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ORIGINAL ARTICLE

Evaluation of Knowledge on Intestinal Parasites and Digestive Wellness Practices Among Healthcare Students in Chennai, South India

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Abstract

Background: Intestinal parasite infection (IPI) is a public health issue in developing countries associated with poverty, illiteracy, hot, humid tropical weather, polluted drinking water, and poor sanitation. Common symptoms include intestinal bleeding, nutritional deficiencies, and tissue damage. Lack of knowledge might contribute to these illnesses. Therefore, this study aimed to explore the attitudes and knowledge of medical and paramedical students regarding IPIs in Chennai. **Methods:** This observational study was conducted among the Medical and paramedical Students from ACS Medical College and Hospital in Chennai. An online questionnaire was administered using Google Forms. The questionnaires included details about the students' information, digestive health, common IPIs, and deworming. The collected data were then analysed. **Results:** Of the 250 participants, 52.8% were female, 69.6% were 18–24 years old, 54.8% were MBBS, and 45.2% were paramedical students. Medical students most commonly practiced hourly handwashing (73.7%), whereas paramedical students more frequently washed hands only after washroom use (26.5%), indicating comparatively better hand hygiene practices among medical students. 82% reported that inadequate sanitation was a reason for IPI spread. 54.4% had no IPI history, 14.4% were unclear, and 31.2% had IPI. **Conclusion:** Our study reveals significant gaps in knowledge, attitudes, and practices concerning gut health and intestinal parasite diseases between medical and paramedical students. Focused curricular improvement, health education, and regular deworming activities are essential for enhancing awareness, promoting preventative behaviours, and improving overall improvement in gut health.

Keywords: Gastrointestinal parasites, Attitude, Knowledge, Deworming, Practices

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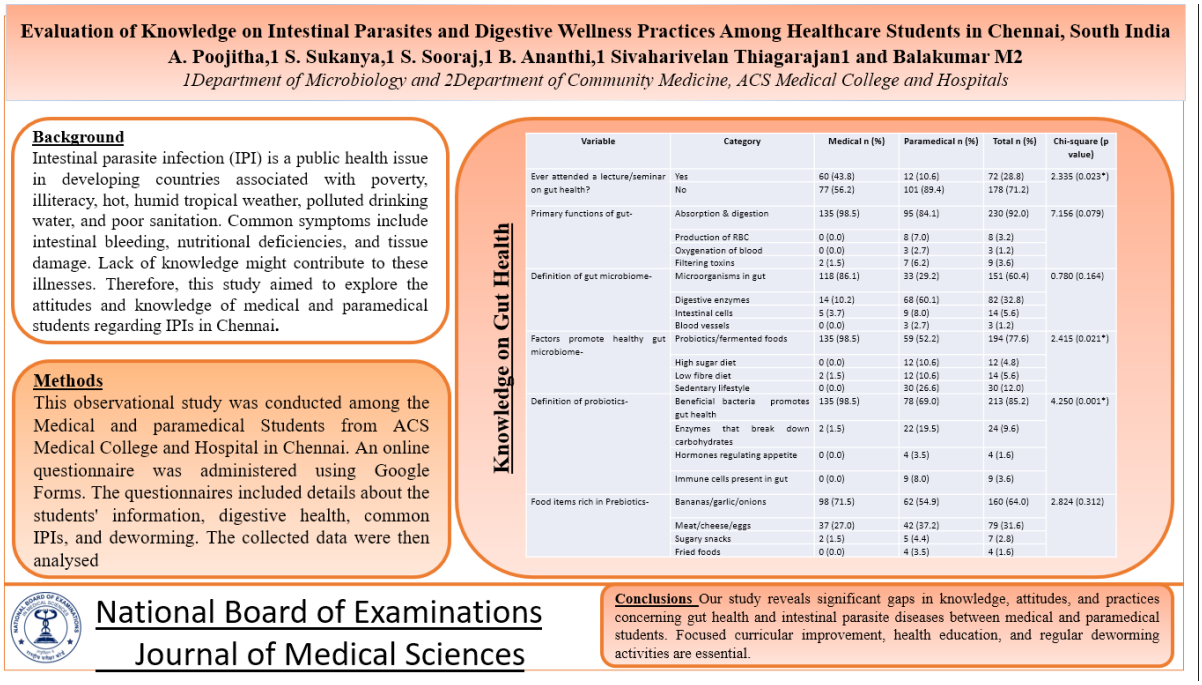
Graphical Abstract



