Relation between health and nutritional status and learning performance among primary school children in Sonover district, Fayoum governorate

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Abstract

Background: The health and nutritional status affect their learning performance. The **aim of the study:** was to assess relation between health and nutrition status and learning performance among primary school children. **Subject and Method: Research design**: Across-sectional design was used in this study. **Setting**: Two primary school at sonover district. **Subjects:** consisted of 125 children in 6 grades. **Tools of data collection**: Three tools were used first questionnaire to collect data about demographic characteristics of the student and their knowledge about nutrition, second the scale to assess the student's learning performance, third clinical assessment sheet. **Results:** revealed low level of student knowledge about diet and nutrition, one quarter of their have one signs of nutritional deficiency, 14.4% of students have attention deficient hyperactivity disorders, and 83.2% of them have concentration problems. **Conclusion** the study revealed present a relation between health and nutrition status and learning and school performance among primary school children. **Recommendation** implement health educational program about nutrition at school setting by the nurse should be held,

Key words: Nutrition status, school performance, health, learning performance, primary school children.

INTRODUCTION

In Egypt (2010), pupils from 5-15 years of age represented about 37% of the total population [1]. In Sonover District, Fayoum Governorate, elementary school pupils constitute about 39.8 % of the total number of pupils [2] These children need health education by the school nurse regarding nutrition and health promotion [3] Given these facts, it is important to understand the relationship between healthy nutrition and school performance. School children constitute a significant and important sector of the population who are constantly growing. [4] Good health is essential for learning and cognitive ability. Ensuring good health of children can boost attendance and educational achievement [5].

Nutritional wellbeing is influenced by the nutrients content of foods consumed in relation to requirements that are determined by age, sex, level of physical activity and

Health status, as well as the efficiency of nutrient utilization by the body [6] Appropriate dietary intake is critical for forming good eating habits and provides the much needed nutrients for growth, long-term health, cognition and educational achievements schoolchildren. However, the dietary intake of schoolchildren in developing countries is limited in diversity, mainly comprising plant-based food sources, but with limited intake of fruits and vegetables. There is a low energy intake and insufficient micronutrient intake. Additionally, there is an emerging trend of consumption of high-energy snacks and beverages, leading to the dual burden of malnutrition [7]

Underachievement at school or failure to reach a satisfactory level of literacy and numeracy is a global problem, particularly in developing countries [8] There is a correlation between nutrition and cognition as well as psychosocial behavior. On the other hand, a school feeding program found improvements in attendance [9] Moreover, anemic children tend to do poorly on vocabulary, reading, and other tests [10]. However, this relationship has been highly under-researched, but there exists many studies that look at the nutritional benefits of many proteins, vitamins, and food substances as they affect learning and brain function [11]

Significance of the study:

Children are the future of society and special gifts to the world, their overall health has improved, and rates of deaths and illness in some areas have decreased. But we still must focus on children's health particularly. Children are vulnerable to malnutrition and infectious diseases, many of which can be effectively prevented or treated [12] In Egypt has high rates of school age child is liable to suffering from malnutrition, anemia, allergy, decrease in learning level and performance [13].

Primary school age is a dynamic period of physical growth and mental development of the child research indicates that nutritional deficiencies and poor health in primary school age children are among the causes of low school enrolment, high absenteeism, early dropout and poor classroom performance. [14].

AIM OF THE STUDY

The aim of this study was to assess the relation between health and nutritional status and learning performance among primary school children in Sonover district, Fayoum governorate.

Research questions:

- What is the effect of health status and nutrition pattern on learning performance among primary school children?

Subjects and Methods:

Research design:

Cross -sectional design was used to achieve the aim of the study.

Study Setting:-

The study will be done at governmental primary schools in Sonover district (Fayoum governorate).

Study subjects:-

Fayoum governorate consist of 10 villages, the total number of school in their village are 27 schools, the total number of students in 6 grade are approximately 2500 students (boys and girls), and average of each class about 30 students we select one village randomly (Sonover district).

Multi stage sample will be used it classified into three stage

- First stage: we select one village randomly. (Sonover district).
- Second stage: All school present in the village will enrolled for this study (2 schools).

- Third stage includes: - total number of school pupils are 270 students in the 2 schools we will select students. Giving the prevalence of learning performance as assessed by their level of achievements 30% (bad of achievement), power of test 80% and level of confidence within of 95%, the sample will be 125 students.

Sample size:

The sample size was calculated to identify the prevalence of any abnormalities in children's learning

performance of 25% or higher, with 4% standard error and at 95%level of confidence. Using the Epi- info 6.04 software packages with a single proportion equation, the required sample size turned to be 113 students. This was increased to 125 male and female students to compensate for an expected non- response rate of about 10%.

