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Effects Of Parasitic Infections on School Achievement of Primary School Children

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ABSTRACT

Background: Intestinal parasitic infections (IPIs) are amongst the most common infections worldwide. Adverse health consequences combine to impair childhood educational performance, reduce school attendance and subsequent productivity.

Aim of the study: To determine the effect of parasitic infections on school achievement of primary school children in Al Qurain district, Sharkia Governorate.

Subject and Methods: This was a cross-sectional study was conducted on 320 primary school children. Participants' data regarding Past history of parasitic infection, Effect on school achievement, questions were collected via semi-structured questionnaire. Also stool samples collected from the students and examined for the presence of parasites.

Results: There was highly statistical significance association between educational performance score and parasitic infection where poor performance was more associated with the presence of infection.

Conclusions: Results of the current study revealed that there was highly statistical significance association between educational performance score and parasitic infection. We should increase awareness about parasitic infectious diseases through health education of the children and their mothers about methods of prevention, healthy habits and good personal hygiene.

Keywords: Parasitic Infections, School Achievement, Primary School Children.

I. INTRODUCTION

Intestinal parasitic infections (IPIs) are amongst the most common infections worldwide. WHO estimate at least 2 billion people worldwide are affected, and of these approximately 300 million are ill as a result of these infections, 50% of them being school age children **(1)**. In Egypt, the intestinal parasites affect 56% of the school children**(1).**

Gastrointestinal parasites (GIPs) are micro-organisms that live in the intestine, some cause problems while others can live for long periods in the bowl without causing any symptoms or requiring any treatment. They can be largely categorized into two groups, protozoans (e.g. Entamoebahistolytica, Giardia duodenalis) and helminthes (e.g. Ascarislumobricoides). These GIPs flourish in settings characterized by a warm temperature, humidity, poor sanitation, dirty water and crowded housing **(2).**

These infections are regarded as serious public health problem and it is the most common among school children . It negatively affects 2071childrens' growth, cognitive development and learning abilities. also, may cause nutritional deficiencies, anemia, and other physical and mental health problems **(3).**

These adverse health consequences combine to impair childhood educational performance, reduce school attendance and subsequent productivity. Also, these affect their physical development and may also prevent them from taking full advantage of their opportunity for formal school education **(4,5).**

We aimed to determine the effect of parasitic infections on school achievement of primary school children in Al Qurain district, Sharkia Governorate.

II-STUDY DESIGN AND PARTICIPANTS

A Cross sectional study design was used in carrying out the study. The study was conducted in two primary schools in Al- Qurain district, Sharkia Governorate. This study was carried out during academic year 2018/2019 on 320 participants. There was 20 school in Al- Qurain district, 13 from

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them were in urban area and 7 were in rural area. Two schools (one from urban, and the other from rural) were selected randomly to represent Al-Qurain district. Students were selected randomly from each school according to the total number of students in each school by proportional allocation method

Data collection questionnaire

A Data collection questionnaire

Effect on school achievement: The scale was developed by **(6)**, used to assess school achievements of the students by their teachers. This scale was translated into Arabic and validated.The responses are on a five-point scale: never, seldom, sometimes, often and always.

It consisted of 5 domains as:

- Learning Motivation/ Attitude included (4 items).
- Learning Characteristics included (4items).
- Behavioral Performance in class included (6 items).
- Creativity included (5 items).
- Ability to concentrate included (23 items).

Scoring system: It consists of 42 questions, the score of each question range from 1.0 to 5.0 except the last 15 questions range from 5.0 to 1.0.

The total score is 210. It is divided into:

- Poor performance (<50.0% = <105)
- Moderate performance (50.0% to less 75.0% = 105 to less 157.5)
- Good performance (≥75.0% = ≥157.5).

Written consent was sent with the students for their parent's approval and upon securing all official permissions, each child was interviewed individually in the class after explanation of the purpose of the study, the researcher read each item of the questionnaire to them. also the teacher of the same students was interviewed to answer the questions of the school achievement's questionnaire.

Students by aid of their mothers was asked to collect material for examination in the early morning prior to bathing or defecation.

The stool specimens were collected in labeled plastic vials without preservatives and transported to the laboratory of the family medicine centre within 4 hours after collection. They were examined for the presence of parasites by direct wet mount, Lugol's iodine solution and modified formaline-ethyl acetate sedimentation techniques **(7)**.