Introduction

Three primary groups of parasites can cause illnesses in humans: helminths, ectoparasites, and protozoa. Ascaris, Entamoeba, Toxoplasma, Cyclospora, Giardia, and Cryptosporidium are among the intestinal parasite infections (IPIs) contributing to the significant disease burden globally [1]. According to the WHO's 2020 Roadmap on Neglected Tropical Diseases (NTDs), soil-transmitted helminth infections (STHI), Ascaris lumbricoides, and Trichuris trichura are classified as one of the 17 NTDs and a significant public health concern [2].

Approximately 3.5 billion people are affected by IPIs, which sicken 450 million individuals, particularly children and women in underdeveloped countries, suffering from the disease. This illness has been linked to 200,000 deaths annually [3]. The high prevalence in developing nations is most likely caused by poor personal hygiene and sanitation. In addition, poverty, illiteracy, hot, humid tropical weather, and polluted drinking water supplies contribute to the incidence of these illnesses [4]. Common symptoms include intestinal bleeding, nutrient malabsorption, nutritional deficiencies, and tissue damage, which can lead to growth retardation and adversely impact the academic performance of students [5].

Removing IPIs is extremely difficult in India due to the wide variety of parasite combinations in different regions. Hookworm infestations are more common in South India than those of T. trichura and A. lumbricoides [6].

The WHO recommends integrated approaches to control IPIs including improved water, sanitation, and hygiene (WASH), behaviour modification, snail control, environmental management, and preventive chemotherapy, which consists of the periodic administration of anthelmintic medications (praziquantel for

schistosomiasis and albendazole or mebendazole) [7].

The Indian government launched a National Deworming Day (NDD) on 10 February and a Mop-up Day on 15 February in 2015 to deworm all pre-school and school children aged 1 to 19 through schools and ICDS facilities. At least once a year, on NDD, children aged 2–19 [8]. Additionally, health education among kids might serve as a preventive measure. A study in India found that younger people's lack of worm knowledge contributes to worm infection [9].

Healthcare students serve as future health educators, making it essential for them to adapt practices that enhance gut health. However, there is a lack of studies assessing knowledge and the adoption of preventive practices regarding this health issue in developing nations, where the curriculum of schools offers limited exposure to gut health. So, this study aimed to assess the parasitic infection knowledge and attitudes among preclinical medical and paramedical students at a Chennai medical school.

The objectives of the study

To analyse the knowledge on Intestinal parasites among medical and paramedical students.

To assess the awareness and practice regarding digestive health and deworming.

Methods

This institute-based cross-sectional study was conducted among preclinical medical and paramedical students at ACS Medical College and Hospital, Chennai, Tamil Nadu, India. The study population included Phase I MBBS students and first-year Allied Health Science students. Phase II, Phase III students and resident doctors were excluded.

A total of 250 students participated in the study. Participants were selected using convenience sampling, as the study targeted students who were readily available and willing to participate during the study period within the institution. This approach was adopted due to feasibility and accessibility of participants. However, convenience sampling may limit the generalizability of the findings to other populations.

Questionnaire Development and Validation

The questionnaire was developed after an extensive review of relevant literature on intestinal parasitic infections, gut health, and deworming practices. The instrument consisted of three sections:

1. Sociodemographic characteristics
2. Knowledge regarding intestinal parasites and gut health
3. Attitudes and practices related to hygiene and deworming

To ensure content validity, the questionnaire was reviewed by subject experts from the Departments of Microbiology and Community Medicine. Necessary modifications were made based on expert suggestions.

Pilot Testing and Reliability

Prior to the main study, the questionnaire was pilot tested among 20 students who were not included in the final analysis to assess clarity, relevance, and feasibility of the questions. Based on feedback from the pilot study, minor revisions were made to improve clarity and comprehension.

