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PREVALENCE OF *TRICHURIS TRICHIURA* AND *ASCARIS LUMBRICOIDES* INFECTION AMONG ELEMENTARY SCHOOL CHILDREN AT POREBADA VILLAGE IN HIRI DISTRICT, CENTRAL PROVINCE, PAPUA NEW GUINEA

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ABSTRACT:
Trichuris trichiura that causes trichuriasis and *Ascaris lumbricoides* that causes ascariasis are highly prevalent among elementary school children in some developing countries. The aim of this study was to determine the prevalence of *Trichuris trichiura* and *Ascaris lumbricoides* among elementary school children at Porebada village, in Hiri district, Central province, Papua New Guinea. This was a prospective purposive cross sectional study. All the children were in the age group 7 to 11 years. Consent was obtained from only 58 (64.4%) of the 90 children in the school. Single stool sample was collected from each of the 58 children (40 males and 18 females). The stool samples were examined for *Trichuris trichiura* and *Ascaris lumbricoides* ova using the recommended direct saline method. A total of 79.3% (46/58) of the children (51.7% males and 27.6% females) were infected. Of the 46 children infected, double infection (*Trichuris trichiura* and *Ascaris lumbricoides*) was prevalent among 47.8% (22/46) of them and single infection (*Trichuris trichura* 2/46 and *Ascaris lumbricoides* 22/46) was prevalent among 52.2% (24/46). The high (79.3%) infection rate observed in the present study should be of concern to the health authorities because of the impact on the health of the school children and possible negative effect on their learning ability and concentration in school work.

Keywords: *Trichuris trichiura, Ascaris lumbricoides,* elementary school children
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INTRODUCTION:

Roundworms infection particularly *Trichuris trichiura* that causes trichuriasis and *Ascaris lumbricoides* that causes ascariasis are distributed globally especially in the rural areas in some developing tropical and subtropical countries [1]. In 2010 the World Health Organization (WHO) stated that approximately one billion humans have ascariasis, about 800 million have trichuriasis, and between 500 to 750 million have hookworm infections worldwide [1]. The effects of both *Trichuris trichiura* and *Ascaris lumbricoides* are often asymptomatic if the infestation is light.

However, heavy infection of *T. trichiura* has been implicated in rectal prolapse and chronic dysentery [2]. Heavy *A. lumbricoides* infection can also results in serious pathology due to migrations of the worms in the body [2, 3]. Both infections have an adverse effect on physical fitness, cognitive performance [4], nutritional status, growth as well as school attendance of school age children [4, 5, 6].

According to the WHO, improving the health and wellbeing of the population is a policy that all countries must implement. The Papua New Guinea (PNG) government accepted this and other health policies proposed by the WHO. Thus, in 2015 the government adopted and implemented the PNG Water, Sanitation and Hygiene (WaSH) Policy 2015 to 2030 [7]. The policy embodies the commitment of the PNG government to sustainably improve the health and wellbeing of the people especially women and children in the rural, urban and remote of the country. This policy focuses on improved service delivery of drinking water, sanitation and promoting long term hygiene behaviour change (collectively known as WaSH) in all the communities [7]. Improved access clean water, toilet facilities in schools and homes among others are essential for human development and therefore the sustainable development of the country. Successful implementation of this policy requires the availability of appropriate data on the sanitation and hygiene practices among the various communities in PNG.

The study was prompted by the very scanty data on the prevalence of *A. lumbricoides and T. trichiura* infestations among elementary school children in PNG [8, 9]. There are no published data on the prevalence of *A. lumbricoides and T. trichiura* infestations among elementary school children in the Hiri district in the Central Province in PNG.

The aim of this study was to determine the prevalence of *Trichuris trichiura* and *Ascaris lumbricoides* among elementary school children in the Porebada village, in Hiri district, Central province, PNG.