Tools of data collection:

Three tools were used for data collection:

Toll 1 consist of 3 part pre-designed interview questionnaire was used. Part 1 entailed school children's socio-demographic characteristics such as age, sex, birth order, residence as well as parent educational level, etc.; part 2 student's knowledge about nutrition covering areas of food components, proteins, carbohydrates, fats, vitamins and minerals, and effect of good nutrition. Knowledge was considered satisfactory if the percent of correct answers was 50% or more; part 3 student's health problems and complaints. It included 15 questions about nutritional symptoms and problems as loss of appetite, colic/flatulence, vomiting, worms, dental caries, headache/dizziness, etc. The student who had a "yes" answer in any of the system's symptoms or complaints was considered as having "definite" symptoms or problems.

Scoring system:-

A correct answer was scored one and the zero for incorrect ones, so the total scoring 21 points for each area of knowledge, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. Knowledge was considered satisfactory if the percent score was 50% or more and unsatisfactory if less

than 50%.

Tool 2 consisted of three scales to assess student's learning performance. 1) Mental capabilities of primary school children (age 9-11): designed by mousa(1984) (15) to assess primary schoolchildren' mental capabilities. It has 90 questions covering abilities in language, mathematics, place, interpretation, and relations. It has a high level of reliability (coefficient 0.63) and concurrent validity (coefficient 0.83). According to the tool manual, each correct answer was scored 1 and the incorrect 0.

Scoring system

The scores are summed giving a total raw score, which is converted into standardized score using tool's normograms. The student's mental capability was classified as "low" if the score was <80, "high" if >120, and "average" if between 80 and 120. 2) Concentration ability of primary school children: based on Abikoff (1985) (16), it consists of 23 questions such as "I memorize what I have learnt," and "I feel unable to do my homework," to be checked as "yes," "sometimes," or "no." These were scored 0, 1, and 2, respectively; a higher score means higher concentration. The scores are summed-up and were converted into a percent score and means and standard deviations were calculated. The student's concentration is considered high if the percent score was equal or higher than the mean + 1 standard deviation. 3) Children attention and adjustment scale: developed by Lambert (17) and modified by Elbehary and Aglan (18) to assess student's attention and adjustment. It has 23 questions covering Conduct behavior, Attention deficit disorder, Hyperactivity, Impulsivity, Inattention, and collectively the Attention Deficit Hyperactivity Disorder (ADHD) and the Attention Deficit Hyperactivity Disorder (ADHD)

DSM. Each item was to be checked as "yes," "sometimes," or "no," scored 0, 1, and 2, respectively so that a higher score meant more attention and adjustment problems. The scores are summed-up and means and standard deviations are calculated. The concentration was considered high if the percent score was equal or higher than the mean + 1 standard deviation according to scale manual.

Tool 3 was a clinical assessment sheet developed by the researcher based on Dudek[19]. It consisted of a general examination checklist to identify any malnutrition signs in student's hair, face, nails, lips, tongue, gums, teeth, and skin. The student who had any malnutrition sign in one or more sites was considered as having unhealthy nutritional status.
Content validity and reliability:

Face and content validity were done for the tools by five expertise's in the field of community health nursing and necessary modification were done. The reliability of the tool was tested using the internal consistency method. It proved to be high with Cronbach alpha coefficient 0.902.

Field work:

After securing official permissions from the manager of the security department in the Ministry of Education, the researcher visited the selected schools, and met with the headmasters and teachers to explain to them the aim of the work and the data collection tools. Then, the researcher started to collect data through interviewing each student individually using the data collection tools. It took about one hour to fill all the forms from each student. The data collection procedure lasted during the period from October 2013 until May 2014.

Pilot study: A pilot study was conducted on 10% of the study sample for testing the clarity, applicability, and relevance of the data collection tools. It also served to estimate the time required for and filling in the forms. Based on the result of the pilot study, the necessary modifications and clarifications of some questions were done to have more applicable tools for data collection.

Administrative and ethical considerations: The study protocol was approved by the research and ethics committee at the Faculty of Nursing, Zagazig University. An informed consent form was signed by each student's parent/guardian before collecting any data; this was done through school administration. The form explained the study aim in a simple and clear manner to be understood by common people. No harmful maneuvers were performed or used, and no foreseen hazards were anticipated from conducting the study. Participants were informed about their right to withdraw from the study at any time without giving any reason. Data were considered confidential and not be used outside this study.

