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Survey of Intestinal Parasites Including Associated Risk Factors Among Food Vendors and Slaughterhouse Workers in Metro Manila, Philippines

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Abstract

Infections by intestinal parasites are considered as one of the major health concerns in developing countries afflicting different groups of people including food handlers and food vendors and are linked to poor personal hygiene and sanitation. This raises public health issues as food vendors and handlers may potentially become agents for the fecal-oral transmission of intestinal parasitic infections to consumers. This study focused on determining the prevalence of intestinal parasites among slaughter house workers and food vendors and examined their personal and food hygiene practices. A small-scale survey was conducted and selected a total of 91 slaughter house workers and food vendors from different areas in Metro Manila. Microscopic examination of the fecal samples collected was done following standard procedures by the World Health Organization (WHO) thru direct smear, formalin-ethyl acetate sedimentation and staining methods. Participants were also interviewed on their food and personal hygiene practices using a questionnaire. The overall prevalence of parasitic infection was 90% with helminthic predominating protozoan infections. Eight (8) different intestinal parasites were identified: Entamoeba histolytica/Entamoeba dispar (15.6%), Balantidium coli (8.4%), Giardia lamblia (4.2%), Ascaris lumbricoides (30%), Trichuris trichiura (14.9%), Ancyclostoma duodenale/ Necator americanus (2.3%). Taenia spp. (2.4%), and Enterobius vermicularis (2.9%). Other amoeba-like protozoans (19.2%) were also observed suggestive of exposure to fecal materials. Based on the results obtained, there is high levels of parasitic infections among slaughter house workers and food vendors. Raising awareness on proper food handling, improved personal hygiene and sanitation is needed to prevent further transmission of parasites to the public.

Keywords: Food handlers, Food safety, Intestinal parasites, Neglected Tropical Diseases, Public Health.

1. Introduction

The emerging fecal-oral parasitic infection associated with water and food is a major concern worldwide with high incidence in the developing countries [13]. This disease has been afflicting the poorest and the most deprived communities in Sub-Saharan Africa, America, Asia and other tropical and subtropical areas thus, considering it as one of the neglected tropical diseases that causes global burden for decades [6, 13].

The World Health Organization (2016) reported a threat of parasitic infections among 7 million Filipinos in the country after a series of food- and waterborne diseases outbreaks in the last five years.

Parasitic infections have been shown to be associated with chronic and insidious effects including anemia, growth retardation, impairment of cognitive and physical development and mortality [4, 5, 11]. This can be acquired thru intake of contaminated food and water containing infective stages of the parasites. Direct contact with contaminated water, feces, soil and vegetation are the common ways linked to the infections [10].

Thus, the proliferation of several types of parasitic infections, particularly of intestinal parasites, is attributed to poor environmental and personal hygiene and sanitation [12].

Among the groups at risk for parasitic infections are food handlers who serve in institutions; in schools, hotels, jails including sidewalk/street vendors [2]. Several factors are known to favor food-borne parasitic transmission during food handling processes but highly in particular the unsanitary environment where food preparation is done. Other factors include poor storage of food and drinks, improper cooking of meat, poor personal hygiene of food handlers and servers, overcrowding and limited access to clean water [3, 7, 8, 14].

Another group that is at risk from parasitic infections and may become agents to spread contamination is the slaughterhouse workers. Their facilities and practices are prone to poor sanitation that may increase occupational exposure to disease. Additionally, contaminated meat may also enter the consumer market that can build up parasitism[7-8].

Epidemiological information on the prevalence of various intestinal parasitic infections in different sectors of the society and localities is very important for the development of appropriate control strategies. Given the current situation, this study aimed to

provide baseline information by assessing the intestinal parasitic infection and associated risk factors among food vendors and slaughterhouse workers in Metro Manila, Philippines.

2. Objectives of the Study

The study aimed to determine the prevalence of intestinal parasites among surveyed food handlers and the associated risk factors particularly their food and personal hygiene. The responses of the participants from the survey were compared to those who are positive for parasitism.

3. Materials and Methods

3.1. Research method and design

A descriptive with correlation type of research was conducted in the month of January to February 2017 in Metro Manila. The determined prevalence of intestinal parasitism among the participants was associated with the assessed personal food and hygiene-related risk factors.

3.2. Study site

The study was carried out among slaughterhouse workers and food vendors who were randomly selected from the different areas of Metro Manila.