METHODOLOGY:

This was a prospective purposive cross sectional study carried out between August 2016 and October 2016. The study population consisted of elementary school children attending Porebada Community School at Porebada village, Hiri district in Central province in PNG. This is the main elementary school in Porebada village. Defecation by the community is in the open fields, bushes, drains and pit latrines. At the school there is one toilet building divided for both gender and shared by all the school children in the Porebada Community School.

Ethical clearance and permission for this project was obtained from the ethical and

research grant committee in the School of Medicine and Health Science (SMHS), University of Papua New Guinea (UPNG) and from the authorities in the Porebada Community School.

All the 90 children attending the school were selected to participate in the study. After obtaining informed and written consent from the parents or guardians, clean wide mouth plastic vial with lid was given to each of the children whose parents gave consent. Standard procedure for sample collection and precautions were explained clearly and thoroughly to the children and their parents and guardians individually. A structured pre-tested questionnaire was used to obtain information on the socio-economic status, living environment, demographic data, sanitary facilities, worm treatments and behavioural habits like washing hands before meals, drinking boiled water and use of foot-ware.

The faecal samples of the consented children were collected and transported to the laboratory for analysis by a qualified medical microbiologist in the Medical Laboratory Sciences discipline department of Health Sciences in the SMHS UPNG. Each faecal sample was examined for *T. trichiura* and *A. lumbricoides* ova using the WHO approved protocol [3]. Each faecal sample was also examined macroscopically for texture and colour. For microscopy, approximately 2 grams of stool was added into 10 ml of saline solution, and then mixed using vortex mixture. Two drops of the mixture was placed on the clean glass slide, cover slip applied and examined for ova and results recorded [3]. The results obtained were analysed using Epi Info 7 and Microsoft Excel Data pack 2010.

RESULTS:

Consent was obtained from 58 (64.4%) of the 90 children selected to participate in this study. Gender distribution of the 58 children showed that 69.0% (40/58) were males and 31.0% (18/58) were females.

Of the 58 children that participated in the study 46 (79.3%) were infected with either *T. trichiura* causing trichuriasis or *A. lumbricoides* causing ascariasis or both (double infection). The single infection by *T. trichiura* was prevalent among 4.3% (2/46) of the children compared to single infection by *A. lumbricoides* that was prevalent among 47.8% (22/46) of the children. The double infection by *T. trichiura* and *A. lumbricoides* was prevalent among 47.8% (22/46) of the children. Table 1 shows gender distribution of the prevalence of single and double infections among the 46 infected children.

The highest infection rate (91.3%) was among children in the 7 to 9 years age group compared to 8.7% among children in the 10 to 11 years age group (Table 2). Analysis of the questionnaires indicated that of the 58 children

49 (84.5%) had toilets in their homes; 54 (93.1%) got water for drinking from water taps while 4 (6.9%) got water for drinking from tanks and drums.

The children were asked if they have experience symptoms such as diarrhoea, abdominal pain, nausea and vomiting, weakness and diarrhoea with blood. Of the 58 children 51 (87.9%) responded that they have experienced at least one or more of those symptoms, while 7 (12.1%) said they had never experience any of the symptoms. Answers to questions on hand washing before eating, use of toilet and foot-ware are presented in Table 3. Most of the children (62.1%) sometimes wash their hands before eating, 37.9% sometimes use toilets and 24.1% never use the toilet because they only use the open field. Foot ware was not used at school by 17.2% (10/58) of the children and 72.4% (42/58) only sometimes wear foot ware at school.

Table 1: Gender distribution of the prevalence of single and double infections among the 46 infected children.

		Single infection		Double infection
	N	***Trichuris trichiura***	***Ascaris lumbricoides***	***T. trichiura & A. lumbricoides***
Male children	30	2 (6.7%)	14 (46.7%)	14 (46.7%)
Female children	16	0	8 (50.0%)	8 (50.0%)
Total	46	2 (4.3%)	22 (47.8%)	22 (47.8%)

Table 2: Prevalence (%) of infection among the 46 children in the 7 to 11 years age group

Age (years)	7	8	9	10	11
Number (%) of children	13 (28.3%)	15 (32.6%	14 (30.4%)	3 (6.5%)	1 (2.2%)