The internal consistency of the questionnaire was assessed using Cronbach's alpha, which demonstrated acceptable reliability (>0.70), indicating that the instrument was suitable for assessing knowledge, attitude, and practice variables.

Data Collection

The questionnaire was distributed electronically using Google Forms through institutional email and WhatsApp groups. Participation was voluntary and responses were collected anonymously to maintain confidentiality. Only fully completed responses were included in the final analysis.

Statistical Analysis

Data were exported to Microsoft Excel and analyzed using statistical software. Categorical variables were summarized using frequencies and percentages.

The Chi-square test of independence was used to assess associations between medical students and paramedical students, which constituted the two comparison groups in the study.

The following assumptions of the Chi-square test were considered:

- Independence of observations
- Categorical nature of variables
- Adequate expected cell frequencies

Where small expected cell counts occurred, findings were interpreted cautiously.

A two-tailed p-value <0.05 was considered statistically significant.

Results

In our study, out of the 250 participants, 69.6% were aged 20 years or younger, whereas 30.4% were aged 21 to 25 years. The study comprised 47.2% men and 52.8% women. Of the participants, 45.2% were AHS students, while 54.8% were MBBS students. The responses from each of the subjects regarding their knowledge, perception, and practice of IPIs are displayed in Tables 1, 2, 3 and 4.

Table 1. Knowledge on Gut Health

Variable	**Category**	**Medical n (%)**	**Paramedical n (%)**	**Total n (%)**	**Chi-square (p value)**
Ever attended a lecture/seminar on gut health?	Yes	60 (43.8)	12 (10.6)	72 (28.8)	2.335 (0.023*)
	No	77 (56.2)	101 (89.4)	178 (71.2)	
Primary functions of gut-	Absorption & digestion	135 (98.5)	95 (84.1)	230 (92.0)	7.156 (0.079)
	Production of RBC	0 (0.0)	8 (7.0)	8 (3.2)	
	Oxygenation of blood	0 (0.0)	3 (2.7)	3 (1.2)	
	Filtering toxins	2 (1.5)	7 (6.2)	9 (3.6)	
Definition of	Microorganisms in	118	33 (29.2)	151	0.780

gut microbiome-	gut	(86.1)		(60.4)	(0.164)
	Digestive enzymes	14 (10.2)	68 (60.1)	82 (32.8)	
	Intestinal cells	5 (3.7)	9 (8.0)	14 (5.6)	
	Blood vessels	0 (0.0)	3 (2.7)	3 (1.2)	
Factors promote healthy gut microbiome-	Probiotics/fermented foods	135 (98.5)	59 (52.2)	194 (77.6)	2.415 (0.021*)
	High sugar diet	0 (0.0)	12 (10.6)	12 (4.8)	
	Low fibre diet	2 (1.5)	12 (10.6)	14 (5.6)	
	Sedentary lifestyle	0 (0.0)	30 (26.6)	30 (12.0)	
Definition of probiotics-	Beneficial bacteria promotes gut health	135 (98.5)	78 (69.0)	213 (85.2)	4.250 (0.001*)
	Enzymes that break down carbohydrates	2 (1.5)	22 (19.5)	24 (9.6)	
	Hormones regulating appetite	0 (0.0)	4 (3.5)	4 (1.6)	
	Immune cells present in gut	0 (0.0)	9 (8.0)	9 (3.6)	
Food items rich in Prebiotics-	Bananas/garlic/onions	98 (71.5)	62 (54.9)	160 (64.0)	2.824 (0.312)
	Meat/cheese/eggs	37 (27.0)	42 (37.2)	79 (31.6)	
	Sugary snacks	2 (1.5)	5 (4.4)	7 (2.8)	
	Fried foods	0 (0.0)	4 (3.5)	4 (1.6)	

The table presents the knowledge levels of medical and paramedical students regarding intestinal health. A total of 72 participants (28.8%) had attended a lecture or seminar on gut health, whereas 178 participants (71.2%) had not and p value was 0.023. Two hundred thirty participants (92.0%) indicated that absorption and digestion are the primary functions of the gut. 151 individuals (60.4%) indicated that the gut microbiome consists of bacteria present in the gut. 194 individuals, representing 77.6%, reported that probiotics or fermented foods contributed to the maintenance of their gut flora health with p value 0.01. 213 individuals (85.2%) indicated that probiotics are beneficial bacteria that contribute to gut health. A total of 160 participants, representing 64.0%, reported consuming foods rich in prebiotics, such as bananas, garlic, and onions.

