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FREQUENCY OF WORM INFESTATIONS AMONG CHILDREN AT LYARI GENERAL HOSPITAL, KARACHI, PAKISTAN

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Abstract

Objective: *To determine the frequency of worm infestations among children at Lyari general hospital, Karachi, Pakistan.*

Methods: *This hospital-based cross-sectional study included children presenting to the paediatric outpatient and emergency departments or admitted to the paediatric ward. Participants were enrolled through non-probability consecutive sampling. Sociodemographic, clinical, anthropometric, hygiene and environmental information was collected using a structured proforma. Direct microscopy of normal saline and Lugol's iodine wet mounts were done in a fresh stool specimen of each child.*

Results: *The analysis included 280 children with a mean age of 3.14 ± 1.33 years; 156 (55.7%) were male. Fifty-five (19.6%) children were found with worm infections. Ascaris lumbricoides was cultured in 32 (58.2%) children and Enterobius vermicularis in 22 (40.0%) children and hookworm in 1 (1.8%) children among the microscopy positive children. Seventy-five (26.8%) children had moderate wasting and 37 (13.2%) children had severe wasting, and 157 (56.1%) had a history of anaemia.*

Conclusion: *Roundworms or worms were found in about 20% of the children participating, with A. lumbricoides the most common species. These findings are only generalisable and have limited diagnostic sensitivities due to sampling in hospital settings and a single direct wet mount.*

INTRODUCTION:

Worm infestation or helminth infection of the gut are a significant public health problem, especially among children in tropical and subtropical countries where access to safe water, sanitation and hygiene is limited.[1] Ascaris lumbricoides, Trichuris trichiura and the hookworms Nectar americanus and Ancylostoma duodenale are the major soil-transmitted helminths. Other intestinal helminths were also reported in children in Pakistan such as Enterobius vermicularis and Hymenolepis nana.[2] About 1.5 billion people (24%) or nearly one in three people worldwide are infected with soil-transmitted helminths. There are over 260 million

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children under the age of five and 654 million children between ages 5 and 16 living in settings with adequate transmission levels to warrant preventative measures.[3]

Infections typically happen when people eat infective eggs in contaminated soil, food, water or on their hands. Another way hookworm larvae may enter the skin is by coming into contact with contaminated soil. Poor sanitation, unsafe drinking water, hand hygiene and eating unwashed produce and walking with bare feet may therefore make people more susceptible to exposure. Children frequently come into contact with soil, practice hand-to-mouth activity, and continue to be exposed to soil in endemic areas, making them especially vulnerable.[3,4]

The clinical effects are dependent on species and intensity of infection. Light infections often do not produce any symptoms, while moderate to heavy infections can manifest with abdominal symptoms, loss of appetite, loss of nutrients, chronic intestinal blood loss, anaemia and growth retardation.[5,6] Intestinal parasitic infections have also been reported to be associated with childhood undernutrition, such as stunting, which may be affected by socioeconomic factors and dietary intake and coexisting infections.[7] Microscopic examination of stool specimens is the most common method of laboratory diagnosis, but the likelihood of finding the parasite is dependent on the type of parasite, the number of specimens collected, and the type of laboratory procedure used.[4]

The frequencies reported in studies from Pakistan are quite varied. In a separate study in the hospital setting in Karachi 185 of 269 children under the age of five years with symptoms had an intestinal parasitic infection (68.8%) and G. lamblia was the predominant organism.[8] Intestinal parasitic infection has been reported in 30.6% and 82.0% of schoolchildren in Zhob and rural Lower Dir respectively.[10,11] This study showed that there was a high prevalence of IPIs in the rural community of Lower Dir in contrast to the urban community of Zhob.[9] These estimates are not directly comparable as the studies used different age groups, varying selection of participants, geographical setting, laboratory methods and whether protozoa were included with helminths.

Although some of the above reports indicate that there has been intestinal helminth infection among children visiting public healthcare facilities in Lyari, the specific type of intestinal helminth infection has yet to be described. The distribution of the species and frequency among the children participating in this service helps in planning for other community based investigations. Hence, this study aimed to find out the frequency of worm infection in children (6–59 months) of Lyari general hospital, Karachi, Pakistan.

METHODS:

This cross-sectional study was conducted in the Department of Paediatrics at Lyari General Hospital, Karachi, over a period of six months from March 2025 to August 2025. Children who were eligible and who were not eliminated by consecutive sampling were added to the sample until the necessary number of children was obtained. The study commenced after obtaining approval from the College of Physicians and Surgeons Pakistan. The parent/legal guardian of each of the children participating gave written informed consent prior to enrolment. Confidentiality of participants was ensured and all information was used only for research.