Table 3: Answers to questions on attitude and practice by the 58 children that participated in this study

Questions	**Always**	**Sometimes**	**Never**
Wash hands before eating?	22 (37.9%)	36 (62.1%)	0
Wash hands with soap and water?	10 (17.2%)	48 (82.8%)	0
How often do you use the toilet?	22 (37.9%)	22 (37.9%)	14 (24.1%)
Wearing footwear to school	6 (10.3%)	42 (72.4%)	10 (17.2%)

DISCUSSION:

A. lumbricoides and *T. trichiura* infections in elementary school children are reported for the first time in this area. In this prospective study, the results show that majority (79.3%) of the children had either single or double infection. Among the two single infections, ascariasis infection was higher (47.8%). The higher number of *A. lumbricoides* in this study was similar to that reported by Leykun [10] in Northwest Ethiopia. In addition 47.8% of the children in our present study had both trichuriasis and ascariasis infections (double-infection) which is also similar to the results obtained by others [10, 11]. It is not surprising to see the double infection in children because the two species have similar mode of transmission and life cycle [2].

A. lumbricoides was more prevalent among the male children. Similar findings have been reported among children in other elementary schools in the Central Province in PNG [9]. In another study the authors reported that *T. trichiura* infection was common among school children, with higher proportion amongst the male than female children [9]. The differences in the prevalence among the gender appear to be associated with environmental sanitation, water supply, individual habits and socioeconomic status of the households, although this needs to be verified in more extensive follow up studies.

The high infection rate among children in the 7 to 8 years old age group indicates that the young children are the high risk groups in the community and serves as one of the sources of infection and transmission. Helminths such as *A. lumbricoides* and *T. trichiura* can also impair the mental and physical development of children [4]. If left untreated they can affect the lungs, heart and liver as well as other body tissues [1,2,13]. These infections can cause anaemia when haemoglobin levels decrease as a result of malabsorption of nutrients and bleeding in the gastrointestinal tract in general [6]. These conditions can affect the learning ability of young children in school.

This should be of great concern to the health authorities in the community, the district and province. It is therefore important to develop appropriate public health strategies to ensure that young children are free from trichuriasis and ascariasis infections. The authorities should provide safe and adequate water supply, proper toilets for the schools and homes, reduce defecation in the open fields or bushes, carryout intensive advocacy and health education aimed at bringing behavioural changes in the community. In addition, periodic de-worming should be carried out among

young children to eradicate trichuriasis and ascariasis infections.

The answers of the participants to questionnaires indicate that washing hands with soap before eating, using proper foot ware and using proper toilets were not very common practices in the community. Tilahu et al [5] reported that the habits of children not wearing shoes to school and not washing hands before eating are associated with increased number of soil transmitted helminths infection. The authors also reported that transmission of both of these species was due to ingestion or penetration of infective eggs. The result in the present study highlights the need for intensive education and awareness campaign to improve sanitation and promoting long term hygiene behaviour change in the community. This can be achieved by effective implementation of the PNG WaSH policy [7].

The Policy aims to reverse the prevailing unhealthy practices and improve water, sanitation and hygiene service delivery for the benefit of the people and in doing so improve personal health, productivity and well-being. Access to these services is a vital component of sustainable development and the alleviation of poverty in the community [7].

CONCLUSION:

A total of 79.3% (46/58) of the children (51.7% male and 27.6% female) attending the Porebada elementary school that participated in this study had either single or double infection of the species *A. lumbricoides* and *T. trichiura.* The highest infection rate (91.3%) was among children in the 7 to 9 years age group compared to 8.7% among children in the 10 to 11 years age group. Of the 58 children 49 (84.5%) had toilets in their homes; 62.1% sometimes wash their hands before eating, 37.9% sometimes use toilets and 24.1% never use the toilet because they defecate in the open field. The result highlights the need for intensive education and awareness campaign to improve sanitation and promoting long term hygiene behaviour change in the community. This can be achieved by effective implementation of the PNG WaSH policy.

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