RESULTS

Table 1 shows that the students' age ranged between 11 and 13 years, with slightly more boys (52.0%). The majority were having male (78.4%) and female (85.6%) siblings. Two-fifth of them were firstborn (40.0%). (49.6%) and (45.6%) of mother were having intermediate level education. More than half of the fathers were having clerical jobs (55.2%), while the majority of the mothers (80.8%) were housewives. Slightly more than half of the families were living in rural areas (52%), and the majority were having sufficient income.

The knowledge about diet and nutrition, as presented in **Table 2,** was generally low among schoolchildren. Except for the knowledge about

minerals, which was satisfactory among 76% of the students, the knowledge in all other areas was low. This was especially evident regarding vitamins (7.2%), and the effect of good nutrition (20.8%). In total, only 11.2% of the students had satisfactory level of knowledge about diet and nutrition.

As shown in **Table 3**, the most common health problems reported by students were dental caries (99.2%), worms (84.0%), fatigue (82.4%) and food allergies (80.0%). At the other extreme, the least reported problems were diabetes (19.2%) and heart disease (3.2%). Overall, approximately one-fourth of the students were having definite reported symptoms or problems. The physical examination identified that slightly less than half of the students (47.2%) were having at least one abnormal sign of malnutrition. The table also indicates that only 9.6% of the students were obese, while a higher percentage (12.8%) of them were underweight.

Table 4 It indicates that the most prevalent disorder was conduct behavior (24.8%), whereas the least prevalent was that of inattention (11.2%). Overall, 14.4% of the students were having Attention Deficit Hyperactivity Disorder (ADHD). Meanwhile, the majority of the students (83.2%) were having concentration problems. As regards the levels of mental abilities, 60.0% were having high abilities, while 13.6% were having low abilities.

Concerning the correlations among ADHD, concentration, mental capabilities, knowledge, symptoms, and physical assessment scores, **Table 5** indicates that ADHD had statistically significant weak negative correlations with concentration, knowledge, and physical examination. Meanwhile, the concentration had statistically significant weak positive correlation with knowledge, and moderate with mental capabilities.

Additionally, mental capabilities had statistically significant weak positive correlation with knowledge.

As regards the predictors of students' knowledge score, **Table 6** illustrates that the family income and student's mental capabilities score were statistically significant positive predictors, while the number of symptoms was a negative predictor. The model explains 20% of the variation in the knowledge score. None of the other students' characteristics significantly influenced this score.

Table 7 shows that the student's age was a statistically significant positive predictor of the mental capabilities score, while the number of symptoms was a negative predictor. The model explains 44% of the variations in the mental capabilities score. None of the other students' characteristics significantly influenced this score.

DISCUSSION

An adequate mode of nutrition is among the most important environmental factors affecting the development of man and maintenance of a good health status Wojtyła-Buciora et al.,[20].Poor nutrition among schoolchildren contributes to inefficiency of their learning since those children with diminished cognitive abilities and sensory impairments naturally perform less well and are more likely to fail (UNICEF & WFP., [21] The study identified a deficiency in these schoolchildren's knowledge about diet and nutrition, and this has negative impacts on their psycho-behavioral and physical health status.

In the present study, approximately one-fourth of the students were having definite reported symptoms or problems, and about one-half of them were having at least

one abnormal physical finding. These are relatively high percentages of ailments or disorders in this age group which should enjoy perfect health. This might be explained by the generally low socio-economic levels of the sample, with about half of it residing in rural areas which are known to have high prevalence of parasitic infestations. Added to this is the low level of dietary knowledge among these children, which would lead to malnutrition problems among them. Similar high prevalence of nutrition-related health problems were reported among schoolchildren in Brazil (Ramires et al ., [22] and in Cambodia Perignon et al,[23]

According to the current study findings, only approximately one-tenth of the school children had total satisfactory knowledge about diet and nutrition. This is an extremely low level of satisfactory knowledge in this essential area that has a major impact on child' growth and development. It may be to lack or inefficiency of health education programs about nutrition from school health team, in addition to deficiency of the educational curriculum in this rather important subject. In agreement with this, Nichols et al., [24] in a study Trinidad and Tobago found low dietary knowledge among primary schoolchildren. Similar findings were also reported in a quasi-experimental intervention study carried out on primary schoolchildren in India Saraf et al., [25]

The multivariate analysis identified family income as a significant independent positive predictor of the current study students' knowledge score. This is expected since a higher family income is associated with better chances to provide nutritious diet to children, which would consequently positively influence their knowledge. In agreement with this, Masters et al., [26]

reported better dietary habits among higher income families in a study in the United States. On the other hand, Bishwalata et al., [27] in India, identified low-income family as a predictor of poor nutritional health status.