An official permission was obtained from the education directorate in Al- Qurain district to perform the study in the selected schools.

Informed written consent was obtained from children's parents to participate in the study. Oral permission was taken from the teacher before interviewing with the students in the class.

Statistical Analysis:

The collected data were coded, entered, presented, and analyzed by computer using a data base software program, Statistical Package for Social Science (SPSS) (Version 20.0. Armonk, NY: IBM Corp). Qualitative data were represented as frequencies and percents. Chi square (X^2) or Fisher's exact tests were used to detect relation between different qualitative variables. For quantitative variables mean and standard deviation (SD) were computed. Independent t-test (t) was used for detection of difference between different quantitative variables. The results were considered statistically significant and highly statistically significant when the significant probability (P value) was < 0.05* and <0.001** respectively.

III.RESULTS

More than half of the studied children belonged to age 9-12 years & divided equally into female and male. They had preparatory father's education, secondary mother's education, their mothers were housewives, had enough income, and had medium social class. The majorities of their fathers were working, had sewage and refuse disposal, and live-in rural area. One third (35%) of them had parasitic infection. More than two third (69.6%) of them had rural residence. The majority (80.4%) of them had single parasitic infection. The highest percentage (44.4%) of them had E.histolytica followed by E.vermicularis and Giardia with percent (38.9%) and (16.7%) respectively.

More than half of the studied children regarding learning attitude and characteristics were "Able to focus on a topic.., Learn autonomously, Sustained interest in certain subjects, understand the diagrams, distinguish between similar diagrams, Seek how and why rather than taking them for granted ". **(Table 1).**

Near half of studied children regarding Behavioral performance and creativity were" Able to concentrate on his study, cooperate with classmates, participate in activities, show courage to ask questions, demonstrate a sense of humor, desire to reach goals and Refuse to accept other

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people's views without reasons ". **(Table 2).**

More than half of studied children often " blamed for not relating the speech, don't care of small parts in the lesson, Not understanding the relation between lesson ideas, record all what the teacher says, can't realize all facts, Feel disoriented on explanation a huge amount of the subject, unable to do his homework, Doubt in his ability to do his school work well and study the subject because he afraid of failing" (**Table 3).**

There was highly statistically significant difference between infected and non-infected children regarding all domains of educational performance and regarding the total score of performance. **(Table 4).**

There was highly statistically significant difference between infected and non-infected children regarding learning characteristics, behavioral performance, and creativity domains & regarding the total score of performance. Also, there was statistically significant difference between them regarding learning motivation\ attitude and concentration ability domains. **(Table 5).**

There was highly statistical significance association between educational performance score and parasitic infection where poor performance was more associated with the presence of infection **(Figure 1)**

Table 1: Frequency distribution of Educational performance (Learning motivation\attitude & Learning characteristics) among the studied children (n=320)..

		Never	Seldom	Sometimes	Often	Always
		No (%)	No (%)	No (%)	No (%)	No (%)
A) Learning motivation\attitude:						
1- Able to focus on a topic for a long period of time		53(16.6)	0.0 (0.0)	61 (19.0)	30 (9.4)	176 (55.0)
2-Able to learn autonomously		53 (16.6)	0.0 (0.0)	61 (19.0)	30 (9.4)	176 (55.0)
3-Sustained interest in certain subjects		49 (15.3)	0.0 (0.0)	63 (19.7)	32 (10.0)	176 (55.0)
4-Refuse to give-up when facing difficulties		13 (4.1)	0.0 (0.0)	180 (56.2)	30 (9.4)	97 (30.3)
			No		%	
Total	Inadequate		223		69.7	
	Adequate		97		30.3	
B)Learning characteristics:						
1- Seek "how" and "why "rather than taking them for granted		53 (16.6)	0.0 (0.0)	61 (19.0)	30 (9.4)	176 (55.0)
2-Able to understand the diagrams		49 (15.3)	0.0 (0.0)	65 (20.3)	30 (9.4)	176 (55.0)
3-Able to distinguish between similar diagrams		46 (14.4)	0.0 (0.0)	68 (21.2)	32 (10.0)	174 (54.4)
4-Able to appreciate the beauty of drawings and create different diagrams		16 (5.0)	0.0 (0.0)	207 (64.7)	30 (9.4)	67 (20.9)
			No		%	
Total	Inadequate		253		79.1	
	Adequate		67		20.9	

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Table 2: Frequency distribution of Educational performance (Behavioral performance & Creativity) among the studied children (n=320).