The minimum sample size required was 273 children, based on the OpenEpi software to estimate a single population proportion. The calculation was made at 95th percentile with 5th absolute precision and 77% prevalence of intestinal helminth infection was assumed based on a previous study done in children of Karachi.[8] Children of both sexes, age 6-59 months were eligible when they presented in paediatric outpatient department and also when admitted to paediatric ward of Lyari General Hospital. Children were enrolled if the parent/legal guardian gave informed consent and a satisfactory stool sample was collected. Children were not included if they had been treated with an anthelminthic medicine in the last 2 weeks prior to the survey or if they had a severe illness that required treatment in the 1 month before the survey.

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Parental/caregiver interviews were conducted with trained physicians who completed a proforma after receiving written informed consent. Sociodemographic and other potential risk factors such as parental education, place of residence, drinking-water source, hygiene practices, animal contact and relevant medical history were assessed. Designed a calibrated weighing scale to measure the weight. In children under 24 months, recumbent length was measured using an infantometer and, in children 24 months or older, standing height was measured using a stadiometer. MUAC was measured to the nearest 1mm at the mid-upper arm circumference (MUAC) with a non-stretchable tape between the acromion and olecranon of relaxed left arm without compressing the underlying tissue. Definitions used were: Anaemia was defined as a diagnosis written in the medical record; Vaccination was defined as being complete if all the routine vaccine doses of the child were received according to the Pakistan EPI schedule. At least one routine vaccine dose was received, but one or more doses (required at that age) was not, and it was classified as incomplete; if no routine vaccine dose was received, it was classified as not vaccinated.

A labelled, clean, dry and leak-proof container was given to each caregiver with instructions to collect fresh stool of the size of ping pong. Direct saline and Lugol's iodine wet-mount microscopy was used to examine fresh stool samples in the lab of Lyari General Hospital. Samples were taken on 3 successive mornings prior to defecation, bathing/changing clothes. The responses on the questionnaires were anonymized for the laboratory staff. Primary outcome was microscopy confirmed presence of at least one intestinal helminth egg or larva in a stool sample.

The analysis of the data was done in IBM SPSS Statistics V25. Continuous variables, which were approximately normally distributed, were reported as mean ± SD. Categorical variables were used to summarize as frequencies and percentages. The mean differences and crude prevalence ratios were presented along with their 95% confidence intervals wherever possible. Two-tailed tests were used, with $p<0.05$ indicating statistical significance.

RESULTS:

The analysis included 280 children with a mean age of 37.31 ± 9.68 years; 156 (55.7%) were male. The majority of participants came from the lower socioeconomic group (236, 84.3%) and from the inpatient paediatric ward (187, 66.8%) with the majority residing in urban areas (228, 81.4%). The largest ethnic group of children were the Baloch (102; 36.4%). No formal education was reported for 45 (16.1%) fathers and 118 (42.1%) mothers (Table 1).

Of the 280 children, 51 (18.2%) caregivers had prior knowledge of intestinal worm infection while the majority 229 (81.8%) did not have any awareness. A total of 55 children were found to be infected with worms (19.6%). Out of the 55 microscopy positive children, 34 (61.8%) had A. lumbricoides infection, 20 (36.4%) had E. vermicularis while one (1.8%) had hookworm. No mixed species infections were found.

According to weight-for-height classification, 40.0% (n = 112) of the children were suffering from acute malnutrition, including 37 (13.2%) with severity and 75 (26.8%) with moderate acute malnutrition. 157 children (56.1%) had anaemia. In 229 (81.8%) children, history of abdominal pain and in 241 (86.1%) children, excessive crying were reported. Table 2 shows that 144 (51.4%) children had completed their immunisation status.

Concerning hygiene and environmental conditions, 91 (32.5%) children washed their hands before eating and after toilet use and 249 (88.9%) children had a common household toilet. 72 children (25.7%) were reported to bite their nails. Soles were not worn or only sometimes worn by 179 (63.9%) children and 134 (47.9%) homes had animals. The most common type of drinking water was tap water (161, 57.5%) and open water storage was used by 177 (63.2%) households (Table 3).

The mean age, weight or length/height among the children who were microscopy positive and negative were not different. The percentage with MUAC <12.5 cm, wasting and anaemia were similar for both the children (Table 4). No statistically significant difference was found for

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age, weight, length/height, low MUAC, wasting or anaemia (Table 5).

