Original Article *Egyptian Journal of Health Care, 2016 EJHC Vol.7 No.3*

Effect of Health Habits' Modification Program on Health Status for School Children with Parasitic Infestation in Rural Areas

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Abstract

Parasitic infestation represents a major cause of morbidity and mortality in school children all over the world. Health habits make children especially vulnerable to parasitic infections. ***Aim:*** To evaluate effect of health habits' modification program on health status for school children with parasitic infestation in rural areas ***Study Design*****:** A quasi-experimental design was used to conduct this study. ***Setting:*** This study was conducted at Toukh Comprehensive Clinic affiliated to Health Insurance in Qalubia Governorate ***Subjects:*** A purposeful sample of 105 school children was included in this study. ***Tools:*** Three tools ***I.*** An interviewing questionnaire, for school children was divided into five parts; to assess demographic characteristics for school children and their modified risk factors, knowledge, attitude, and healt*h* habits ***II.*** Observational checklist to assess school children practices. ***III.*** Medical records of school children's health status. ***Results****: R*evealed that 59% of school children had poor total health habits pre program implementation, while it was modified to become 61% and 84.8% had good total health habits through post program implementation and follow up respectively compared to 41% in pre program implementation with a highly statistically significant difference (P< .0001). ***Conclusion:*** The study concluded that there was statistically significant efficacy of the modification program on improving the health habits for school children and their knowledge, attitude, and practices related to parasitic infestation. As well, the program had evident effect on restoring school children's health status and preventing parasitic complications in addition to enhancing scholastic achievement through program implementation phases (P< .0001). ***Recommendations:*** The study recommended that periodical health education about prevention of parasites is necessary to raise school children's awareness about health habits and improve personal and environmental hygienic measures at school time.

Key words: school children with parasitic infestation – Health habits related to parasitic infestation – school health nurse.

Introduction

Parasitic infestations are among the most common infections worldwide. About one-third of the world; more than two billion people, are infected with intestinal parasites. Approximately 300 million people are severely ill with these worms and of those, at least 50 % are school-age children **(Sadeghi et al., 2015&** Pandey **et al., 2015).**

The prevalence of parasitic infections in a particular region depends not only on bio-environmental situation, but also on social, economical and cultural conditions, in developing Countries that are mainly situated in tropical areas. Poverty, illiteracy, poor hygiene, lack of access to potable water, hot humid tropical climate, lack of access to health services, malnutrition, poor sanitation, and bad health habits are the factors associated with parasitic infestations, which increase vulnerability to infection especially in school children who are more susceptible to parasitic infestation **(Hazrati Tappeh et al., 2010).**

The transmission of intestinal parasites is affected directly or indirectly by objects contaminated with faeces. These include food, water, nails, and fingers, indicating the importance

of faecal-oral human-to-human transmission. Moreover, agriculture and food production (e.g., raw vegetables) can be one of the main sources of parasitic infections. Interestingly, soil-transmitted parasites are more prevalent in regions where warmth and moisture are abundant, it causing severe infection and serious clinical problems. Furthermore, parasites with direct life cycles, such as Entameba histolytica, Giardia lamblia, Hymenolepis nana and Enterobius vermicularis, are spread more easily and more commonly among school children **(Alsubaie et al., 2016).**

Parasitic infections have adverse effects on the health of school children in addition to the complications of the disease. These parasites consume nutrients from the children they infect, thus aggravating malnutrition and retarding physical development. They also destroy the tissues and organs in which they live. They cause abdominal pain, diarrhea, intestinal obstruction, anemia, ulcers and various other health problems. These ailments can impair learning and slow cognitive development, ultimately resulting in poor school performances of a child and absenteeism. It is not uncommon for heavy or long-term infection to result in death, if treatment is not given in time **(Ngoboka , 2015).**

Reducing the risk of transmission of targeted parasitic infections in the rural areas will be achieved through improving monitoring of parasitic diseases in the rural area, improving diagnosis and detection of parasitic diseases, increasing capacity of clinical providers to diagnose and manage patients with parasitic diseases, and increasing awareness of parasitic diseases through effective health communication and education about modification of health habits **(CDC, 2015).**

The World Health Organization (WHO) recommends periodic medicinal treatment (deworming) without previous individual diagnosis to all at-risk people living in endemic areas. Treatment should be given once a year when the prevalence of soil-transmitted helminth infections in the community is over 20%, and twice a year when the prevalence of soil-transmitted helminth infections in the community is over 50%. This intervention reduces morbidity by reducing the worm burden. In addition, health and hygiene education reduces transmission and reinfection by encouraging healthy behaviors and habits, and provision of adequate sanitation is also important but not always possible in resource-poor settings **(WHO, 2016)**.

