and also another one done in Kenya . The high levels of stunting among children could have been contributed to inadequate red meat intake among the malnourished children. Consumption of animal source foods was found to be associated with a decreased risk of stunting and underweight. A study that was conducted by Dror and Allen, 2011 reported that consuming animal source foods not only decreased stunting but also improved other anthropometric indices toward the reduction of morbidity and mortality among undernourished children [6].

In this regard, the nutritional status of children in the developing countries should be emphasized for the improvement of health of children in the coming generation.

CONCLUSION AND RECOMMENDATIONS

The present study results showed high prevalence of underweight and stunting among primary school children in kafr Sakr district, Sharqia which is significantly associated with parasitosis and anemia. There is a positive relation between anemia, parasitosis and anthropometric status of school -age children.

So, we recommend emphasizing the importance of screening program of anemia and parasitosis (early detection and treatment even being a symptomatized).Also, health education, good nutritional knowledge, personal hygiene, safe water supply, good sanitation, and school feeding program including feeding and micronutrient supplements; all are important factors can be included in control programmes of malnutrition and anemia in low and middle income countries with focus on school children.

LIMITATIONS

The finding presented in this study representing only the rural areas of Kafr Sakr, there is may be a different results in the urban regions. We only assessed anemia, parasitosis as risk factors for malnutrition further investigation are needed to understand the complete picture and to assess other factors which affect nutritional status among Egyptians school children.

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