

ORIGINAL ARTICLE

WORM INFESTATION AND ASSOCIATED FACTORS IN SCHOOL CHILDREN OF DISTRICT ZHOB, BALOCHISTAN, PAKISTAN

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Background: Worm infestation or ‘Soil Transmitted Helminthiasis’ (STH) is a global health problem affecting 3.5 billion people worldwide. STH is the commonest cause of iron deficiency anemia world over, affecting about 1.3 billion people with highest prevalence and morbidity in young children. Anemia in children is associated with growth retardation, delayed motor development, poor cognitive abilities and impaired immune response. The objective of this study was to determine frequency of worm infestation and its causal relationship with iron deficiency anemia and to evaluate factors associated with it. **Methods:** It was a cross sectional study conducted in district Zhob Balochistan from Apr 2014 to Dec 2014. Our study population was school going children selected according to inclusion and exclusion criteria. A structured questionnaire was administered. **Results:** Worm infestation was found in 30.6% students. *Ascaris* was found to be highest in frequency (15.3%) followed by *Giardia* (4.4%) and Hookworm (3.9%). Out of worm infested students, 87% were anaemic. **Conclusion:** Most of the children who were affected by worm infestation were anaemic.

Keywords: Helminthiasis, Iron deficiency, anaemia, faeco-oral route

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INTRODUCTION

Worm infestation or ‘Soil Transmitted Helminthiasis’ (STH) is a global health problem affecting globally 3.5 billion people including 49% of Pakistani population.¹ Worldwide 1.47 billion people are infested with roundworm, 1.3 billion with hookworm, and 1.05 billion with whipworm.^{1,2} Most affected population is children aged 5–15 years.¹ Children of an endemic community start getting intestinal worm infestation during post-weaning period and run a high risk of re-infestation in the rest of their lives.³ STH is the commonest cause of iron deficiency anemia⁴ world over, affecting about 1.3 billion people with highest prevalence and morbidity in young children⁵.

Anaemia in children is associated with multiple health problems, like growth retardation, delayed motor development, poor cognitive abilities and impaired immune response.⁶ Despite improved socio-economic conditions and elevated living standards, it is still a public health problem even in developed countries.⁷ Due to slow progression, it is one of the most ignored diseases.³

Unavailability of pure drinking water, low socio-economic state, poor sanitation coupled with low literacy rates of parents particularly the mothers are the main causes of intestinal worm infestation in children.⁸ In India, there is also high prevalence of intestinal parasitic infestation in children.⁹ Studies conducted in various cities of Pakistan including those at Karachi¹⁰, Rawalpindi/Islamabad¹¹, Lahore¹², Sargodha¹³, Northern Areas¹⁴ and Abbottabad¹⁵ have demonstrated prevalence rates of 30–80%. Anaemia as an outcome was found to be significant in most of these studies.^{10–14}

It has become a global public health problem mainly due to being overlooked by clinicians, despite its severe consequences. Until now, studies are scant on this issue in Balochistan province in general and in Zhob particularly, warranting an intense need to conduct such studies. The present study is an effort to estimate the frequency of intestinal worm infestations in the children of school going age in District Zhob, Balochistan, and to find out its relationship with anaemia, socioeconomic status and hygiene practices.

SUBJECTS AND METHODS

A cross-sectional study was conducted from April to December 2014 in District Zhob, Balochistan. A sample size of 450 students was calculated based on the prevalence of 49%.¹

Only 229 students were given consent by their parents to be part of the study. Cases were selected from school using convenience non-probability sampling technique. The inclusion criteria comprised of both male and female students of 5–16 years age while those whose parents did not consent or students absent at the time of data collection were excluded from the study. Participants were briefed on the objectives of the study and consent was taken prior to inclusion in the research. Proforma based interview was conducted and questionnaire was developed in both English and Urdu and filled by the researchers themselves, or parents in case of younger children.