The health habits' modifications program designed by the community nurse focused on informing the school children to prevent re-infection, by the following measures: hand washing after toileting and before eating, daily showering rather than tub bathing, keeping the fingernails short to minimize the chance of ova collecting under the nails, wearing shoes and avoid direct contact with soil, avoid using contaminated water, and avoid raw meat and vegetables' consumption. Also instruct parents to wash all clothes and bed linen in hot water and vacuuming **(Potts, & Mandleco, 2012; Nyantekyi et al., 2014).**

Significance of the study:

School age children are important target group in the community health because their physical and emotional health is vital to the future of society and they require guidance, direction and health habits modification. Children are vulnerable to many illness, injuries, emotional problems as a result of a complex and stressful environment, especially parasitic infestations **(Allender et al., 2010).**

In Egypt, the most common parasitic infestations present are Enterobius vermicularis, Hymenolepis nana and tape worm, 40.4% of the Egyptian school children were suffering from Enterobius vermicularis. Their effects on child development appear less serious (**El-Masry et al., 2010).** Through research conducted in El-Minia City in Preventive Medical Department in Administrative Health in West Medical Center, at 2010 and also 2012, the results revealed that 1800 cases were affected with parasitic infestation. Based on this result, the parasitic infection is the most common health problem in the Egyptian rural community **(Amein et al., 2014).**

The school health nurse has an essential role in supporting parents and providing them with important knowledge, and give health education to school children to modify their health habits and caregivers about how to deal with infected school children with parasitic infestations through families, and community **(Bogitsh et al., 2013).**

Aim of the study:

The aim of this study was to evaluate effect of health habits' modification program on health status for school children with parasitic infestation in rural areas through:

1. Assessing school children's health habits related to parasitic infestation.
2. Assessing school children's knowledge, attitude and practices toward parasitic infestation.
3. Designing and implementing the health habits' modification program for school children with parasitic infestation.
4. Evaluating the effect of the health habits' modification program on improving school children's knowledge, attitude, practices and their health habits related to parasitic infestation.

Research hypothesis:

The health habits' modification program will improve school children's knowledge, attitude and practices, related to parasitic infestation and also modify their health habits toward prevention of parasitic infestation.

Methodology:

Research design:

A quasi-experimental design was used to conduct this study aiming to identify the health habits of children with parasitic infestation also, their knowledge, attitude, and practices regarding prevention of parasites.

Research setting:

The study was conducted in the Toukh Comprehensive Clinic, which is considered one of school Health clinics affiliated to Health Insurance in Qalubia Governorate , Egypt, which offers health insurance services to a large sector of school students in Toukh Center.

Subjects:

A purposive sample of 105 school children was included in this study, which represents 10% of total children who had been diagnosed positive with parasitic infestation, in the year 2014 (1050 cases). All available cases were selected randomly with the following criteria: school children diagnosed with parasitic infestation, their age ranged from 6 to16 years, both genders, under treatment, and agreed to participate in the study.

Tools of data collection: Three tools were used after reviewing related literature, for collecting the necessary data.

First tool: An Interviewing Questionnaire was developed by the researchers for school children with parasitic infestation, based on the relevant recent literature. It included the following parts:

Part I. Demographic characteristics of children, such as; age, gender, mother's education, mother's occupation, father's education, father's occupation, crowding index, number of children in family, and daily pocket money.

Part II. The modified risk factors related to parasitic infestation. It included 6 closed ended questions about risk factors such as: housing sanitary conditions, recurrent parasitic infections, number of infected siblings, early consultation for treatment, compliance with therapy, and sibling referral for therapy.

Part III. Health habits related to parasitic infestation of school children. This part included 17 close-ended questions by using three categories of Likert scale as never, sometimes, and always. The main items included nutritional habits, drinking unsanitary water, hygienic habits in food handling, personal hygienic habits, bathing in dirty water, health habits in family, and health habits related to parasitic treatment.

Scoring System

Each statement has a score ranged from zero to two distributed as the following; never =0, sometimes= 1, always= 2, for 15 questions and for 2 questions, the scores were yes = 0 and No = 1. The total final score was 32 grads, 60% and above

were considered good health habits, and less than 60% were considered bad health habits .

Part IV. School children's knowledge, about parasitic infestation, this part included 6 open- ended questions regarding, meaning of parasitic infestation, types, causative agent, risk factors, mode of transmission, preventive measures, treatment, and follow up.

Scoring System for knowledge:

Each correct answer was given one point score, while zero score was given to each incorrect answer. The total score was 8 grades, for 8 items, which equals 100%. The school children's knowledge was considered satisfactory if the percent score was 60% or more and unsatisfactory if the score was less than 60% through program implementation.

Part V. This part was used to assess school children's attitudes toward prevention of parasitic infestation through program implementation. It included 7 close-ended questions regarding avoiding drinking contaminated water, avoiding bathing in dirty water, avoiding open defecation in water, avoiding unripe fruit consumption, avoiding meat consumption, wearing shoes, and avoiding direct contact with soil.

Scoring System for attitude:

Each positive attitude answer was given one point score and zero score was given to each negative attitude answer.

Second tool: Observation Checklist.

Modified from **WHO (2015),** it was used to assess school children's practices regarding health habits' modification for prevention of parasitic infestation as hand washing procedure, including 11 items.

