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Original Research Article.

Effect of Socio-economic Status, Quality of Hygiene, Nutritional Status on Helminthic Infection Among School Going Children

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ABSTRACT

Background: Helminthic infections have been major public health burdens. Some isolated helminths include Ascaris lumbricoides, the whipworm Trichuris trichuira, the hookworm Ancylostoma duodenale, Necator americanus and Strongyloides stercoralis. The present study was conducted to study the effect of socio-economic status, quality of hygiene, nutritional status on helminthic infection among school going children aged between 5 to 13 years.

Materials and Methods: A cross-sectional study on 352 children at Govt. Primary school, Rajapur was conducted from January 2007 to June 2008. Children were interviewed using pre-tested proformas to identify the risk factors and prevalence of Helminthic infestation. Stool examination was done by using the formal ether concentration technique in microbiology laboratory at M. R. Medical college. Statistical analysis was done by using the percentage, chi-square, SPSS statistical software.

Results: Out of 352 children 162 tested positive for various intestinal helminth's in the age group 5 to 13 years. The overall prevalence of Helminthic infestation was 46.02% the predominant parasites were Ascaris Lumbricoides 48.77% followed by Hymenolepsis Nana 27.16% Ancylostoma duodenale 11.73%, Trichuris Trichiura 9.88% & Enterobius vermicularis 2.46%. 4.94% cases were of mixed infection. The present study found that Socio-economic class, nutritional status and pallor was significantly associated with prevalence of Helminthic infestation. Habit of digit sucking or nail bitting, Storage of food and water were not significantly associated with Helminthic infestation (p>0.05). The association between Hand wash before eating food, Status of Nails, practice of open air defecation and hand wash with soap after defecation, footwear use, eating mud or pica, drawing water for drinking, source of water, eating of raw vegetables or fruits, eating of food sold by vendor and prevalence of Helminthic infestation were found to be significant (P<0.05). The association between prevalence of Helminthic Infestation and KAP of children was also found to be Significant.

Conclusions: In the present study the prevalence of helminthic infestation in school children are on the higher side which requires due attention and consideration despite helminthic control programme in school for all children.

Keywords: Prevalence, Helminthic Infection, *Ascaris Lumbricoides*.

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INTRODUCTION

Soil transmitted helminthic infections are among the most common and neglected infections worldwide.[1] They are among the most prevalent afflictions of humans living in areas of poverty in the developing world. Two billion individuals were reported[2] to be parasitized with helminthic worms, majority of them living in resource-poor settings, 80% of these live in sub-Saharan Africa.[2,3] Children in developing countries are the most severally affected particularly those between the age of 5 to14 years in whom intestinal worm account for up to 12% of total disease burden the largest single contributor. As many as 1,50,000 children die each year from intestinal obstruction and other abdominal complication caused by large adult worm.[4] It has become imperative to known

more about factors which can be targeted for public health intervention to bring down the prevalence of Helminthic infestation & reduce the risk of worm infection because school aged children are the group at highest risk of intestinal parasitic infestation & its adverse effect are diverse & alarming as these parasites consumes nutrients from children they infect thus retarding their physical development. They destroy tissue and organs cause abdominal pain, diarrhoea, Intestinal obstruction, anemia, Ulcer & other health problems. All of these consequence of Helminthic infestation has detrimental effects on the growth, development, school attendance, cognitive performance & survival of the children.[5] Hence this study was formulated with the intention to know about the effect of socio economic status, quality of hygiene, nutritional status on helminthic infection among school going children aged between 5 to 13 years.