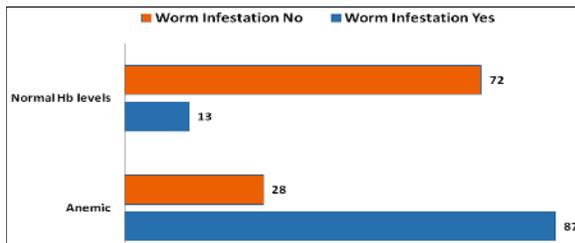
All students were tested for parasites/ova in their stools by stool DR. Hb levels of all the students were checked by HemoCue Hb analyzer. Data was entered on MS Excel and transformed after resolving inconsistencies to SPSS-20 for analysis and $p \leq 0.05$ was

taken as significant. For descriptive statistics frequency and percentages were calculated for categorical variables while Mean±SD were calculated for numerical variables. Permission from school administration was taken prior to conducting the study.

RESULTS

Out of 229 children, 179 (78.2%) were boys and 50 (21.8%) were girls. Seventy (30.6%) children were found to have worm infestation. The rest 159 (69.4%) children tested negative for helminths.

Ascaris was found to be highest in frequency (35, 15.3%), followed by *Giardia* (10, 4.4%), and Hookworm (9, 3.9%). Pin worms were found in a small amount of the sample (1.7%) followed by negligible amount of *Hemophilus nana* and *Tinea saginata*. When comparing haemoglobin level and worm infestation, it was found that 61 (87%) children who had worm infestation were anaemic (Graph-1).



Graph-1: Association of anaemia with worm infestation

Drinking clean water is an important factor that correlates to worm infestation, only 3 (1.3%) children drank filtered water, 4 (1.7%) consumed boiled water, and 213 (93%) drank unfiltered water.

In terms of hygiene, as shown in Table-1, only 2 (0.9%) children had independent toilet facility and belonged to the category whose parents earned more than PKR 25,000 monthly. The remaining 227 (99.1%) children had a single toilet that was shared by all family members.

Looking at living conditions, 210 (91.7%) children shared a room with siblings, 5 (2.2%) lived in a room with parents and 14 (6.1%) lived in a single room.

In terms of mother’s education, 161 (70.3%) were uneducated, whereas 53 (23.1%) had primary education, and only 16 (6.5%) mothers were matriculate or above. Maternal education influenced factors like taking baths, frequency of nail clipping, and teeth brushing habits.

It was found that 153 (66.8%) children were not aware of their parents’ income and in that group alone 53 (75.7%) were found to have worm infestation. Thirty-one (13.5%) children’s fathers earned less than PKR 10,000 a month, 34 (14.8%) earned PKR 10,000–25,000 and only 11 (4.8%) earned over PKR 25,000 a month.

Five (7.1%) children were worm infested where father’s income was less than 10,000 rupees, 9 (12.9%) were infested whose income was 10–25 thousand, and only 3 (4.3%) suffered in those whose fathers’ income was greater than 25,000 rupees.

With relation to worm infestation and hygienic factors those who shared a common bathroom, 70 (30.8%) were found to have worm infestation as compared to 157 (69.2%) who did not.

A total of 94 (41.0%) took a bath daily out of which 30 (31.9%) had worm infestation and the remainder 64 (68.1%) did not. Sixty-four (27.9%) took a bath twice a week and 25 (39.1%) of them were infested. Sixty-seven (29.3%) took a bath once a week, and 13 (19.4%) of them had worm infestation. Only 2 (0.9%) took a bath once a month and there was an equal divide of 50% (n=1) on being infested and not infested with worm infestation.

A total of 103 (45%) children washed their hands before meal and after using toilet. Twenty-nine (28.2%) were found to have worm infestation as compared to 74 (71.8%) who did not. One hundred twenty-three (53.7%) children washed their hands before meals, out of which 40 (32.5%) had worm infestation. Twenty-two (9.6%) had the habit of biting their nail, and in that group 9 (40.9%) were infested with worms as compared to those who did not bite their nails 207 (90.4%) and only 61 (29.5%) were worm infested. Participants were asked about whether they had a balanced diet which comprised of milk, lentils, meat and vegetables (Table-2).