Scoring system for practices:

Each practice item observed to be done correctly was scored "one", and done incorrectly or not done "zero". The total practice scores were calculated by summing all these grads and converting them into percentages as the following: The total school children's practice was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60%.

Third tool: Medical Records of School Children with Parasitic Infestation.

They were used to assess health status of children as complaints and parasitic complications, which included child complaint such as; headache, fatigue, pallor, loss of appetite, abdominal pain/colic, diarrhea, polyphagia, fever, and pruritus ani, anthropometric measurements as weight, height, body mass index (BMI), and laboratory investigations as; hemoglobin to assess anemia, urine analysis to assess hematuria, stool analysis to investigate positivity of parasitic infestation and its type , abdominal sonar to detect hepatomegaly, and also to evaluate scholastic achievement.

Scoring system:

The normal range of laboratory investigations according to traditional units of the sheet of ***Clinical Laboratory Tests–Reference Values (2015)***

-The normal hemoglobin level (11.2-16.5 g/dL).
-The equation to calculate BMI:
BMI = Weight (kg)/height^2 (m^2).

According to the recommendations of ***Centers for Disease Control and Prevention (CDC) (2016)***, BMI categorization for children and teens between age 2 and 20 is as follows:

- Underweight <5%.
- Normal weight 5% - 85%.
- Overweight >85%.

Tools Validity and Reliability:

Content and face validity were performed by three professors of the Community Health Nursing Department of Faculty of Nursing and two professors from the Pediatric Department, Faculty of Medicine. All experts were affiliated to Ain Shams University, Egypt; they reviewed the tools for content accuracy. The reliability test of translated version was established by using the Cronbach alpha and Pearson correlation, which showed good internal consistency construct validity (Cronbach alpha = 0.887).

Pilot study:

A pilot study was conducted on 10% of the study subjects11 school children to test and evaluate the clarity, and applicability of the study tools and time required for completion of each study tool. Also the pilot study sample was excluded from the main study sample.

Operational Design:

Field work:

After official permissions to carry out the study, the aim of the study was explained to the school children and their parents. Preparation of data collection tools was carried out over a period of one month beginning from end of July 2015 to end of August 2015, after being revised from experts to test their validity.

The application of the educational program, done by the researchers, lasted for 3 months from the beginning of September 2015 to end of November 2015 and the follow up was done after three months completed by the end of February 2016. The average time consumed to fill in the questionnaire tool was 30 minutes and 30 minutes, to fill observational checklist, then it took 20 minutes to check medical records. The previously mentioned setting were visited by the researchers two days/week (Tuesdays& Thursdays) from 9.00 a.m. to 12.00 moon during the period of medical examination for school children.

Educational development program phases:

This educational program was conducted on four consecutive phases, assessing, developing, implementing and evaluating.

Phase 1: Using the pre-program assessment tool, used in the previous interview questionnaire for data collection from the previously mentioned setting. This phase aimed at assessing school children health habits and their knowledge/attitude related to the parasitic infestation.

Phase 2: Developing an educational program about the parasitic infestation and its prevention for children with parasitic infestation based on their needs and recent related literature.

The general objective of the program was to improve school children's knowledge, attitude, and practices, modify their health habits related to parasitic infestation and enhance their health states as well as reduce their health complaint and prevent parasitic complications.

The content of the educational program was based on needs' assessment of school children with parasitic infestation covering the following; meaning of parasitic infestation, causative agent, modified risk factors, healthy and unhealthy habits, signs and symptoms, diagnostic measures and investigations, complications, treatment of parasites, and the care included prevention, follow up, management of diet and medications.

Phase 3: Implementation of the program:

Implementation of the educational program was carried out at the Toukh Comprehensive Clinic. At the beginning of the first session, an orientation to the program and its purpose was presented. Each session started with a summary about what had been given through the previous sessions and the objectives of the new topic, taking into consideration the use of simple language to suite the level of school children.

The theoretical part of the program was presented in two sessions, in the form of lectures/discussions followed by the practical part, which consisted of two subsequent reinforcement sessions in the form of demonstration and redemonstration by using a video and real situations, 2 days/week (Tuesdays & Thursdays), from 8.00 a.m. to 12.00 noon.).Time of each session ranged between 30 to 45 minutes, using effective media of conveying information as, laptop, posters, and power point presentation. An illustrated booklet was developed by the researchers for school children as a reference after program implementation. The study was carried out within seven months one month for preparing program contents and six months for implementing it, while lasted from end of July 2015 to end of February 2016.(Based on the program implementation).

School children with parasitic infestation were divided into 10 groups, and each group consisted of 10-11 approximately. The educational program was conducted at the suitable time for them according to their availability, during follow

up assessment. Sometimes, the session was held for five or more subjects. To insure that they were exposed to the same learning experience, they received the same educational program content and used the same teaching strategies. Direct reinforcement was in the form of a copy of the educational program booklet offered to them.

Phase 4: Evaluation phase:

The evaluation phase was done immediately after implementation of the program, while the follow up evaluation was done after six months from beginning of the program by using the same pre-program tools to compare changes in school children's knowledge, attitude, practices and their health habits' score, in order to identify differences, similarities and areas of improvement as well as clinical defects.