DISCUSSION:

The observed prevalence was lower than the pooled prevalence (31.6%) of children under five with intestinal parasitic infections as reported internationally, and the estimate (35.5%) for South Asia.[12] This was also lower than previous results for Karachi, where the proportion of children under five years attending hospitals was estimated at 68.8%, and of children living in an urban informal settlement (52.8%).[9,13] Even though the frequencies of schoolchildren in the mentioned studies were higher, the prevalence of intestinal parasites, that is, 58.5% in Bajaur and 82.0% in rural Lower Dir, were comparable to the lower frequencies (29.4% at primary hospital and 32.5% in community multicentre studies) reported in other recent Pakistan studies and the estimated 32.5% prevalence of preschool children of Ethiopia in a recent meta analysis.[18] This estimate is, however, similar to the 20.6% pooled prevalence of helminths in schoolchildren globally, but it can only be compared directly with this pooled prevalence because of the differences in age and setting between the two.

This high prevalence of A. lumbricoides is similar to previous Pakistani studies and recent international meta-analysis.[11,12,14,18] E. vermicularis was reported in 5.75% of the school children in a Pakistani study of stool wet mounts,[19] but this method of stool examination is not always sensitive, since eggs tend to be deposited on the perianal skin, and it is preferable to use adhesive-tape sampling instead on repeated mornings.[20] Thus, the percentage of species shared in this study does not reflect the prevalence of enterobiasis, but rather the percentage of microscopy positive specimens in which the characteristic eggs were found..

Laboratory confirmation, consecutive enrolment and reporting of the frequency are the strengths of this study. These important limitations include single centre, non-probability sampling, majority of inpatients, one stool sample and direct wet mount (without concentration), adhesive-tape testing, and lack of infection intensity and multivariable testing. Misclassification of anaemia prevalence may have occurred with respect to caregiver-reported practices and anaemia status from records. Further studies of the community should be conducted via probability sampling, repeated sampling, species-suitable diagnostic techniques and analytical comparisons.

CONCLUSION:

About 1/5 of children aged 6-59 months visiting Lyari General Hospital were found to be infected with worms and Ascaris lumbricoides was most common. These results must not be interpreted as representative of community prevalence, as sampling was done in the hospital and the sensitivity of the single direct wet mount is limited. More sensitive and species-specific diagnostic techniques in community-based studies with probability sampling are required to more accurately define the burden.

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CONFLICT OF INTEREST:

The authors declared no conflict of interest.

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AUTHORS' CONTRIBUTIONS:

All other authors contributed equally as per IMCJE. All authors agreed to be accountable for all aspects of the research.

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Table 1: Demographic Characteristics of Study Participants (n=280)

Gender, n (%)	
Male	156 (55.7%)
Female	124 (44.3%)
Age (months)	
Mean ± sd	37.31 ± 9.68
Status of Patient, n (%)	
Hospitalised Out patient	187 (66.8%) 93 (33.2%)
Ethnicity, n (%)	
Baloch Punjabi Sindhi Pathan Urdu Speaking	102 (36.4%) 53 (18.9%) 53 (18.9%) 43 (15.4%) 29 (10.4%)
Residence, n (%)	
Rural Urban	52 (18.6%) 228 (81.4%)
Socioeconomic Status, n (%)	
Lower: <PKR 60,000/month Middle: PKR 60,000–150,000/month	236 (84.3%) 44 (15.7%)

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Father's Education, n (%)	
No formal education	45 (16.1%)
Primary	28 (10%)
Secondary	76 (27.1%)
Intermediate	102 (36.4%)
Graduation	29 (10.4%)
Mother's Education, n (%)	
No formal education	118 (42.1%)
Primary	86 (30.7%)
Secondary	57 (20.4%)
Intermediate	14 (5%)
Graduation	5 (1.8%)

Table 2: Stool-microscopy findings and clinical and anthropometric characteristics of participants (n=280)

Stool microscopy	
Positive stool microscopy	55 (19.6%)
Negative stool microscopy	225 (80.4%)
Weight (Kg)	
Mean ± sd	11.25 ± 2.21
Length/height (cm)	
Mean ± sd	87.33 ± 8.65
MUAC, n (%)	
≥ 12.5 cm	23 (8.2%)
11. 5- <12.5 cm	191(68.2%)
< 11.5 cm	66(23.6%)
WLZ/WHZ, n (%)	
SD < -3 (severe wasting)	37 (13.2%)
≥−3 to <−2 (moderate wasting)	75 (26.8%)
≥−2 (no wasting)	168 (60%)
Anemia, n (%)	
Yes	157 (56.1%)
No	123 (43.9%)
Caregiver-reported abdominal pain, n (%)	
Yes	229 (81.8%)
No	51 (18.2%)
Vaccination history, n (%)	
Complete	144 (51.4%)
Incomplete	132 (47.1%)
Not vaccinated	04 (1.4%)