MATERIALS AND METHODS

The present cross-sectional study was carried out to determine the prevalence of Helminthic infestation in children of Govt, Primary School of Rajapur which is under the field practice area of Department of community Medicine, M. R. Medical College, Gulbarga. Rajapur from 1st January 2007 to 30th June 2008. Prior the commencement of the study ethical approval of Ethical Committee of the institute and administrative permission and support obtained from the Head mistress Govt. Primary School. Rajapur, Gulbarga to carry out the study. The study subjects comprised of 380, i.e. all children enrolled in the Govt. primary school of Rajapur from 1st to class 7th standard, during the course of study. All children attending Govt. primary school of Rajapur were included in the study. Children who are enrolled, taken transfer from the school or remained absent during the course of the study were excluded from the study. A pilot study on 40 subjects was conducted. With minor changes in the initial questionnaire a final proforma was designed and the study continued. A pilot study on 40 subjects was conducted. With minor changes in the initial questionnaire a final proforma was designed and the study continued. The proforma deals with general data and family particulars of children, general physical examination of the children, personal hygiene habits of the children and KAP of children about Helminthic infection. The nature, purpose and objectives of the study were explained to the children and teachers prior to the study. All the subject was personally contacted and interviewed in their school. A general physical examination was done, the information was collected and recorded in the pre-tested proforma. For collection of stools samples, the subjects were explained the purpose & objectives of the study, and also how to collect the stool samples. The children were supplied with labelled sealed plastic containers with applicator and instructed to bring fresh stool samples the next day. All the specimen was checked for their label, quantity and immediately shifted to Microbiology laboratory at M. R. Medical college for examination. Helminthic infections were diagnosed by detecting egg and larvae in the given stool sample by using formalin-ether concentration. The eggs were identified according to the Key proposed by the WHO.[6] Modified kuppuswami's classification was used per capital income was updated by applying correction factor for socioeconomic status. Gomez Classification[7] was used for nutritional status. Knowledge, Attitude, Practice regarding helminthic infestation among the subjects was assessed by asking appropriate questions, scoring was done. Out of a total score of 12, the score for awareness of Helminthic infestation were graded as follows: Good ≥ 9, Fair:5-8, Poor: ≤ 4. Weight was taken in standing position without footwear measuring to an accuracy of 0.5 kg. Height was measured with a calibrated measuring tape marked in centimetres. The measurement was taken in erect standing position bore foot with feet together heels against the wall and looking straight ahead. Stool examination was done by using formalin-ether concentration technique. One gram of faeces was suspended in 10ml of 10% formaldehyde solution and mixed with a glass rod the suspension was passed through a funnel covered with a gauze pad into a centrifuge tube, then 3ml of ether were added and the suspension was mixed for 1 minute. The tube was centrifuge for 1 minute at 4000RPM. After discarding the supernatant, the rudiment was examined by sampling a drop with a Pasteur pipette and depositing it on a glass slide. The eggs were identified according to the Key proposed by the WHO.[7] The data was analyzed and tabulated by applying chi-square test.

Table 1: Distribution of children based on socio-economic status (Modified Kuppuswami's classification)

Socio Economic Class	Number	Percent
I	0	0.00
II	33	9.38
III	75	21.31
IV	177	50.28
V	67	19.03
Total	352	100.00

Table 2: Distribution of children based on Nutritional status (GOMEZ classification)

Weight for Age	Number	Percent
Normal nutritional status (90-110%)	145	41.19
1st degree-mild malnutrition (75-89%)	188	53.41
2nd degree – moderate mal nutrition – (60-74%)	19	5.40
3rd degree-Severe malnutrition (< 60%)	0	0.00
Total	**352**	**100.00**

Table 3: Prevalence of Helminthic infestation

Helminthic infestation	Children	
	Number	Percent
Present	162	46.02
Absent	190	53.98
Total	352	100.00

Table 4: Prevalence of various intestinal Helminthic infestation in children

Helminth	Children	
	Number	Percent
Ascaris Lumbricoids	79	48.77
Hymenolepis Nana	44	27.16
Ancylostoma Duodenale	19	11.73
Trichuris trichiura	16	9.88
Enterobius Vermicularis	4	2.46
Total	**162**	**100.00**