Administrative Design and Ethical Considerations:

Permission for conduction of the study was obtained by submission of official letters issued from the Faculty of Nursing, Ain Shams University to the Director of the Health Insurance Administration in Qalubia Governorate, and Manager of Toukh Comprehensive Clinic. An informed consent to participate in the current study was taken after the purpose of the study was clearly explained to each child and his/her parents. Confidentiality of obtained personal data, as well as the respect of participants' privacy were totally ensured. A summary of the program was explained to school children who voluntarily agreed to participate in the study and their parents were assured that all data will be used only for research purpose and used to improve their children's health. Also, they were informed that they can withdraw from the study at any time without giving any reason.

Statistical Design:

The calculated data were analyzed and tabulated and appropriate statistical tests as "Chi square" for number and percentage distribution, by using the Statistical Package for Social Science (SPSS), version 20 to determine if there are statistically significant relations. Chi-square (X^2) and P-value less than 0.05 was considered significant and less than 0.001 was considered as highly significant.

Results

Table (1): shows that the studied school children included 105 students (44.8% males &55.2% females) and more than one third of them (38.1%) aged between 6-<9 years. Less than one quarter of school children (23.8%) and less than one tenth (9.5%) their mothers and fathers respectively were illiterate. As well, 64.8% of mothers were house wives. Regarding crowding index less than half of them (44.8%) were crowded and as for pocket money for students 67.6% were having 4-5 pounds daily.

Table (2): Reveals that 63.8% of the studied school children had poor housing sanitary conditions, while the majority of them (81%) had recurrent parasitic infections and 52.4% of them had three or more infected siblings. Also, the table shows that, almost three fifths of school children (59%) were not compliant with therapy.

Table (3): Shows that 66.7%, 82.9%, 67.6% and 61.0% of the studied school children in the post program implementation phase and 96.2%, 94.3%, 88.6% and 81.9% in follow up phase had modified their health habits regarding good nutritional habits, never drinking unsanitary drinking water, good personal hygienic habits and good health habits in family respectively with a highly statistically significant difference ($P < .0001$). Also the table demonstrated that school children had good hygienic habits in food handling and not bathing in dirty water through post program implementation 84.8% and 69.5% respectively and 92.4% and 78.1% respectively in follow up with a statistically significant difference.

Figure (1): Illustrates that 59% of school children had bad total health habits pre program implementation which modified to became 61% and 84.8% had good total health habits through post program implementation and follow up respectively compared to less than half (41%) in pre program implementation, with a highly statistically significant difference ($P< .0001$).

Figure (2): Describes that as regards to the studied school children's knowledge, 67.6% had unsatisfactory knowledge before the program implementation, which improved to the majority of them (82.9% & 87.6%) had satisfactory knowledge post program implementation and

follow up respectively, With a highly statistically significant difference (P< .0001).

Figure (3): Illustrates that the studied school children's total practices improved through program implementation phases as more than half of them (58.1%) had inadequate practices before the program implementation, which improved to the most of them (92.3% & 98.1%) had adequate practices post program implementation and follow up respectively, with a highly statistically significance difference (P< .0001).

Figure (4): Shows that there was a highly statistically significant difference (P< .0001) regarding the studied school children attitude toward health habits' modification related to parasitic infestation through program implementation phases.

Table (4): Demonstrates that related to positive parasitic infections among the studied school children there were statistically significant differences through program implementation phases (P < 0.05), compared to not statistically significant related to mixed infection (P > 0.05).

Table (5): Demonstrated that most of studied school children (92.4 %, 97.1 %, 91.4 % and 91.4%) complain from headache, fatigue, loss of appetite and polyphagia respectively, in pre program implementation, which decreased compared to the majority of them (81.0%, 87.6%, 79.1% & 83.8% respectively), in post test and at follow up program they decreased to be 35.2%, 22.9%, 32.4%,and 42.9% respectively, with a highly statistically significant difference (P < .0001). As regards scholastic achievement, there was a statistically significant difference through program implementation and follow up (P < 0.05).

Table (1): Distribution of school children with parasitic infestation according to their demographic characteristics (n = 105)

Characteristics	No	%
Gender		
Male	47	44.8
Female	58	55.2
Age:		
6 - < 9	40	38.1
9 - <12	36	34.3
12- <16	29	27.6
Mother's Education:		
Illiterate	25	23.8
Primary education	14	13.3
Secondary education	48	45.7
University	18	17.2
Mother's Occupation:		
Working	37	35.2
Housewives	68	64.8
Father's Education:		
Illiterate	10	9.5
Primary education	19	18.1
Secondary education	41	39.1
University	35	33.3
Father's Occupation:		
Farmer	16	15.2
Fisherman	13	12.4
Trader	30	28.6
Employee	27	25.7
Technical worker	19	18.1
Crowding index:		
Not crowded <1	31	29.5
Crowded 1- <1.5	47	44.8
Over crowded 1.5+	27	25.7
Number of children in family:		
1-2 child	22	21.0
3 - 4 child	61	58.0
5-7 child	22	21.0
Daily pocket money in bounds:		
2- <4 pound	9	8.6
4- < 5 pound	71	67.6
5+ pound	25	23.8

Table (2): Distribution of the studied school children according to the modified risk factors related to parasitic infestation (n =105).