		Never	Seldom	Sometimes	Often	Always
		No (%)	No (%)	No (%)	No (%)	No (%)
C)Behavioral performance:						
1-Participate in activities in accordance with instructions		52 (16.3)	0.0 (0.0)	62 (19.4)	61 (19.1)	145 (45.3)
2- Show courage to ask questions		52 (16.3)	0.0 (0.0)	60 (18.7)	62 (19.4)	146 (45.6)
3-Able to concentrate on his\her study		53 (16.6)	0.0 (0.0)	59 (18.4)	60 (18.7)	148 (46.3)
4-Able to cooperate with classmates		53 (16.6)	0.0 (0.0)	60 (18.75)	60 (18.75)	147 (45.9)
5-Able to express his emotions effectively		52 (16.3)	0.0 (0.0)	62 (19.4)	140 (43.7)	66 (20.6)
6-Able to listen to others patiently		12 (3.8)	0.0 (0.0)	182 (56.9)	60 (18.7)	66 (20.6)
			No		%	
Total	Inadequate		173		54.1	
	Adequate		147		45.9	
D) Creativity :						
1- Demonstrate a keen sense of humor		0.0 (0.0)	0.0 (0.0)	114 (35.6)	60 (18.8)	146 (45.6)
2-The desire to reach goals		0.0 (0.0)	0.0 (0.0)	112 (35.0)	61 (19.1)	147 (45.9)
3- Refuse to accept other people's views without reasons, not afraid to express his own opinion		0.0 (0.0)	0.0 (0.0)	112 (35.0)	61 (19.1)	147 (45.9)
4-Ability to innovate		0.0 (0.0)	0.0 (0.0)	193 (60.3)	61 (19.1)	66 (20.6)
5-Able to suggest ideas and solutions to various problems		0.0 (0.0)	0.0 (0.0)	193 (60.3)	60 (18.8)	67 (20.9)
			No		%	
Total	Inadequate		174		54.4	
	Adequate		146		45.6	

Table 3: Frequency distribution of Educational performance (Concentration ability) among the studied children (n=320).

	Never	Seldom	Sometimes	Often	Always
	No (%)	No (%)	No (%)	No (%)	No (%)
E)Concentration ability :					
1- Keep what he learn	0.0 (0.0)	0.0 (0.0)	193 (60.3)	127 (39.7)	0.0 (0.0)
2- Read the topic more than once to keep it	0.0 (0.0)	0.0 (0.0)	193 (60.3)	127 (39.7)	0.0 (0.0)
3-Keep the important words and know it's meaning	0.0 (0.0)	0.0 (0.0)	194 (60.6)	126 (39.4)	0.0 (0.0)
4-When the teacher corrects his mistakes, he repeat the correct ones	0.0 (0.0)	0.0 (0.0)	186 (58.1)	134 (41.9)	0.0 (0.0)
5-Keep any information for exam	0.0 (0.0)	0.0 (0.0)	193 (60.3)	127 (39.7)	0.0 (0.0)