Table 5: Mixed intestinal Helminthic infestation in children

Helminth	Children	
	Number	Percent
Ascaris Lumbricoids + Ancylostoma Duodenale	4	50
Ascaris Lumbricoids + Trichuris trichiura	3	37.50
Ascaris Lumbricoids + Hymenolepsis Nana	1	12.50
Total	**8**	**100.00**

Table 6: Association between socio economic status & Helminthic infestation

Socio economic class	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Class I	0	0.00	0	0.00	0	0.00
Class II	3	9.09	30	90.90	33	9.38
Class III	16	21.33	59	78.66	75	21.31
Class IV	94	53.10	83	46.89	177	50.28
Class V	49	73.13	18	26.86	67	19.03
Total	162	100.00	190	100.00	352	100.00

$\chi^2 = 62.21$; $p < 0.001$- Highly significant

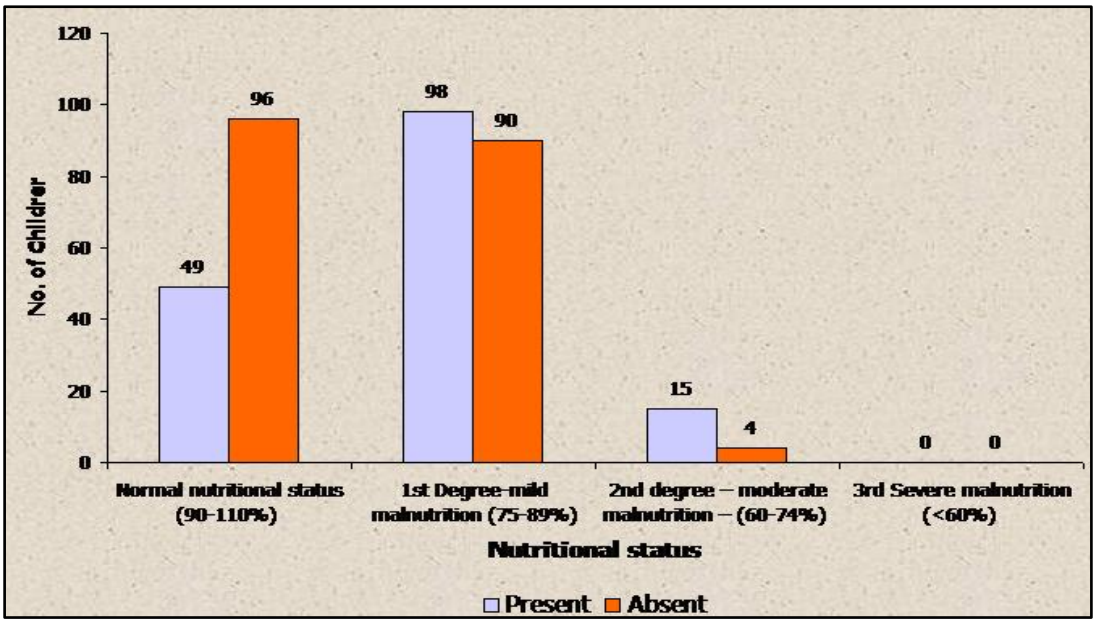

Figure 1: Association between Nutritional status and Helminthic infestation (GOMEZ classification)

RESULTS

Out of 352 children studied 51.14% (180) were males and 48.86% (172) were females. Maximum number of children 46.31% (163) were in the age group of 5 – 7 years followed by 40.34% (142) in the age group of 8 – 10 years and 13.35% (47) in the age group of 11 – 13 years.

Table 1 reveals that children belonging to SES Class II, Class III, Class IV and Class V were 9.38% (33), 21.31% (75), 50.28% (177) and 19.03% (67) respectively.

Table 2 shows that according to Gomez classification, 41.19% (145) had normal nutritional status, maximum number of children 53.41% (188) had 1st degree – mild malnutrition and only 5.40% (19) children had 2nd degree – moderate malnutrition.