Table 2. Knowledge on Intestinal Parasitic Infections (All Responses)

Variable	Category	Medical n (%)	Paramedical n (%)	Total n (%)	Chi-square (p value)
Ascaris lumbricoides is a	Protozoa	31 (22.6%)	43 (38.1%)	74 (29.6%)	1.613 (.203)
	Nematode	89 (65.0%)	64 (56.6%)	153 (61.2%)	
	Cestode	8 (5.8%)	6 (5.3%)	14 (5.6%)	
	Trematode	9 (6.6%)	0 (0.0%)	9 (3.6%)	
Common symptoms of worm infestation	Abdominal pain/anaemia/weight loss	123 (89.8)	75 (66.4)	198 (79.2)	6.315 (0.215)
	Headache/fever	11 (8.0)	19 (16.8)	30 (12.0)	
	Joint pain/fatigue	3 (2.2)	10 (8.8)	13 (5.2)	
	Skin rash	0 (0.0)	9 (8.0)	9 (3.6)	
Factors contribute to the spread of parasitic infections	Poor sanitation and hygiene	114 (83.2%)	91 (80.5%)	205 (82.0%)	1.714 (.295)
	Consumption of spicy food	16 (11.7%)	12 (10.6%)	28 (11.2%)	
	Overuse of antibiotics	7 (5.1%)	2 (1.8%)	9 (3.6%)	
	Air pollution	0	8	8	

		(0.0%)	(7.1%)	(3.2%)	
Diagnostic test for gut health	Stool analysis	137 (100.0)	85 (75.2)	222 (88.8)	16.630 (0.001*)
	Blood pressure	0 (0.0)	15 (13.3)	15 (6.0)	
	Lung function test	0 (0.0)	6 (5.3)	6 (2.4)	
	ECG	0 (0.0)	7 (6.2)	7 (2.8)	
Most common Causative agent of amoebiasis in India	Entamoeba histolytica	119 (86.9)	79 (69.9)	198 (79.2)	9.431 (0.076)
	Giardia lamblia	4 (2.9)	15 (13.3)	19 (7.6)	
	Ascaris lumbricoides	14 (10.2)	17 (15.0)	31 (12.4)	
	Trichuris trichiura	0 (0.0)	2 (1.8)	2 (0.8)	
Infections with Ascaris lumbricoides are associated with the following complications?	Liver cirrhosis	22 (16.1%)	16 (14.2%)	38 (15.2%)	3.378 (.290)
	Intestinal obstruction and poor absorption	115 (83.9%)	63 (55.7%)	178 (71.2%)	
	Joint pain	0 (0.0%)	21 (18.6%)	21 (8.4%)	
	Pneumonia	0 (0.0%)	13 (11.5%)	13 (5.2%)	
How is it transmitted?	Ingestion of contaminated food or water	132 (96.4%)	67 (59.3%)	199 (79.6%)	12.083 (.283)
	Blood transfusion	0 (0.0%)	33 (29.2%)	33 (13.2%)	
	Sexual contact	5 (3.6%)	4 (3.5%)	9 (3.6%)	
	Respiratory droplets	0 (0.0%)	9 (8.0%)	9 (3.6%)	
Meaning of deworming	Removal by medication	135 (98.5)	63 (55.8)	198 (79.2)	0.295 (0.439)
	Surgical removal	2 (1.5)	30 (26.5)	32 (12.8)	
	Lab sterilization	0 (0.0)	5 (4.4)	5 (2.0)	
	None of the above	0 (0.0)	15 (13.3)	15 (6.0)	
medication used for deworming-	Albendazole	103 (75.2%)	40 (35.4%)	143 (57.2%)	1.023 (0.751)
	Metronidazole	24	28	52	