Table-1: Association of worm infestation with hygienic practices

| | | Worm Infestation | | | | p |
|-------------------------------------|------------------------------|------------------|------|-----|------|-------|
| | | Yes | | No | | |
| | | n | % | n | % | |
| Frequency of teeth brushing | Once a day | 56 | 80 | 130 | 81.8 | 0.785 |
| | Twice a day | 10 | 14.3 | 18 | 11.3 | |
| | Not daily | 4 | 5.7 | 11 | 6.9 | |
| Frequency of taking shower | Daily | 31 | 44.3 | 65 | 40.9 | 0.141 |
| | Twice weekly | 25 | 35.7 | 39 | 24.5 | |
| | Once weekly | 14 | 20 | 55 | 34.6 | |
| Frequency of hand washing | Before meal and after Toilet | 29 | 41.4 | 74 | 46.5 | 0.729 |
| | Before Meals | 40 | 57.1 | 83 | 52.2 | |
| | After using toilet | 1 | 1.5 | 2 | 1.2 | |
| Frequency of changing socks | Daily | 8 | 11.4 | 16 | 10.1 | 0.104 |
| | Twice weekly | 30 | 42.9 | 52 | 32.7 | |
| | Once weekly | 32 | 45.7 | 91 | 56.9 | |
| Frequency of changing undergarments | Daily | 20 | 28.6 | 43 | 27 | 0.549 |
| | Twice week | 30 | 42.9 | 64 | 40.3 | |
| | Once week | 20 | 28.5 | 52 | 32.7 | |
| Frequency of Nail clipping | Once a week | 20 | 28.6 | 44 | 27.7 | 0.526 |
| | Once fortnight | 34 | 48.6 | 85 | 53.5 | |
| | Once a month | 16 | 22.8 | 30 | 18.9 | |
| Nail Biting | Yes | 9 | 12.9 | 13 | 8.2 | 0.268 |
| | No | 61 | 87.1 | 146 | 91.8 | |
| Toilet | Independent | 0 | 0 | 2 | 1.3 | 0.346 |
| | Shared | 70 | 100 | 157 | 98.7 | |

Table-2: Association of Hb level with nutrition

| | | Anaemia | | Normal | | p |
|-----------------|----------------|---------|------|--------|------|-------|
| | | n | % | n | % | |
| Meat | Daily | 2 | 50 | 2 | 50 | 0.545 |
| | Twice a week | 85 | 44.3 | 107 | 55.7 | |
| | Once a week | 17 | 58.6 | 12 | 41.4 | |
| | Occasionally | 2 | 50 | 2 | 50 | |
| Fish Intake | Twice a week | 1 | 50 | 1 | 50 | 0.983 |
| | Once a month | 2 | 50 | 2 | 50 | |
| | Don't eat fish | 103 | 46.2 | 120 | 53.8 | |
| Lentils | Daily | 6 | 40 | 9 | 60 | 0.165 |
| | Twice a week | 91 | 45 | 111 | 55 | |
| | Once a week | 4 | 57.1 | 3 | 42.9 | |
| | Occasionally | 5 | 100 | 0 | 0 | |
| Apples | Daily | 0 | 0 | 1 | 100 | 0.09 |
| | Twice a week | 14 | 70 | 6 | 30 | |
| | Once a week | 22 | 40 | 33 | 60 | |
| | Occasionally | 70 | 45.8 | 83 | 64.2 | |
| Eat Vegetables | Daily | 8 | 42 | 11 | 58 | 0.712 |
| | Twice a week | 91 | 46.7 | 104 | 53.3 | |
| | Once a week | 6 | 43 | 8 | 57 | |
| | Occasionally | 1 | 100 | 0 | 0 | |
| Milk | Yes | 32 | 50 | 32 | 50 | 0.483 |
| | No | 74 | 44.8 | 91 | 55.2 | |
| Cereals | Yes | 5 | 50 | 5 | 50 | 0.810 |
| | No | 101 | 46 | 118 | 54 | |
| Eggs | Yes | 70 | 46 | 82 | 54 | 0.92 |
| | No | 36 | 46.8 | 41 | 53.2 | |
| Water at school | Filtered | 104 | 46.4 | 120 | 53.6 | 0.776 |
| | Unfiltered | 2 | 40 | 3 | 60 | |
| Water at home | Filtered | 2 | 66.7 | 1 | 33.3 | 0.671 |
| | Boiled | 1 | 25 | 3 | 75 | |
| | Tap water | 103 | 46.4 | 119 | 53.6 | |