Table 3 shows that the overall prevalence of Helminthic infestation among study population was 46.02% (162 cases).

Table 4 shows that the maximum number of children were infested with Ascaris Lumbriocoids 48.77% (79) followed by Hymenolepis Nana 27.16% (44), Ancylostoma Duodenale 11.73% (19), Trichuris trichiura 9.88% (16) and Enterobius Vermicularis 2.46% (4).

Table 5 shows that out of 162 Children positive for helminthic infestation 4.94% (8) were found to have mixed infestation. Ascaris lumbricoids and Ancylostoma duodenale was most predominant mixed infestation 50% (4).

Table 6 shows that with respect to socio – economic class maximum number of children were infested in class IV 53.10% (94) followed by class V 73.13% (49), class III 21.33% (16) and class II 9.09% (3) respectively. Children lower in socio-economic status had highest prevalence of Helminthic infestation as evident from the above figures. The association between Socio economic status and prevalence of helminthic infestation was found to be statistically highly significant (P<0.001). It was observed that the prevalence of Helminthic infestation was maximum 78.95% (15) among children who have 2nd degree moderate malnutrition followed by 52.13% (98) in children who have 1st degree mild malnutrition. In children whose nutritional status was normal the prevalence of Helminthic infestation was 33.79% (49). The association between nutritional status and prevalence of Helminthic infestation was found to be statistically highly significant (p < 0.001).

It could be observed from the table 7 that 87.50% (308) children had pallor and the prevalence of Helminthic infestation among them was 48.05% (148) as compared to 31.82% (14) among children who did not had pallor. A statistically significant association was observed between Pallor and helminthic infestation (P<0.05).

Table 8 shows that Out of 37.79% (133) children who washed their hands properly with soap and water the prevalence of helminthic infestation was 22.56% (30) as compared to absence of Helminthic infestation in 74.44% (103). Prevalence of Helminthic infestation was maximum 88.89% (64) in children who do not wash their hands before eating food. Among those who wash their hand only with water the Helminthic infestation was 46.26% (68). The association between Hand wash before eating food and prevalence of Helminthic infestation was found to be statistically highly significant (p < 0.001).

Table No.9 shows that prevalence of Helminthic infestation was high 56.63% (141) among children with untrimmed nails compared to 20.39% (21) among children with trimmed nails. Status of nails were found to be significantly associated with prevalence of Helminthic infestation (P<0.001).

Table 10 shows that the prevalence of helminthic infestation was maximum 51.82% (157) among children who practice open air defecation as compared to those who use latrine 10.20% (5). The association between place of defecation and Helminthic infestation was found to be statistically highly significant (p < 0.001).

Table 11 shows that among the study population 59.94% (211) children who washed their hand after defecation with plain water the prevalence of helminthic infestation was 59.72% (126) compared to 39.13% (9) and 22.88% (27) who washed their hand using water with mud or ash and with soap and water respectively. The association between washing of hands after defecation and Helminthic infestation was found to be statistically highly significant (p < 0.001).

Table 7: Association between pallor and Helminthic infestation

Pallor	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Present	148	48.05	160	51.95	308	87.50
Absent	14	31.82	30	68.18	44	12.50
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 4.08$; $p < 0.05$ Significant

Table 8: Association between Handwash before eating food and Helminthic infestation

Hand wash before eating food	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
No wash	64	88.89	8	11.11	72	20.45
With water	68	46.26	79	53.74	147	41.76
With soap and water	30	22.56	103	74.44	133	37.79
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 82.743$; $p < 0.001$ Highly significant

Table 9: Association between status of nails and Helminthic infestation

Status of nails	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Untrimmed	141	56.63	108	43.37	249	70.74
Trimmed	21	20.39	82	79.61	103	29.26
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 38.58$; $p < 0.001$ Highly significant