		(17.5%)	(24.8%)	(20.8%)	
	Amoxicillin	0 (0.0%)	44 (38.9%)	44 (17.6%)	
	Ciprofloxacin	10 (7.3%)	1 (.9%)	11 (4.4%)	
deworming medications safe for administration during pregnancy-	Yes, but only in the second and third trimesters	61 (44.5%)	42 (37.2%)	103 (41.2%)	3.913 (.430)
	No, deworming is contraindicated in pregnancy	44 (32.1%)	32 (28.3%)	76 (30.4%)	
	Yes, at any stage of pregnancy	20 (14.6%)	15 (13.3%)	35 (14.0%)	
	Only after childbirth	12 (8.8%)	24 (21.2%)	36 (14.4%)	
Hookworm treatment	Penicillin	0 (0.0%)	50 (44.3%)	50 (20.0%)	2.493 (0.844)
	Mebendazole/Albendazole	89 (65.0%)	44 (38.9%)	133 (53.2%)	
	Metronidazole	38 (27.7%)	5 (4.4%)	43 (17.2%)	
	Ciprofloxacin	10 (7.3%)	14 (12.4%)	24 (9.6%)	
Untreated worm infestation in children can results-	Malnutrition and stunted growth	135 (98.5%)	52 (46.0%)	187 (74.8%)	2.641 (0.001)*
	Improved digestion	2 (1.5%)	29 (25.7%)	31 (12.4%)	
	Increased intelligence	0 (0.0%)	21 (18.6%)	21 (8.4%)	
	Bone fractures	0 (0.0%)	11 (9.7%)	11 (4.4%)	

The table presents the knowledge levels of medical and paramedical students regarding intestinal parasitic diseases. One hundred fifty-three individuals (61.2%) of the participants identified Ascaris lumbricoides as a nematode. A total of 198 individuals (79.2%) reported common symptoms, including stomach ache, anemia, and weight loss. Two hundred five respondents (82.0%) attributed the issue to inadequate sanitation and hygiene. Two hundred twenty-two individuals (88.8%) indicated that stool analysis constitutes a diagnostic test. Entamoeba histolytica was identified as the causative agent of amoebiasis by 198 respondents (79.2%) with p value (0.001). Additionally, 178 respondents (71.2%) reported that intestinal blockage and poor absorption were issues. A total of 199 individuals, representing 79.6%, reported that their illness was a result of consuming contaminated food or water. Of the participants, 198 (79.2%) selected deworming as a method for eliminating worms using medication. 143 individuals (57.2%) identified albendazole as a medication effective in eliminating worms. Untreated infestation resulted in malnutrition and stunted growth in 187 cases (74.8%) with p value 0.001.

Table 3. Attitudes and Perceptions on Intestinal Parasitic Infections

Variable	Category	Medical n (%)	Paramedical n (%)	Total n (%)	Chi-square/p-value
Following Practices leading to the transmission of intestinal parasites-	Open defecation	17 (12.4)	19 (16.8)	36 (14.4)	0.932 (0.354)
	Walking barefooted	4 (2.9)	8 (7.1)	12 (4.8)	
	Drinking untreated water	9 (6.6)	17 (15.0)	26 (10.4)	
	Eating soil	0 (0.0)	15 (13.3)	15 (6.0)	
	None of the above	0 (0.0)	3 (2.7)	3 (1.2)	
	All of the above	107 (78.1)	51 (45.1)	158 (63.2)	
Gut health & immunity	The gut plays a crucial role in immune function by housing a large portion of immune cells	96 (70.1%)	80 (70.8%)	176 (70.4%)	17.730 (.721)
	The gut does not interact with the immune system	18 (13.1%)	8 (7.1%)	26 (10.4%)	
	Gut health only affects digestive	23	14	37	