DISCUSSION

In Pakistan a number of studies have been conducted that have helped to determine the prevalence of worm infestation in the country. Due to varying living conditions in the country, the prevalence of worm infestation has also been variable. In the urban areas, the prevalence was 23% in Islamabad¹³, 31% in Quetta¹⁶, as compared to the rural areas where figures were: Skardu (54.9%)¹⁴, Abbottabad (74.6%, 85%)¹⁵ and in towns of Yasin and Singal the figures were (91%)¹⁷. One of the reasons for the inconsistency of the figures could be due to the climate and living conditions as pointed out in Abbottabad study¹⁵. Higher prevalence in northern and hilly areas may be due to drinking of contaminated water coming long way from hills that is polluted by human or animal wastes.¹⁴

Our study was conducted in the Zhob area of Balochistan, amongst the school going children aged 5–16 years. It was found that 30.6% had worm infestation or STH. Specific worm infestation indicates the route of transmission and may be helpful to improve specific causal factors that will certainly improve prevalence of worm infestation.¹ In our study, *A. lumbricoides* was found to be highest in frequency, followed by *G. lamblia* and Hookworm. These results are *at par* with other studies in which infestation by *A. lumbricoides* (35.54%) was followed by *G. lamblia* (30.94%)⁸

infestation. One of the reasons behind this is that Zhob is a district marred by poverty and scarcity of clean drinking water.¹⁷ We found that the majority (213, 93%) drank unfiltered water. Similar results were obtained from the Northern Areas of Pakistan, where drinking of contaminated water led to a high incidence of worm infestation.¹⁸

In our study, 153 (66.8%) children were not aware of their fathers' monthly income and in that group alone 53 (75.7%) were having worm infestation, as compared to 3 (4.3%) children in those whose fathers' income was greater than 25,000. Seventy (30.8%) of the subjects who had poor sanitary facilities were found to have worm infestation as compared to those having independent toilets. Out of those children who reported to take a bath daily, only 31.9% had worm infestation. Socio-economically stable families can keep personal hygiene and cleanliness of house hold and their belongings.^{10,16} Sufficient house space also prevents overcrowding and heavy faecal pollution of premises. Proper sanitary facilities are a very effective measure to control helminthes.¹⁶

Some factors like washing hands and nail biting habits, support clues towards the mode of transmission of certain worms. Looking at our study it was found that out of 103 (45%) children who washed their hands before meal and after toilet, only 29 (28.2%) were found to have worm infestation as compared to 74 (71.8%) of those who did not. These results were in coherence with other studies that suggest that hand washing with soap decreases the prevalence of *A. lumbricoides*.⁸ Biting of fingernails is another factor that may affect transmission of worms.⁸ In our study 22 (9.6%) children had the habit of biting their nails and 9 (40.9%) children in that group were infested with worms. Therefore, it can be said that hand washing, availability of clean drinking and improvement in nail-biting habits may leave positive effects on prevalence of worm infestation.

CONCLUSION

This study on the whole was able to shed light on the most neglected health problem, the worm infestation, in District Zhob. To handle this neglected tropical disease, much effort is required, including implementing the right interventions to improve the factors associated with it.

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