Table 10: Association between Place of defecation and Helminthic infestation

Place of defecation	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Open Air	157	51.82	146	48.18	303	86.08
Latrine	5	10.20	44	89.79	49	13.92
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 29.40$; $p < 0.001$ Highly significant

Table 11: Association between Washing hands after defecation and Helminthic infestation

Washing hands after defection	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
With plain water	126	59.72	85	40.28	211	59.94
With water and mud or ash	9	39.13	14	60.87	23	6.53
With soap and water	27	22.88	91	77.12	118	33.54
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 41.803$; $p < 0.001$ Highly significant

Table 12: Association between using footwear and Helminthic infestation

Using foot wear	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Yes	92	34.46	175	65.54	267	75.85
No	70	82.35	15	17.65	85	24.15
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 59.54$; $p < 0.001$ Highly significant

Table 13: Association between Eating of mud/pica and Helminthic infestation

Eating of mud / Pica	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Yes	9	100.00	0	0.00	9	2.56
No	153	44.61	190	55.39	343	97.44
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 10.84$; $p < 0.001$ Highly significant

Table 14: Association between Habit of digit sucking or Nail biting and Helminthic Infestation

Habit of digit sucking or Nail biting	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Yes	18	56.25	14	43.75	32	9.09
No	144	45.00	176	55.00	320	90.91
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 1.48$; $p > 0.05$ Insignificant

As observed from the table 12; 75.85% (267) children had the habit of wearing foot wear while defecation or going out of house and 24.15% (85) did not. Prevalence of Helminthic infestation was 34.46% (92) and 82.35% (70) among children who wear footwear and who don't wear respectively. The association between using footwear and Helminthic infestation was found to be statistically highly significant ($p < 0.001$).

Table 13 shows that within the study population 2.56% (9) children had the habit of eating mud/pica. Prevalence of Helminthic infestation among them was 100%, compared to 44.61% (153) among those who didn't had habit of eating mud/pica. The association between eating mud/pica and Helminthic infestation was found to be statistically highly significant ($p < 0.001$).

Table 14 shows that the 9.09% (32) children had a habit of digit sucking or nail biting and prevalence of Helminthic infestation among them was 56.25% (18), compared to prevalence of Helminthic infestation 45.00% (144) among children who were not having the habit of digit sucking or nail biting. It was found that the association between habit of digit sucking or nail biting and prevalence of Helminthic infestation was statistically insignificant ($P>0.05$).

It is seen from the table 15 that among the study population majority 86.08% (303) were drinking tap water followed by bore water 10.51% (37) and well water 3.41% (12). Helminthic infestation was maximum (66.67%) in children drinking well water, followed by 49.50% in tap water users and 10.81% in children who used borewell water for drinking purpose. The association between Source of drinking water and Helminthic infestation was found to be statistically highly significant ($p < 0.001$).

It was observed from the table 16 that prevalence of helminthic infestation in children who used to drink water kept uncovered was 54.55% compared to 45.45% in children who drank water stored covered. The association between storage of drinking water and helminthic infestation was statistically insignificant ($P>0.05$).

Table No. 17 shows that 63.35% (223) children use to draw drinking water by dipping the glass into the stored water compared to 36.65% (129) using jug with handle. Prevalence of Helminthic infestation among children's who use to draw water by dipping glass was 57.85% (129) and among those who use jug with handle it was 25.58% (33). It was found that method of drawing water was found to be significantly associated with prevalence of Helminthic infestation ($P<0.001$).

Table 18 show that 42.05% (148) children wash raw vegetable and fruits with water before eating and 57.95% (204) did not. It was found that the prevalence of Helminthic infestation among those who did not had a habit of washing fruits and vegetables before eating was 74.02% (151) compared to 7.43% (11) among those who use to wash. The association between eating of unwashed raw vegetables or fruits and Helminthic infestation was found to be statistically highly significant ($p < 0.001$).