	enzymes, not immunity	(16.8%)	(12.4%)	(14.8%)	
	Poor gut health boosts immune response	0 (0.0%)	11 (9.7%)	11 (4.4%)	
Most effective preventive measure	Using hand sanitizers	13 (9.5)	33 (29.2)	46 (18.4)	0.369 (0.694)
	Boiling drinking water	21 (15.3)	26 (23.0)	47 (18.8)	
	Wearing masks	1 (0.7)	17 (15.0)	18 (7.2)	
	Using insect repellents	0 (0.0)	22 (19.5)	22 (8.8)	
	Boiling water + sanitizers	102 (74.5)	15 (13.3)	117 (46.8)	
Role of public health education	Minor role	14 (10.2)	40 (35.4)	54 (21.6)	1.963 (0.053)
	Crucial role	118 (86.1)	53 (46.9)	171 (68.4)	
	No role	3 (2.2)	12 (10.6)	15 (6.0)	
	Only rural areas	2 (1.5)	8 (7.1)	10 (4.0)	
Does the curriculum place sufficient emphasis on gut health -	Yes	108 (78.8)	12 (10.6)	120 (48.0)	2.466 (0.016)*
	No	2 (1.5)	46 (40.7)	48 (19.2)	
	Not sure	27 (19.7)	55 (48.7)	82 (32.8)	
Gut health is important in preventing chronic diseases-	Very important	128 (93.5)	48 (42.5)	176 (70.4)	5.929 (0.020)*
	Moderately important	7 (5.1)	48 (42.5)	55 (22.0)	
	Slightly important	1 (0.7)	13 (11.5)	14 (5.6)	
	Not important	1 (0.7)	4 (3.5)	5 (2.0)	
A routine deworming program should be conducted in schools-	Yes	121 (88.3)	46 (40.7)	167 (66.8)	9.873 (0.010)*
	No	0 (0.0)	38 (33.6)	38 (15.2)	
	Not sure	16 (11.7)	29 (25.7)	45 (18.0)	
Barriers to	Lack of	55 (40.2)	29 (25.7)	84 (33.6)	0.641

deworming	awareness				(0.821)
	Poor access to medication	17 (12.4)	11 (9.7)	28 (11.2)	
	Cultural beliefs and stigmas	8 (5.8)	6 (5.3)	14 (5.6)	
	Poor infrastructure	3 (2.2)	12 (10.6)	15 (6.0)	
	Lack of awareness + Poor access	3 (2.2)	8 (7.1)	11 (4.4)	
	Lack of awareness + Cultural beliefs	2 (1.4)	11 (9.7)	13 (5.2)	
	Lack of awareness + Poor access + Cultural beliefs + Poor infrastructure	4 (2.9)	1 (0.9)	5 (2.0)	
	Poor access + Cultural beliefs + Poor infrastructure	2 (1.5)	1 (0.9)	3 (1.2)	
	Cultural beliefs + Poor infrastructure	43 (31.4)	34 (30.1)	77 (30.8)	

The table presents the perceptions of medical and paramedical students regarding intestinal parasite infections and gut health. Open defecation accounted for 14.4%, while drinking untreated water constituted 10.4%. Collectively, these practices contributed to 63.2% of the disease transmission. The importance of gut health in preventing chronic diseases was significant (p=0.020). Of the participants, 176 individuals, representing 70.4%, provided correct responses regarding gut health and immunity. Preventive strategies comprised boiling water with sanitizers (46.8%) and utilizing hand sanitizers (18.4%). A statistically significant difference was observed in support for normal school deworming programs (p=0.010). A total of 171 individuals (68.4%) indicated that public health education is of significant importance. A statistically significant association was observed between the curriculum's emphasis on gut health and additional variables (p=0.016).

Table 4. Practice of participants towards gut Health, Hygiene Practices, and Deworming

Variable	Category	Medical n (%)	paramedical n (%)	Total n (%)	Chi-square (P-value)
Are you on diet to improve gut health-	Yes	84 (61.3)	21 (18.6)	105 (42.0)	0.824 (0.072)
	No	12 (8.8)	72 (63.7)	84 (33.6)	
	Plan in future	41 (29.9)	20 (17.7)	61 (24.4)	
Any history of Intestinal parasite infection-	Yes	41 (29.9)	37 (32.7)	78 (31.2)	2.290 (0.041)*
	No	87 (63.5)	49 (43.4)	136 (54.4)	
	Not known	9 (6.6)	27 (23.9)	36 (14.4)	
Regular handwashing practice-	Yes	135 (98.5%)	107 (94.7%)	242 (96.8%)	4.541 (0.041)*
	No	2 (1.5%)	6 (5.3%)	8 (3.2%)	
Frequency of Handwashing usually-	Hourly	101 (73.7%)	37 (32.8%)	138 (55.2%)	1.610 (0.053)
	Once in 2 hours	24 (17.5%)	21 (18.6%)	45 (18.0%)	
	Once in 3 hours	9 (6.6%)	25 (22.1%)	34 (13.6%)	
	Only after washroom	3 (2.2%)	30 (26.5%)	33 (13.2%)	