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Table 3: Personal hygiene, sanitation, environmental exposure, and water-related practices of study participants (n=280)

Reported handwashing occasions, n (%)	
Before meals only	159 (56.8%)
After toilet use only	30 (10.7%)
Both occasions	91 (32.5%)
Frequency of nail clipping, n (%)	
Once a week	113 (40.4%)
Once a month	112 (40.0%)
Every two weeks	50 (17.9%)
No	5 (1.8%)
Nail-biting habit, n (%)	
Yes	72 (25.7%)
No	208 (74.3%)
Toilet facility at home, n (%)	
Used exclusively by the household Shared	31 (11.1%) 249 (88.9%)
Caregiver-reported home cleanliness, n (%)	
Very good	41 (14.6%)
Good	206 (73.6%)
Poor	33 (11.8%)
Washing hands after soil contact, n (%)	
Yes	227 (81.1%)
No	53 (18.9%)
Playing with stray animals (cats or dogs), n (%)	
Yes	56 (20.0%)
No	224 (80.0%)
Keeping animals at home, n (%)	
Yes	134 (47.9%)
No	146 (52.1%)
Shoe wearing practices, n (%)	
Always	101 (36.1%)
Sometimes	161 (57.5%)
Not at all	18 (6.4%)
Main household drinking-water type, n (%)	
Untreated tap water	161 (57.5%)
Filtered water	96 (34.3%)
Boiled water	18 (6.4%)
Bottled/mineral water	5 (1.8%)
Household water storage, n (%)	
Open	177 (63.2%)
No storage	53 (18.9%)

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Pot/ bowl	35 (12.5%)
Canister	15 (5.4%)

A history of anaemia was determined from medical records.

Table 4. Age, anthropometric and nutritional characteristics according to stool microscopy result (n=280)

Characteristic	Negative (n=225)	Positive (n=55)	Crude effect estimate (95% CI)	p-value
Age (months) mean ± SD	37.47 ± 9.78	36.67 ± 9.29	MD −0.80 (−3.67 to 2.07)	0.584
Weight (kg) mean ± SD	11.36 ± 2.19	10.76 ± 2.26	MD −0.60 (−1.26 to 0.05)	0.070
Length/height (cm) mean ± SD	87.37 ± 8.42	87.15 ± 9.60	MD −0.21 (−2.78 to 2.35)	0.870
MUAC <12.5 cm n (%)	206 (91.6)	51 (92.7)	PR 1.14 (0.45–2.87)	1.000
Wasting, WHZ <−2 SD n (%)	91 (40.4)	21 (38.2)	PR 0.93 (0.57–1.51)	0.878
Anaemia n (%)	127 (56.4)	30 (54.5)	PR 0.94 (0.58–1.51)	0.880

Values are mean ± standard deviation or n (%). MD represents the mean difference between microscopy-positive and microscopy-negative children. For categorical variables, PR represents the crude prevalence ratio for microscopy positivity among children with versus without the stated characteristic. Student's independent-samples t-test was used for continuous variables and Fisher's exact test for categorical variables. MUAC, mid-upper arm circumference; WHZ, weight-for-height z score; CI, confidence interval.

Table 5. Anthropometric and nutritional characteristics according to helminth species among microscopy-positive children (n=55)

Characteristic	*A. lumbricoides* (n=34)	*E. vermicularis* (n=20)	Hookworm (n=1)	Crude effect estimate (95% CI)	p-value
Age (months) mean ± SD	34.82 ± 10.29	39.35 ± 6.58	46.0	MD −4.53 (−9.68 to 0.63)	0.084
Weight (kg) mean ± SD	10.74 ± 2.35	10.68 ± 2.15	13.3	MD 0.06 (−1.22 to 1.35)	0.922
Length/height (cm) mean ± SD	86.43 ± 10.11	88.28 ± 9.05	89.5	MD −1.85 (−7.35 to 3.66)	0.503

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MUAC <12.5 cm n (%)	31 (91.2)	19 (95.0)	1 (100.0)	PR 0.96 (0.83–1.11)	1.000
Wasting, WHZ <−2 SD n (%)	15 (44.1)	6 (30.0)	0 (0.0)	PR 1.47 (0.68–3.17)	0.391
Anaemia n (%)	17 (50.0)	12 (60.0)	1 (100.0)	PR 0.83 (0.51–1.36)	0.576

P-values and effect estimates compare children with A. lumbricoides and E. vermicularis. MD represents A. lumbricoides minus E. vermicularis. For categorical variables, PR represents the prevalence in the A. lumbricoides group relative to the E. vermicularis group. Student's independent-samples t-test and Fisher's exact test were used.