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6-Keep well the important information and facts which related to at the end of the term	0.0 (0.0)	0.0 (0.0)	193 (60.3)	127 (39.7)	0.0 (0.0)
7-Rewrite the lesson in a simple way during studying	0.0 (0.0)	0.0 (0.0)	192 (60.0)	128 (40.0)	0.0 (0.0)
8- What is important for him is remembering the information for exam	0.0 (0.0)	0.0 (0.0)	192 (60.0)	128 (40.0)	0.0 (0.0)
9-Read the subject without understanding	0.0 (0.0)	0.0 (0.0)	192 (60.0)	128 (40.0)	0.0 (0.0)
10-Use school book only during studying	0.0 (0.0)	0.0 (0.0)	187 (58.4)	133 (41.6)	0.0 (0.0)
11-Find difficulty in understanding the subject	0.0 (0.0)	0.0 (0.0)	194 (60.6)	126 (39.4)	0.0 (0.0)
12- Always blamed for not relating the speech	0.0 (0.0)	0.0 (0.0)	114 (35.6)	206 (64.4)	0.0 (0.0)
13-Don't care of small parts in the lesson	0.0 (0.0)	0.0 (0.0)	120 (37.5)	200 (62.5)	0.0 (0.0)
14-Not understanding the relation between lesson ideas	0.0 (0.0)	0.0 (0.0)	114 (35.6)	206 (64.4)	0.0 (0.0)
15-Record all what the teacher says without attention to importance	0.0 (0.0)	0.0 (0.0)	121 (37.8)	199 (62.2)	0.0 (0.0)
16-Can't realize all facts because concentration on remembering	0.0 (0.0)	0.0 (0.0)	117 (36.6)	203 (63.4)	0.0 (0.0)
17-Feel disoriented on explanation a huge amount of the subject	0.0 (0.0)	0.0 (0.0)	110 (34.4)	210 (65.6)	0.0 (0.0)
18-Feel frightened when start doing the questions	0.0 (0.0)	0.0 (0.0)	122 (38.1)	198 (61.9)	0.0 (0.0)
19- Doubt in his ability to do his school work well	0.0 (0.0)	0.0 (0.0)	144 (45.0)	176 (55.0)	0.0 (0.0)
20-Feel often unable to do his homework	0.0 (0.0)	0.0 (0.0)	147 (45.9)	173 (54.1)	0.0 (0.0)
21- He study the subject because he afraid of failing	0.0 (0.0)	0.0 (0.0)	142 (44.4)	178 (55.6)	0.0 (0.0)
22- Like someone telling him how to do his homework briefly	0.0 (0.0)	121(37.8)	102 (31.9)	97 (30.3)	0.0 (0.0)
23- A lot of homework and competition between the students make him nervous	0.0 (0.0)	119 (37.2)	106 (33.1)	95 (29.7)	0.0 (0.0)

		No	%
Total	Inadequate	183	57.2
	Adequate	137	42.8

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Table 4: Relation between mean score of educational performance domain and parasitic infection among the studied children (n=320).

Domain	Infected (n=112) Mean ± SD	Non infected (n=208) Mean ± SD	[a]t-Test	P value
Learning motivation \attitude	13.16±3.77	16.35±4.35	5.56	**<0.001****
Learning characteristics	13.04 ±3.47	16.15±4.22	5.66	**<0.001****
Behavioral performance	18.96±5.45	23.88±6.48	5.80	**<0.001****
Creativity	18.26±3.44	20.21±3.70	4.62	**<0.001****
Concentration Ability	76.44±9.08	80.92±9.31	4.14	**<0.001****
Total score	139.9±29.95	157.5±25.98	5.47	**<0.001****

Table 5: Relation between educational performance domains and the total score of performance and parasitic infection among the studied children (n=320).

Concentration ability	Infected (n=112)		Non infected (n=208)		[a]X^2	P value
	No	%	No	%		
Learning motivation\attitude						
Inadequate (n=223)	90	40.4	133	59.6	9.29	**0.002***
Adequate (n=97)	22	22.7	75	77.3		
Learning characteristics						
Inadequate (n=253)	101	39.9	152	60.1	12.86	**<0.001****
Adequate (n=67)	11	16.4	56	83.6		
Behavioral performance						
Inadequate (n=173)	78	45.1	95	54.9	16.84	**<0.001****
Adequate (n=147)	34	23.1	113	76.9		
Creativity						
Inadequate (n=174)	78	44.8	96	55.2	16.19	**<0.001****
Adequate (n=146)	34	23.3	112	76.7		
Concentration Ability						
Inadequate (n=183)	77	42.1	106	57.9	9.41	**0.002***
Adequate (n=137)	35	25.5	102	74.5		
Total score						
Poor (n=53)	34	64.2	19	35.8		
Moderate (n=200)	67	33.5	133	66.5	30.16	**<0.001****
Good (n=67)	11	16.4	56	83.6		