Items	No	%
Housing sanitary conditions		
Good	38	36.2
Poor	67	63.8
Recurrent parasitic infections		
Yes	85	81.0
No	20	19.0
Number of infected siblings:		
0	11	10.5
1-2	49	46.7
≥3	55	52.4
Early consultation for treatment:		
Yes	39	37.1
No	66	62.9
Compliance with therapy		
Yes	43	41.0
No	62	59.0
Sibling referral for therapy		
Yes	44	41.9
No	61	58.1

Table (3): Distribution of the studied school children with parasitic infestation according to their health habits' modification throughout the program phases (n =105).

Health Habits	Pre program		Post program		Follow up		Chi-Square	P- value
	No	%	No	%	No	%		
Nutritional habits								
Good	65	61.9	70	66.7	101	96.2		
Bad	40	38.1	35	33.3	4	3.8	2402.88 df .2	0.0001 HS
Drinking unsanitary water								
Yes	29	27.6	18	17.1	6	5.7	18.01 df .2	0.0001 HS
No	76	72.4	87	82.9	99	94.3		
Hygienic habits in food handling								
Good	81	77.1	89	84.8	97	92.4	9.44 df .2	0.0089 S
Bad	24	22.9	16	15.2	8	7.6		
Personal hygienic habits							23.9 df .2	<.0001 HS
Good	62	59.0	71	67.6	93	88.6		
Bad	43	41.0	34	32.4	12	11.4		
Bathing in dirty water							8.92 df .2	0.0116 S
Yes	43	41.0	32	30.5	23	21.9		
No	62	59.0	73	69.5	82	78.1		
Health habits in family							41.77 df .2	<.0001 HS
Good	64	61.0	64	61.0	86	81.9		
Bad	41	39.0	41	39.0	19	18.1		
Healthy habits related to parasitic treatment							119.03 df .2	<.0001 HS
Good	22	21.0	35	33.3	96	91.4		
Bad	83	79.0	70	66.7	9	8.6		

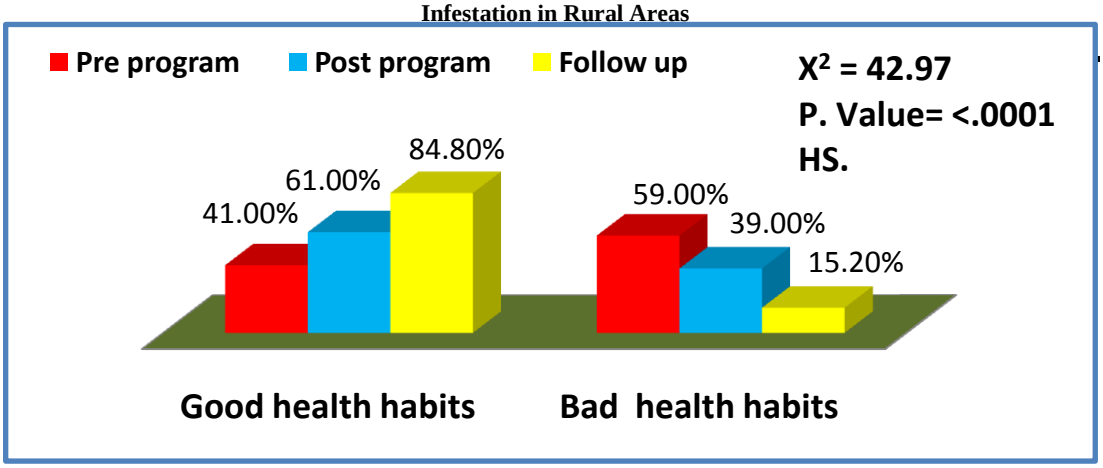

Figure (1): Distribution of the studied school children with parasitic infestation according to their total health habits' modification through program implementation phases (n=105).