Table 19 shows that 87.78% (309) children eat food which was stored covered and 12.22% (43) children from food stored uncovered. Prevalence of Helminthic infestation was 44.43% (137) among former group compared to 58.14% (25) among later. The association between storage of food and helminthic infestation was insignificant ($P>0.05$).

Table 20 shows that out of 352 children 60.51% (213) had a habit of eating food sold by vendors and 39.49% (139) did not. Prevalence of Helminthic infestation among those who used to eat vendor sold food was 52.11% (111) compared to 36.69% (51) among children who did not had habit of eating food sold by vendor. It was observed that eating of food sold by vendors to be significantly associated with Helminthic infestation ($P<0.05$).

It was observed from the table 21 that, KAP in the study population was poor in 61.93% (218) children and the prevalence of Helminthic infestation among them was 66.06% (144), 23.01% (81) children KAP score was fair the Prevalence of Helminthic infestation was 18.52% (15) and 15.06% (53)children whose KAP score was good the prevalence of Helminthic infestation was 5.66% (3). The association between prevalence of Helminthic infestation and KAP of children were found to be statistically highly significant ($p<0.001$).

Table 15: Association between Source of drinking water and Helminthic infestation

Source of water	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Well	8	66.67	4	33.33	12	3.41
Tap water	150	49.50	153	50.49	303	86.08
Bore Well	4	10.81	33	89.19	37	10.51
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 22.005$; $p < 0.001$ Highly significant

Table 16: Association between Storage of drinking water and Helminthic infestation

Storage of drinking water	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Covered	150	45.45	180	54.55	330	93.75
Uncovered	12	54.55	10	45.45	22	6.25
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 0.69$; $p >0.05$ Insignificant

Table 17: Association between drawing water for drinking and Helminthic infestation

Drawing of water	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Dipping the glass	129	57.85	94	42.15	223	63.35
Jug with handle	33	25.58	96	74.42	129	36.65
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 34.25$; $p < 0.001$ Highly significant

Table 18: Association between eating of raw vegetables or fruits and Helminthic infestation

Eating of raw vegetables or fruits		Helminthic Infestation				Total	
		Present		Absent			
		Number	Percent	Number	Percent	Number	Percent
Wash with water	Yes	11	7.43	137	92.57	148	42.05
	No	151	74.02	53	25.98	204	57.95
Total		162	46.02	190	53.98	352	100.00

$\chi^2 = 153.09$; $p < 0.001$ Highly significant

Table 19: Association between Storage of food and Helminthic infestation

Storage of food in Utensils	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Covered	137	44.34	172	55.66	309	87.78
Uncovered	25	58.14	18	41.86	43	12.22
Total	162	46-02	190	53.98	352	100.00

$\chi^2 = 2.89$; $p > 0.05$ Insignificant

Table 20: Association between Eating of food sold by vendors and Helminthic infestation

Eating of food sold by vendors	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Yes	111	52.11	102	47.89	213	60.51
No	51	36.69	88	63.31	139	39.49
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 8.05$; $p < 0.05$ Significant

Table 21: KAP Vs Prevalence of Helminthic infestation

KAP Score	Helminthic Infestation				Total	
	Present		Absent			
	Number	Percent	Number	Percent	Number	Percent
Good (9-12)	3	5.66	50	94.34	53	15.06
Fair (5-8)	15	18.52	66	81.48	81	23.01
Poor (0-4)	144	66.06	74	33.94	218	61.93
Total	162	46.02	190	53.98	352	100.00

$\chi^2 = 94.639$; $p < 0.001$ Highly significant

DISCUSSION

The present cross-sectional study consisting of 352 subjects was undertaken with the objective to know the prevalence of helminthic infestation and various risk factors associated with prevalence of helminthic infestation. In the present study 50.28% (177) children belonged to SES class IV, 21.31% (75) belonged to Class III and 19.03% (67) belonged to class V only 9.38% (33) belonged to class II and none were in class I. Khalid Mehmood et al.[8] observed that worm infestation was significantly more in poor children 34.9% than in middle income 21.8% (P<0.05) or high income (2/6 cases 33.3%). A study by Ahmed Khan et al.[9] found that prevalence of Helminthic infestation is very high 34.33% among subjects with Income less than Rs 3000/ Pm, as compared to subjects with Income more than Rs. 3000/ pm 8.22% (P<0.001).