Ever dewormed	Yes	132 (96.4)	64 (56.6)	196 (78.4)	5.316 (0.001)*
	No	5 (3.6)	49 (43.4)	54 (21.6)	
Deworming every 6 months	Yes	36 (26.3)	6 (5.3)	42 (16.8)	2.226 (0.031)*
	No	96 (70.1)	58 (51.3)	154 (61.6)	
	Never	5 (3.6)	49 (43.4)	54 (21.6)	
Last deworming was done at-	< 6 months	13 (9.5)	3 (2.7)	16 (6.4)	4.562 (0.079)
	6–12 months	38 (27.7)	26 (23.0)	64 (25.6)	
	1–2 years	22 (16.1)	19 (16.8)	41 (16.4)	
	>2 years	56 (40.9)	19 (16.8)	75 (30.0)	
	Never	8 (5.8)	46 (40.7)	54 (21.6)	

The table presents data on the practices of medical and paramedical students regarding gut health, hygiene, and deworming. A total of 105 participants, representing 42.0%, reported making dietary changes for gut health. A history of intestinal parasite infection was reported by 78 individuals (31.2%), and a statistically significant association was observed (p=0.041). A total of 242 individuals (96.8%) reported regular handwashing, a statistically significant finding (p=0.041). Of the participants, 138 individuals (55.2%) reported washing their hands every hour. A total of 196 individuals (78.4%) reported having received deworming, demonstrating a significant correlation (p=0.001). Forty-two individuals (16.8%) reported deworming every six months, a statistically significant finding (p=0.031).

Discussion

Although intestinal parasite infections can occur at any age, they are more common in young children, who may be at higher risk due to malnourishment, a weakened immune system, migration, and poor living conditions. Although intestinal parasite infections are a global issue, they are particularly severe in developing nations due to a persistent lack of basic sanitary facilities, ignorance of the proper mechanism of transmission, and a lack of preventive measures [10].

In this study, students who were not exposed to microbiology in the curriculum were included. The purpose of this study was to assess knowledge, awareness, and practices regarding IPIs. Many other studies have been conducted among schoolchildren and the general population [9,11,12] and this is the only study that included healthcare students. A study conducted in Malaysia included subjects with similar age groups [13].

In our study, most study subjects knew about probiotics and gut bacteria. More than three-quarters of the subjects were aware of the importance of probiotics. Regarding probiotics' usefulness, Aditi et al.'s study [14] found

that 42.1% of students were aware of their benefits. This was in contrast to the findings of a study by Payahoo et al. [15] on Iranian medical science students, which found that 60% of students were aware of probiotics' benefits, which was significantly higher than the findings of our study. In the study among Nigerian healthcare professionals, Amaruche et al. found that over 65% of them were aware [16].

Most study subjects (79.6%) knew how worms spread, and 82% claimed inadequate sanitation and hygiene were the main contributors. Since they knew the infection's source, most subjects blamed soil, walking barefoot, drinking untreated water, and eating undercooked food.

A study of school students found that most don't know how parasites are transmitted. Over 400 parasites have been found, and 45% can be spread by close nonsexual contact, including the fecal-oral route. Knowledge of infection transmission routes is crucial for children's health. Hand-to-hand contact transmits intestinal parasites, while ambient surfaces or food transmit them indirectly. Thus, ignorance about the transmission mechanism is always a risk factor, especially in young children due to poor hygiene [10].

Study subjects knew worms and the signs and symptoms caused by the parasitic infections. Weight loss, abdominal pain, diarrhoea, vomiting, fatigue, lack of appetite, and craving for soil were listed as major signs of worm infection, which is in accordance with the findings of other investigations [17,15].