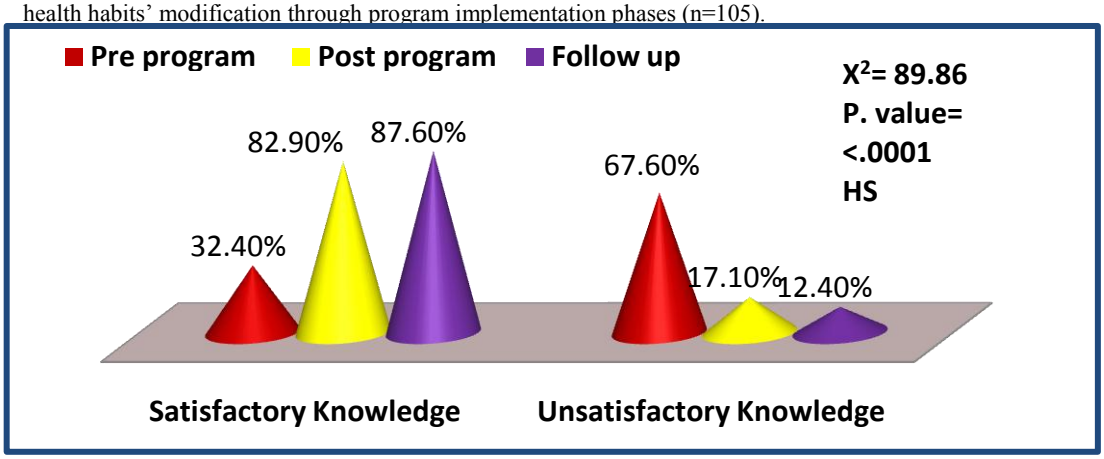

Figure (2): Distribution of the studied school children with parasitic infestation according to their total knowledge through program implementation phases (n =105).

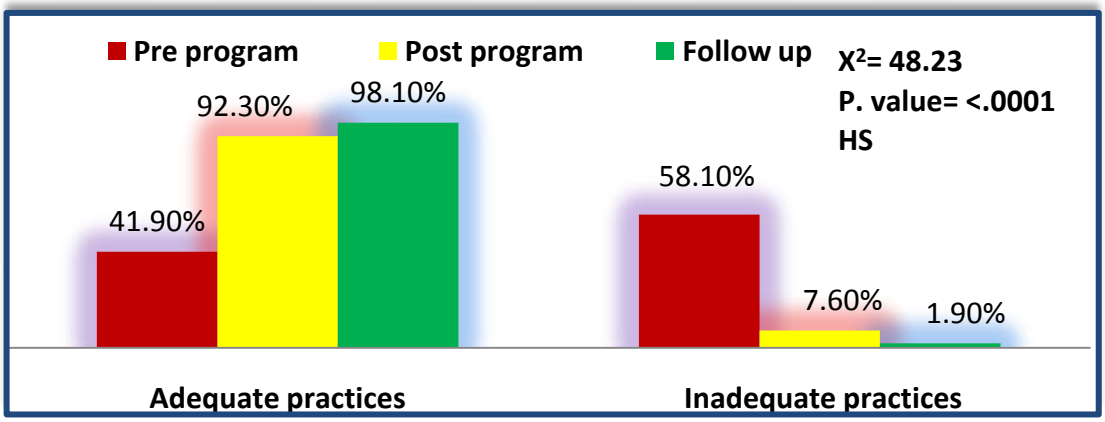

Figure (3): Distribution of the studied school children with parasitic infestation according to their total practices through program implementation phases (n =105).

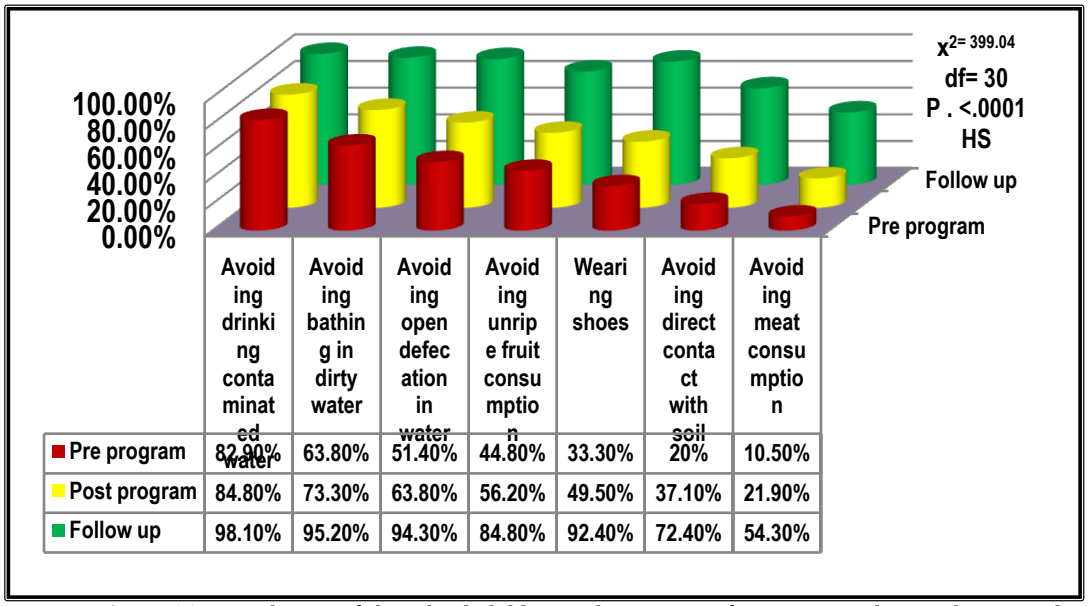

Figure (4): Distribution of the school children with parasitic infestation according to their attitude toward health habits' modification through program implementation phases (n =105).