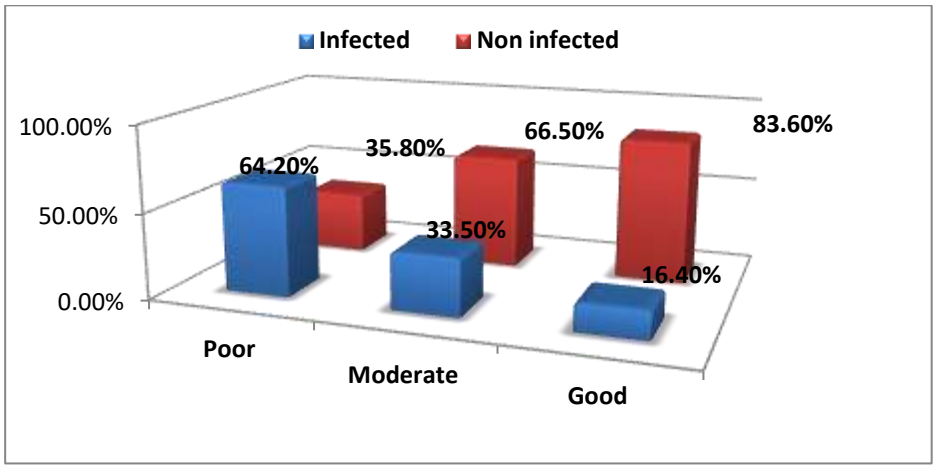

Figure (1): Relation between educational performance score and parasitic infection among the

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IV.DISCUSSION

In spite of remarkable development in medical science in recent years, the parasitic infection remains a serious health issue in developing countries. Intestinal parasitic infections occur in both rural and urban population, especially in school age children due to their habits of playing or handling infected soils, eating with soiled hands, unhygienic toilet practices, and ingestion of contaminated food, water or soils **(8)**.

Apart from causing morbidity and mortality, these infections can cause iron deficiency anemia, growth retardation in children and other physical and mental health conditions. Intestinal parasites produce a variety of symptoms in those who are affected, most of which manifest themselves in gastrointestinal complications and general weakness, gastrointestinal complications include diarrhea, nausea, dysentery, and abdominal pain and abdominal discomfort. These symptoms negatively impact with nutritional status, including decreased absorption of micronutrients, loss of appetite, weight loss and intestinal blood loss that can often result in anemia. It may also cause physical and mental disabilities, delayed growth in children, and low education performance of schoolchildren **(9).**

There was highly statistically significant difference between infected and non-infected children regarding all domains of educational performance and the total score of performance where poor performance was more associated with the presence of infection

These results may be due to the reason that the school aged children with parasitic infections became unable to attend school due to diarrhoea or severe abdominal pain, uncomfortable night sleeping, anaemia and associated nutritional deficiency which may have an effect on the child's concentration and achievement and consequently leading to the low academic performance**.**

These results matched with **El-Sayed et al. (10)** at Sharkia governorate who showed that when the prevalence of the infestation increases, the school achievement decreases, also **Mohammed et al. (11)** in Hehia center, reported that there was statistically significant relation between the prevalence of the infestation and the students' performances among the studied children.

A previous cross-sectional study among schoolchildren in Brazil by **Jardim-Botelho et al. (12**) suggested that poly-parasitised children experience worse cognitive outcomes than children with only one helminth infection. Another study was done in Ethiopia by **Amenu, (13)** about the effect of intestinal parasitic infection on academic performance of school children and found that presence of intestinal parasitic infection could affect school performance negatively. A study conducted by **Gabbad and Elawad, (14)** in Sudan and found out that there was a significant relationship between intestinal parasite infection and education progression among primary school children. Another Study in India by **Perignon et al. (15)** found that parasitic infection and nutritional deficiency are significant risk factors for lower cognitive performance and school achievement in Cambodian school-aged children. Another study was done by **Liu et al., (16)** about the effect of soil transmitted helminthes on cognitive ability and school performance among school children in Southwestern China and found that there was significant differences in children's cognitive ability and performance between infected children and uninfected children.

These findings were also in concordance with **Bassey and Loko, (17)** and **Gyang et al. (18)** in Nigeria who stated that helminthes associated infection may have adverse effects on the educational performance of the school children.

These results were also in agreement with the results of a previous study conducted by **Buntoro et al. (19)** who studied the impact of nutrition, helminth infection, and the lifestyle on the elementary school students' achievements, and found out a statistically significant difference between the parasites-infected group and non-infected group in the students' achievements.

In Angeles city, Philippines **Pabalan et al. (20)** did a study about the relation between Soil-transmitted helminth infection, loss of education and cognitive impairment in school-aged children and found that infected children were more affected than others.

V.CONCLUSION

Results of the current study revealed that There was highly statistical significance association

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between educational performance score and parasitic infection.

VI. Recommendation

The study recommended to increase awareness about parasitic infectious diseases through health education of the children and their mothers about methods of prevention, healthy habits and good personal hygiene and to perform routine medical examination and laboratory investigation of children. Regular screening and prober treatment should be provided in schools and primary health care units.

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