79.2% of the subjects correctly identified the protozoan that causes amoebiasis (E. histolytica), and nearly two-thirds of them knew something about parasites. Most subjects accurately identified stool analysis as the diagnostic technique. 50% of the subjects recognised the primary medication for amoebiasis treatment (metronidazole), and the majority were aware of the commonly used deworming (albendazole).

Regarding infection prevention, a lot of participants thought that hand washing and drinking purified water were good strategies. Furthermore, almost 90% of the participants had become accustomed to handwashing practice. According to the Yemeni research [19], most participants wash their hands both before eating and after urinating. Compared to the Ethiopian [20] and Colombian [21] research, our findings show better awareness.

Additional steps included drug treatment, general personal hygiene, and appropriate disposal of human waste. The subjects also said that utilizing restrooms and latrines, as well as wearing shoes and receiving health information, will aid in the fight against the infection. Even though the vast majority of survey participants were aware of IP, the mode of transmission, and preventive actions was insufficient. Similar results were obtained in the Malaysian investigation [22]. Active student participation is essential for the effectiveness and sustainability of initiatives like 'Swach Bharat' in educational and healthcare settings.

More than half of the students said they had no history of IP infection, nearly 15% were unsure of the condition, and 31% reported a history of IPI. The Malaysian study and these reports are comparable [13]. This finding contradicts a survey on IP infection conducted among students in Asmara, Eritrea, Africa, which found that 73% of them had prior knowledge of IP infection [10].

When it comes to practice, most of the subjects followed handwashing, and many subjects washed their hands at least once every two hours.

Although more than three-fourths of the subjects in our study had undergone deworming previously, only 16% received it biannually. 54 of the subjects had not previously undergone deworming. The inadequacy of deworming programs may account for this issue. Many of them recommended that deworming and health education activities should be conducted regularly in educational institutions. According to a study done on mothers in Chennai, 35% of them practiced preventing worm infestations inadequately, while 50% of them knew enough about it [23]. 100 mothers participated in a community-based study to gauge their knowledge about worm infestations. The results showed that regarding worm infestations, the majority of the moms had somewhat sufficient knowledge (65%) and moderate behaviours (72%) [24].

According to our report, several subjects mentioned obstacles like taboo traditions, a lack of healthcare resources, and misunderstandings that resulted in underutilization of deworming treatments that were either unavailable or too expensive. According to a Ghanaian study, those who said they had not gone to a hospital or health center because they were poor and their symptoms weren't severe enough cited a lack of funds, with proximity not being a deterrent [25].

According to a study done in the Erode District, Tamil Nadu, schoolchildren have a low degree of understanding, while paramedical workers have a good level. The majority of paramedical personnel have a positive attitude [26].

The results of another deworming study conducted in Tamil Nadu indicate that mothers of under-fives residing in rural areas often lack adequate and frequent deworming practices [20]. Since intestinal parasites are a public health issue, it is essential to implement interventional programs, provide regular monitoring, and educate parents and caregivers on health issues to reduce the disease's prevalence [27].

The study revealed significant gaps in awareness of gut health between medical and paramedical groups. Both groups acknowledged certain gut-related conditions; however, medical students demonstrated significantly greater knowledge. This highlights the necessity for focused educational interventions for paramedical students to address the existing knowledge gap. Health science students should be more knowledgeable about gut health so they can utilize and advocate for probiotics more confidently to treat and prevent stomach problems [28].

Conclusion

This study highlights differences in knowledge, attitudes, and practices related to intestinal parasitic infections and gut health between medical and paramedical students. Although general awareness regarding transmission and prevention was relatively high, gaps remain in structured education and preventive practices. Strengthening curricular components and health education programs may improve awareness and promote better preventive behaviours among future healthcare professionals.

Study Limitations

The primary limitation of this study is its single-centric nature and the fact that subjects are healthcare students, rendering the conclusions non-generalizable to the broader public.

Ethical Approval

Ethical approval for the study was obtained from the Institutional Ethics Committee of ACS Medical College and Hospital.

Conflicts of interest

The authors declare that they do not have conflict of interest.

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