Table (4): Distribution of positive parasitic infections among the studied school children through program implementation phases (n = 105).

Parasitic Infection	Pre program		Post program		Follow up		Chi-Square	P- value
	No	%	No	%	No	%		
Entamoeba histolytica	26	24.8	23	21.9	11	10.5	7.78	0.0204 S
Enterobius vermicularis (worm/ova)	19	18.1	15	14.3	8	7.6	5.11	0.0777 S
Giardia lamblia (cyst)	16	15.2	14	13.3	5	4.8	6.62	0.0365 S
Hymenolepis (H) nana (ova)	15	14.3	13	12.3	3	2.9	8.87	0.0119 S
Ascaris lumbricoides (ova)	7	6.7	6	5.7	2	1.9	2.94	0.2299 S
S. haematobium (ova)	6	5.7	5	4.8	2	1.9	2.09	0.3517 S
Ancylostoma duodenale (ova)	5	4.8	4	3.8	1	1.0	2.69	0.2605 S
Trichuris trichiura (ova)	2	1.9	2	1.9	0	0.0	2.03	0.3624 S
Mixed infection	13	12.4	9	8.6	4	3.8	5.11	0.0777 NS

Not mutually exclusive

Table (5): Distribution of the studied school children according to their clinical manifestation and parasitic complications through program implementation phases (n= 105).

Clinical Manifestation and Parasitic Complications	Pre program		Post program		Follow up		Chi-Square	P-value
	No	%	No	%	No	%		
Complaint							1363.93 df= 45	0.0001 HS
Headache	97	92.4	85	81.0	37	35.2		
Fatigue	102	97.1	92	87.6	24	22.9		
Pallor	105	100.0	103	98.1	86	81.9		
Loss of appetite	96	91.4	83	79.1	34	32.4		
Abdominal pain/colic	105	100.0	91	86.7	32	30.5		
Diarrhea	78	74.3	64	61.0	29	27.6		
Polyphagia	96	91.4	88	83.8	45	42.9		
Fever	30	28.6	21	20.0	2	1.9		
Pruritus ani	19	18.1	15	14.3	8	7.6		
Body mass index							19.83 df= 6	0.003 HS
Low weight	87	82.9	78	74.3	65	61.9		
Normal weight	14	13.3	23	21.9	34	32.4		
Over weight	4	3.8	4	3.8	6	5.7		
Hematuria	8	7.6	7	6.7	0	0.0	7.98 df= 1	0.0185 S
Anemia	102	97.1	100	95.2	87	82.9	16.68 df= 1	0.0002 HS
Hepatomegaly	16	15.2	16	15.2	14	13.3	0.2 df= 1	0.9048 NS
Scholastic achievement:							10.01 df= 5	0.2643 S
Excellent (≥85.0%)	9	8.6	11	10.5	16	15.2		
Very good (≥75.0%)	15	14.3	19	18.1	22	21.0		
Good(≥65.0%)	24	22.9	29	27.6	32	30.5		
Pass (≥50.0%)	36	34.3	28	26.7	21	20.0		
Fail (<50.0%)	21	20.0	18	17.1	14	13.3		

Discussion:

Concerning the school children with parasitic infestation demographic characteristics, the current study revealed that less than half of the sample were males, this finding disagreed with *Amein et al.,(2014*), who found that more than one half of studied sample were males. This research result found that around two thirds aged between 6- <9 years and 9- <12 this result agreed with that of *Abo-Elnasser (2010),* who reported that, in study in Cairo, the age of children in the study sample was 6-12 years. The current study mentioned that less than one quarter of the children's mothers and a minority of their fathers were illiterates *(Table 1).*

These results were incongruent with *El-Masry et al., (2010),* who studied the prevalence risk factors and impact of intestinal parasitic infections among rural school children in Sohag Governorate and showed that low level of parents' education, low level of parents' occupation and low social class were significant risk factors for intestinal infestations.

The present study indicated that, less than two thirds of mothers were housewives and slightly less than one fifth of fathers were technical workers *(Table 1).* This was in contrast with *Amein et al., (2014),* who assessing the knowledge and practices of caregivers about intestinal parasitic infestations at El- Minia City, mentioned that about three quarters (73.0%) of fathers are workers, and 73.0% of mothers were housewives.

According to the modified risk factors related to parasitic infestation, the present study result revealed that less than two thirds of the studied school children had poor housing sanitary conditions, *(Table 2)* which had a negative impact on the recurrence of infection and so leading to that the majority of them had recurrent parasitic infections as revealed in this study. In addition, more than half of the studied school children had three or more infected siblings because they live in the same environmental condition. Moreover, almost three fifths were not compliant with therapy.

From the perspective of researchers, this result was due to the lack of awareness among parents and mothers about causes of parasitic infestation, modes of transmission, treatment and methods of prevention, and also due to the low socioeconomic standard, also due to bad health habits especially hygienic habits.