3.3. Participants

The study team recruited food vendors and slaughterhouse workers from different target areas in Metro Manila. The criteria for the selection of participants include; working in slaughterhouse as butcher or as food vendor/street food vendor for more than one (1) year, ages 18 and above. In total, forty-one (41) slaughterhouse workers (45%) and fifty (50) food vendors (55%) participated in the study for a total of ninety-one (91) participants. Primary data was collected by using a survey questionnaire. The questionnaire was reviewed and pilot-tested prior to use and distribution with food handlers. The survey consisted of four categories: (i) socio-demographic profile, (ii)

personal hygiene, (iii) food hygiene and (iv) sanitation practices was administered by face to face interview.

3.4. Ethical consideration

The study was approved by the research review committee of the Polytechnic University of the Philippines.

A short description about the main objective and the importance of the research was explained to the respondents before the distribution of the questionnaire. The willingness to participate was warranted through a secured written consent.

3.5. Fecal sampling and processing

Participants were given fecal-sampling kit containing sterile stool cup, gloves and newspaper. Each participant was given ample instructions on proper fecal sample collection. Each container was carefully labelled and coded then immediately transported to the ISTR- Laboratory of the Polytechnic University of the Philippines for detection of parasites.

Briefly, ten-percent (10%) of formalin was added to the fresh fecal specimens in the container. The detection was made on direct wet mount with stains and formalin-ether concentration. Observation for intestinal parasites was done following the standard procedure described by the World Health Organization (WHO) and observed parasites were compared and confirmed using WHO Bench Aids for the Diagnosis of intestinal parasites.

3.6. Statistical Analysis

A Chi-square test was used to assess associations among the variables. SPSS 16 software was used for statistical analysis. The results were expressed in percentages and were significantly different at 5% when $P< 0.05$.

4. Results and Discussion

4.1. Socio-demographics characteristics of participants

Participants were categorized according to the nature of their work. There were forty-one (41) slaughterhouse workers (45%) and fifty (50) food vendors (55%) participated in the study for a total of ninety-one (91) participants. Collectively, they are classified as food handlers in this study.

Majority of the participants were within the age of 41-50 years old (33%) followed by 21-30 years old (25%), 31-40 years old (20%), 18-20 years old (16%) and 51 years old and above (5%). There are 34 females (37.4%) and 57

The socio-demographic characteristics of study participants in relation to their intestinal parasitic infections are illustrated in Table 1. The percentage shown is based on the overall number of infected participants (82).

As indicated in the table, there is a higher rate of parasitic infections among males than females regardless of the type of parasite/s detected. Although findings cannot conclude which among sex groups would most likely to acquire STH infections, it is striking to note that sex is a significant risk factor as revealed by a P-value < 0.003. One possible reason of the lower prevalence among females is their natural hygiene-conscious behavior [1] but it can also be an indicative of other factors such as host genetics so further investigation in relation to sex groups needs to be taken.

In relation to age, the prevalence of intestinal parasitic infections compared to the overall positive samples was higher among individuals within the age of 41-50 years old followed by the participants within the age group of 21-30 years old. It is also observed that the five participants aging 50 years old & above are all infected. This can be linked to the suppressed immune system of older individuals. This finding has weak association to STH infection with a P-value of < 0.131.

The socio-economic status of the participants was also examined. It shows that most of the participants (47/91) earned P5, 000.00 and below monthly income while only 4 out of 91 participants earn P21, 000.00 and above. Several studies linked the likelihood of STH infection as significantly higher among poor individuals. This is supported by the current findings with higher prevalence of parasitic infections among participants with a monthly income of P10, 000.00 & below and mostly prevalent among participants with a monthly income of P5, 000.00 & below.

It is also notable that all participants with elementary, either graduate or undergraduate, as the highest educational attainment are infected by intestinal parasites (18/18).

Table 1: Socio-demographic characteristics of study participants.

Characteristics	No.	Infected	%	P-value
Sex				
Male	57	53	64.63	0.003
Female	34	29	35.36	
Age				
18-20 y/o	15	14	17.1	0.131
21-30 y/o	23	22	26.8	
31-40 y/o	18	17	20.7	
41-50 y/o	30	24	29.3	
51 & above	5	5	6.1	
Education level				
College (g*)	7	5	6.09	0.637
College (ug*)	21	20	24.39	
Elementary (g)	10	10	12.20	
Elementary (ug)	8	8	9.76	
High School (g)	15	13	15.85	
High School (ug)	30	26	31.71	
Economic status				
P5,000 & below	47	42	51.22	0.864
P 6,000 – 10,000	29	26	31.71	
P11,000 - 20,000	10	10	12.20	
P21,000 & above	5	4	4.88	

The lowest prevalence was observed among the participants who graduated in college (71.4%).