The present study also demonstrated that the students having unsatisfactory knowledge had significantly higher numbers of symptoms and health problems. This is expected given the influence of sound knowledge about diet and nutrition on healthy dietary habits, and consequently on child's nutritional and general health status. In congruence with this, a study in Bangladesh revealed that the deficiency of knowledge about diet and nutrition was associated with high prevalence of iron deficiency anemia Shill et al.,[8]. Similarly, a study of schoolchildren in Columbia demonstrated a high prevalence of nutritional health problems that were related to low levels of dietary knowledge Galiano et al.,[29]

Moreover, the present study results showed that the students with high mental capabilities and better ability to concentrate have more satisfactory dietary knowledge. However, it could be interpreted inversely, i.e. those schoolchildren with good dietary knowledge have better mental capabilities and more concentration, i.e. a better knowledge about nutrition would lead to better dietary habits, which will in turn enhance the child's mental abilities. Given the cross-sectional design used in the present study with no possible temporal relationship, it is not possible to discern whether the knowledge influenced the mental abilities or the reverse happened. In order to identify this, a longitudinal design should be used. In congruence with this, Gage et al .,[30] in a study in European countries reported that parents considered good nutrition to have a

positive impact on child's mental performance, more than social and biological determinants. On the same line, Bele et al .,[31] in India identified under-nutrition among the independent risk factors of child's emotional and behavioral disorders, and also a significant impact on child's educational performance.

According to the present study findings, approximately fifteen percent of the schoolchildren were having Attention Deficit Hyperactivity Disorder (ADHD). The most prevalent associated disorder was conduct behavior, which affected about one-fourth of these children. This is considered as a high prevalence rate since the average worldwide rate mentioned by Arns et al., [32] is only 5.3%, but this rate varies according to regions. Lower rates were also reported in a study in the United States where the prevalence varied between 2.4% and 7.1% Reyes et al., [33]. The high rate in the present study might be attributed to the fact that the tool used in the study is a screening rather than a diagnostic tool, which may lead to over-estimation of the true prevalence rate.

The current study results have also demonstrated that the schoolchildren having ADHD had significantly lower knowledge scores and mental capabilities. This indicates the negative impact of this disorder on child's intellectual capacities, with subsequent deleterious effects on their academic achievement. In agreement with this, Langberg et al ., [34] in a study in the United States, showed that in a sample of children with ADHD the symptoms of inattention were significantly correlated with the domains of academic functioning.

Similarly, in another study in the United States, Crump et al [35] identified a strong association between ADHD and poor academic achievement among elementary schoolchildren. Moreover, Du Paul et al [36] demonstrated the association between ADHD and learning disability.

Conclusion

The study concludes that the primary schoolchildren in the study setting have deficient knowledge about diet and nutrition, with associated high prevalence of nutritional health problems symptoms and signs. The most prevalent psycho-behavioral problems among them are the lack of concentration and abnormal conduct behavior. Their knowledge deficiency has a negative effect on their concentration abilities, ADHD, and reported health problems, but is positively affected by their mental capabilities and their family income.

Recommendations:

Based on these findings, the study recommends improving schoolchildren's dietary knowledge through school health educational programs, community health nursing interventions, and school curricula. Screening programs for early identification of students having any nutrition-related health problem, including psycho-behavioral are proposed with more focus of those with low school performance. Nursing interventions should also extend to parents. Further research is suggested to examine the effect of interventions aimed at improving the nutritional status of schoolchildren, and its impact on their school performance.

RESULTS
Table 1: Socio-demographic characteristics of students in the study sample (n=125)

Items	Frequency	Percent
School:		
Girls	60	48.0
Boys	65	52.0
Age:		
11	31	24.8
12	88	70.4
13+	6	4.8
Range	11.0-13.0	
Mean±SD	11.8±0.5	
Median	12.0	
Have male siblings:	98	78.4
Have female siblings:	107	85.6
Birth rank order:		
1	50	40.0
2	54	43.2
3+	21	16.8
Father education:		
Illiterate/read/write	14	11.2
Intermediate	62	49.6
High	49	39.2
Father job:		
Clerical	69	55.2
Manual work	56	44.8
Mother education:		
Illiterate/read/write	18	14.4
Intermediate	57	45.6
High	50	40.0
Mother job:		
Housewife	101	80.8
Working	24	19.2
Residence:		
Rural	65	52.0
Urban	60	48.0
Income:		
Saving	49	39.2
Sufficient	57	45.6
Insufficient	19	15.2