The previous results were in accordance with these of Awad (2009), who studied the effect of health promotion program for prevention and control of intestinal parasitic disease among primary school children in Dakahlia Governorate and found that, the houses' sanitary conditions of children who were infested by parasites were significantly lower than those for houses of students who were not infested. Significant differences were present in example of water supply, drainage of latrines, flooring, raising domestic animals and birds, and presence of insects. Similarly, *Elsdon (2010),* who studied the effect of housing condition in South Africa, reported that parasitic infestations remain highly endemic in populations of low socioeconomic status where poor hygiene, overcrowding and close contact between individuals, provide many opportunities for the direct spread of parasites.

Considering health habits in this study sample of school children, there were poor health habits among school children regarding nutritional habits, drinking unsanitary water, and children's hygienic habits in food handling with a highly significant modification through program implementation phases *(Table 3).*

This result was in the same line with *Ulukanligil, (2014)* who mentioned in his study about the risk factors of parasitic infection status for school children in Sanliurfa Province, Turkey, that a common belief in that study villages was that, primarily the transmission of parasitic worms was through contaminated food and water.

Concerning the children's personal hygienic habits in the current study, there was a highly significant improvement in the good personal hygienic habits through program implementation phases. These findings were in agreement with that of *Rousham (2010),* who conducted his study on 2657 students who were questioned about their knowledge and perception of parasitic infestation, their hygienic habits and lifestyle, showed highly statistically significant differences between students' awareness related to parasitic infestation and their life style.

Regarding the bathing in dirty water there was a significant improvement and modification in this behavior, this goes in the same line with Borg and Ryan *(*2010) who found that children' personal hygienic habits and behavior related to using dirty water in

washing and bathing were the main responsible for infection especially in rural areas. This poor health habits such as bathing in dirty water were related to ancient behaviors and traditions of rural residents to bath in canals and Nile and this could be attributed to lack of awareness about parasitic infestation and mode of transmission.

As regards health habits in family as a Concern to the healthy habits related to parasitic treatment, there was a highly significant improvement in the healthy habits, these were as a positive result for the researchers' health habits' modification program and its impact on the behaviors of the studied school children and their families. This result is in agreement with *El- Masry et al., (2010),* who showed that (low level of parents education, occupation and social class were significant risk factors for parasitic intestinal infestations).

Considering the total health habits, this study finding revealed that, three fifths and like majority of studied school children had good health habits through post program implementation and follow up respectively compared to slightly more than two fifths in pre program implementation, with a highly statistically significant difference (P< .0001) *(Figure 1).* This confirms the importance of activating the health habits modification program and spreading the awareness about parasitic infestation and its mode of transmission to prevent infection among school children.

This study clarified that the studied school children's total practices improved through program implementation phases as more than half of them had inadequate practices before the program implementation which improved to most of them had adequate practices post program implementation and follow up respectively, with a highly statistically significant difference (P< .0001) *(Figure 3).* This result was congruent with that of *Mohamed et al., (2014),* who stated that there was highly statistically significant relation between the students' awareness related to parasitic infestation and their practices, (χ^2= 46. 361, p <.05), because the students had knowledge about parasitic infestation but surprisingly not applied in practices.

According to clinical manifestation and parasitic complications of the studied school children, the study result demonstrated that, most of studied school children complain from headache, fatigue, loss of appetite and polyphagia in pre program implementation, which decreased to most of them in post test and follow up program, with a highly statistically significant difference (P < .0001). As regards scholastic achievement, there was a statistically significant difference through program implementation and follow up (P < 0.05) *(Table 5).*

This current study finding was in agreement with that of Bundy and Guyatt (2009), who surveyed 390 students from nine schools for parasitic infection at baseline and conducted a final evaluation of 363 students. From baseline to final evaluation, improvement was seen in students' knowledge of correct answers about parasitic causes and prevention (65%, P<0·01) they found highly significant relation among students' knowledge related to parasitic infestation and attitude and habits.

The difference in this study finding was a result for the good effect of the health habits' modification program, which had an impact on improving school children's knowledge, attitude and practices related to parasitic infestation and also modifying their health habits toward prevention of parasitic infestation. As well, the program had evident effect on restoring school children's health status and preventing parasitic complications in addition to enhancing scholastic achievement through program implementation phases.

Conclusion:

Based on the results of the current study, and the research hypothesis the following can be concluded: The most common modified risk factors related to parasitic infestation were poor housing sanitary conditions, with recurrent parasitic infections and non compliance with therapy. The health habits' modification program had an impact on improving school children's knowledge, attitude and practices related to parasitic infestation and also modifying their health habits toward prevention of parasitic infestation.

Recommendations:

Based on the findings of the study, the following recommendations were suggested:

- Periodical health habits' modification program about prevention of parasitic infection are to be carried out to raise school children's awareness about good health habits and improve personal and environmental hygiene measures at school time.
- Regular screening and follow up to be done for school children who are at high risk for parasitic infestation.
- More researches are proposed to assess mother's knowledge and practices about parasitic infestation and its management through preventive measures at home.
- Further studies on a larger number of school children with parasitic infestation in both rural and urban areas of Egypt are to be conducted for generalization the study results.

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