Hagel I et al.[10] in their study reported that children in extreme poverty 62% had a significantly higher prevalence (P<0.001) than those in critical poverty 38%. Yet in another study by De Silva N. R et al.[11] It was revealed that prevalence of Helminthic infestation tends to increase as the Socio-economic class declined (P=0.026)
The association between Nutritional status and prevalence of Helminthic infestation was found to be highly significant (P<0.001)
Shadma Mumtaz et al.[12] in their study observed that almost one third 29.4% of the children were mildly malnourished while 20.4% showed moderate malnutrition (P=0.058) But in another study by A. Zulkifli et al.[13] found that there was no significant relationship detected between the intensity of geo-helminthic infection and the nutritional status of the children (P>0.05).
In the present study association between pallor and Helminthic infestation was found to be statistically significant (P<0.05). During the course of the literature review the Investigator did not come across any studies which addressed thus association.
In our study the association between Hand wash before eating food and Helminthic infestation was found to be highly significant (P<0.001). But in a study by K. Habbari et al.[14] found that Hand washing before meals had no statistically significant effect on the prevalence of Intestinal Helminthic infection (P>0.05).
In the present study status of Nails was significantly associated with the prevalence of Helminthic infestation (P<0.001). The results from our study are compatible with that obtained in SA Wani et al.[15] study and it was highly significant (P<0.001). Similarly, Dongre AR et al.[16] found that the prevalence of intestinal parasitic infection was significantly high among children having dirty untrimmed nails (P<0.001). However, on the contrary Girum Tadesse[5] study showed that Dirty materials in the right hand finger nails and Helminthic infestation was insignificant (P>0.05).
In the present study the prevalence of Helminthic infestation was maximum 51.82% among children who practiced open air defecation and Helminthic infestation was found to be highly significant (P<0.001). SA Wani et al.[15] in their study observed that children who defecate in open field, open latrine & Modern Latrine Helminthic infestation was 100%, 77.58% and 36.36% respectively (P=0.002).
The present study showed that the association between various methods of washing hands after defecation and helminthic infestation was found to be highly significant. (P<0.001). Human contaminative activities such as open field defecation and use of unhygienic water supply for bathing and drinking favor transmission of intestinal helminths. This was different from the study done in Lumame town.[17] The odds of having intestinal helminths among children who eat unwashed or undercooked vegetables in the stool of the children were about six times higher (p = 0.000) than those who eat washed or cooked vegetables. This was similar with the study done in Lumame town.[17]
Similarly, a study done by Shadma Mumtaz et al.[12] observed that prevalence of Helminthic infestation was 56% among children who don't wash hands and 4 % who washed their hands without soap. And 40% among children who wash hands with soap (P<0.001) significant association was seen between the habit of washing hands after defecation and prevalence of Helminthic Infestation.
Yet another study by Dongre AR et al.[16] found that prevalence of Intestinal parasites in children who wash their hands with mud, ash or water was 37.02% compared to 6.7% children who use soap and water (P<0.05).
In the present study association between footwear use and Helminthic Infestation was found to be significant (P<0.001).
A study by Girum Tadesse[5] revealed that regular wearing of shoes has a significant contribution to the low prevalence rate of Hookworm infestation (P<0.05). However, in contrast Dongree AR et al.[16] in their study observed that prevalence of Intestinal parasites in children who wear chapples was marginally high 18.2% compared to 16.7% who do not use chapples (P>0.05).
In the present study it was observed that association between eating mud or pica and Helminthic Infestation was found to be highly significant (P<0.001). Similar results were obtained from Shadma Mumtaz et al.[12] study it was found that eating mud or pica was present in 36% children (P<0.001).
In the present study it was found that digit sucking or nail biting and prevalence of Helminthic Infestation was insignificant (P>0.05). Similarly, in a study done by AA Escobedo et al.[18] found that sucking finger or nail biting and prevalence of intestinal parasites was insignificant (P>0.05).
The present study showed that the Association between source of water and Helminthic Infestation was highly significant (P<0.001).
SA wani et al.[15] observed that Helminthic Infestation was very high 93.75% in children who use well water and 73.29% who use Tap water and 28.57% who use River or stream water. Significant association between source of water and Helminthic Infestation was found (P<0.005). A study done by Girum Tadesee[5] found that Helminthic Infestation was 50% in children who use well water compared to 27.4% who use pipe water. Similarly, a study by K. Habbari et al.[14] showed that about two thirds of the families used private wells inside their homes, while the other third used public wells and fountains. No statistically significant difference was found between the two water sources (P>0.05).
The present study found that the association between storage of drinking water and Helminthic Infestation was insignificant (P>0.05). Similarly, a study by Girum Tadesse[5] showed that Helminthic Infestation was 30.5% in children who kept their water stored uncovered and 26.4% who kept their water covered no significant association was found between the storage of water and Helminthic Infestation (P>0.05).
In the present study the association between drawing water for drinking and Helminthic Infestation was highly significant (P<0.001). During the course of literature review the Investigator did not come across any studies which addressed this association.
The present study showed that the association between eating of raw vegetables or fruits and Helminthic Infestation was found to be Highly significant (P<0.001). But in a similar study by AA Escobedo et al.[18] they found that prevalence of Intestinal parasites was 92.1% among children who wash fruits before eating and 89.5% among those children who eats fruits without washing no significant association between eating fruits after washing and eating without washing was found (P>0.05).
It was observed in the present study that the association between storage of food and Helminthic Infestation was in significant (P>0.05). During the course of literature review the Investigator did not come across any studies which addressed this association.
The present study revealed that the association between eating of food sold by vendor and Helminthic Infestation was significant (P<0.05).