Table 2: Knowledge about diet and nutrition among students in the study sample (n=125)

Satisfactory knowledge (50%+) of:	Frequency	Percent
Food components	34	27.2
Proteins	46	36.8
Carbohydrates	27	21.6
Fats	47	37.6
Vitamins	9	7.2
Minerals	95	76.0
Effect of good nutrition	26	20.8
Total knowledge:		
Satisfactory	14	11.2
Unsatisfactory	111	88.8

Table 3: Symptoms of dietary problems among students in the study sample (n=125)

Items	No.	%
Symptoms of:		
Dental caries	124	99.2
Worms	105	84.0
Fatigue	103	82.4
Food allergies	100	80.0
Anemia	99	79.2
Vomiting	97	77.6
Diarrhea	85	68.0
Constipation	76	60.8
Headache/dizziness	74	59.2
Loss of appetite	71	56.8
Colic/flatulence	70	56.0
Heartburn	63	50.4
Diabetes	24	19.2
Heart disease	4	3.2
Total having definite symptoms:		
Yes	32	25.6
No	93	74.4
Have malnutrition signs:		
No	66	52.8
Yes	59	47.2
Body mass index:		
Obese	12	9.6
Normal	97	77.6
Underweight	16	12.8

Table 4: Attention Deficit Hyperactivity Disorder (ADHD) among students in the study sample (n=125)

Items	Frequency	Percent
Conduct behavior (CD):		
Normal (<=mean + 1 SD)	94	75.2
Abnormal (>mean + 1 SD)	31	24.8
Attention deficit disorder (ADD):		
Normal (<=mean + 1 SD)	100	80.0
Abnormal (>mean + 1 SD)	25	20.0
Hyperactivity (H):		
Normal (<=mean + 1 SD)	103	82.4
Abnormal (>mean + 1 SD)	22	17.6
Impulsivity (I):		
Normal (<=mean + 1 SD)	102	81.6
Abnormal (>mean + 1 SD)	23	18.4
Attention deficit hyperactivity disorder (ADHD) DSM:		
Normal (<=mean + 1 SD)	103	82.4
Abnormal (>mean + 1 SD)	22	17.6
Inattention (N):		
Normal (<=mean + 1 SD)	111	88.8
Abnormal (>mean + 1 SD)	14	11.2
Attention deficit hyperactivity disorder (ADHD):		
Normal (<=mean + 1 SD)	107	85.6
Abnormal (>mean + 1 SD)	18	14.4
Concentration:		
Normal	21	16.8
Abnormal (<mean + 1 SD)	104	83.2
Mental capabilities:		
Low (<80)	17	13.6
Average (80-120)	33	26.4
High (>120)	75	60.0

Table 5: Correlation matrix of ADHD, concentration, mental capabilities, knowledge, symptoms, and physical assessment scores

Items	Spearman's rank correlation coefficient					
	ADHD	Concen-tration	Mental capabilities	Knowledge	Symptoms	Exam.
ADHD						
Concentration	-.344**					
Mental capabilities	-0.01	.479**				
Knowledge	-.181*	.256**	.349**			
Symptoms	0.151	0.035	-0.12	-.290**		
Physical exam	-.186*	-0.008	0.027	0.071	-.220*	

(*) Statistically significant at p<0.05   (**) statistically significant at p<0.01

Table 6: Best fitting multiple linear regression model for the knowledge score

Items	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	37.40	10.37		3.61	<0.001	16.88	57.93
Income	5.32	1.84	0.23	2.90	0.004	8.95	1.68
No. of symptoms	-0.31	0.11	-0.22	2.70	0.008	-0.53	-0.08
Mental capability	0.19	0.05	0.30	3.68	<0.001	0.09	0.29

r-square=0.20
Model ANOVA: F=11.42, p<0.001
Variables entered and excluded: gender, age, birth order, number of siblings, parents' education and job, residence, crowding index, scores of physical assessment, ADHD, concentration,

Table 7: Best fitting multiple linear regression model for the mental capabilities score

Items	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	-253.70	38.80		6.54	<0.001	-330.50	-176.90
Age	33.33	3.34	0.68	9.99	<0.001	26.73	39.93
No. of symptoms	-0.44	0.15	-0.20	2.91	0.004	-0.73	-0.14

r-square=0.44
Model ANOVA: F=50.50, p<0.001

Variables entered and excluded: gender, birth order, number of siblings, parents' education and job, income, residence, crowding index, scores of physical assessment, ADHD, concentration.

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