In a similar study done by given Tadesse[5] revealed that children who eat food items sold on the street had a higher prevalence of Ascaris Lumbriocoids and Trichuris trichiura infections than those who didn't eat (P=0.05). Teshale T et al.[19] (2018) conducted a study and showed the prevalence of intestinal helminths was 12.7%. The highest prevalence of intestinal helminth infections was observed in the age group of 11–14 years old and the most prevalent helminths species were *Schistosoma mansoni*. Mothers' level of education, place of defecation, hand wash before meals, hand wash after defecation and eating unwashed vegetables were associated with higher risk of having intestinal helminths detected in stool. In the study area the risk of detecting intestinal helminths in their stool were more associated the improper personal hygiene of the children.

The present study showed that the association between prevalence of Helminthic Infestation and KAP of children was found to be Highly Significant (P<0.001).

CONCLUSION

In the present study the prevalence of helminthic infestation in school children are on the higher side which requires due attention and consideration despite helminthic control programme in school for all children. There is also a pressing need to increase the awareness regarding factors which promote transmission of Helminthic infestation.

RECOMMENDATIONS

- The school should provide clean water for drinking and hand-washing, the availability of appropriate toilet facilities and the safe and hygienic removal of human and other waste from school ground.
- Soap should be kept for children to wash their hands before eating food and after defecation.
- Teachers should regularly monitor cleanliness and hygiene practice of children by observing their habits, hygiene practices and physical examination and advice appropriate measures for improvement.
- Health education to encourage children to adopt behaviours to prevent their own infections, and others', infection.
- Apart from this improvement in the standard of living, literacy rate, socioeconomic status, better health services and strengthening of school health services.

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