4.2. Prevalence of intestinal parasitic infection

Among the 91 participants, 82 (90%) are infected with any intestinal parasites. Table 2 presents the type and prevalence of intestinal parasites detected from stool specimens

of food vendors and slaughterhouse workers. It also shows the types of parasitic infection based on the parasite species detected in each participant.

Table 2: Type and prevalence of intestinal parasites detected from stool specimens of food vendors and slaughterhouse workers.

Parasite species and type of parasitic infection	Frequency (%)
Entamoeba histolytica/ Entamoeba dispar	26 (28.57%)
Balantidium coli	14 (15.38%)
Giardia lamblia	7 (7.69%)
Amoeba-like protozoan	32 (35.16%)
Ascaris lumbricoides	50 (54.94%)
Trichuris trichuria	25 (27.47%)
Ancyclostoma duodenale/ Necator americanus	4 (4.39%)
Taenia spp.	4 (4.39%)
Enterobius vermicularis	5 (5.49%)
Protozoan parasite infection	12 (13.18%)
Helminthes parasite infection	29 (31.86%)
Dual Protozoan parasite infection	8 (8.79%)
Dual Helminth parasite infection	5 (5.49%)
Multiple parasitic infection	28 (30.76%)
None	9 (9.89%)

Infection with only one helminths species was the most common (31.86%) while infection with dual helminths infection per infected participant was rare (5.49%). There were also 28 participants who were detected with multiple parasitic infections (30.76%).

Protozoan was also detected from some participants. There were 12 participants (13.18%) detected with just one species of protozoan while 8 participants (8.79%) were detected with dual protozoan infection.

Nine (9) species of parasites detected from the participants. *Ascaris lumbricoides*, a soil-transmitted helminth, was the most common detected parasite with a prevalence of 54.94% (Fig. 1) The least detected parasites are *Giardia lamblia* (7.69%), *Enterobius vermicularis* (5.49%), *Ancyclostoma duodenale/ Necator americanus* (4.39%) and *Taenia* spp. (4.87%).

The other common parasites detected were Amoeba (39.0%), *Entamoeba histolytica /Entamoeba histolytica* (31.7%) *Trichuris trichiura* (30.4%) and *Balantidium coli* (17.0%).

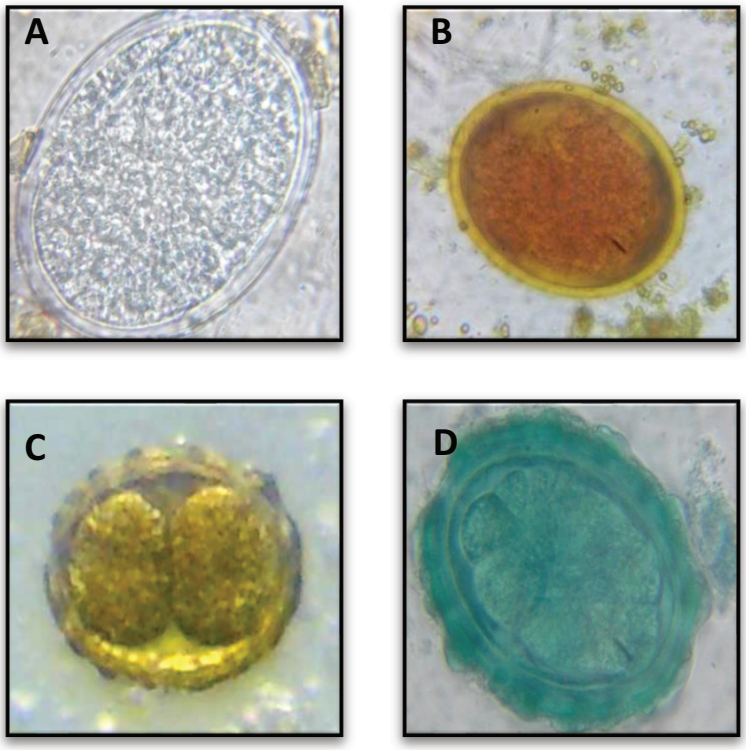

Figure 1: Actual photographs of *Ascaris lumbricoides* detected. A. Decorticated *A. lumbricoides* (unstained), B. Decorticated *A. lumbricoides* in Lugol's iodine stain, C. Corticated *A. lumbricoides* in Lugol's iodine stain, and D. Corticated *A. lumbricoides* in malachite green..

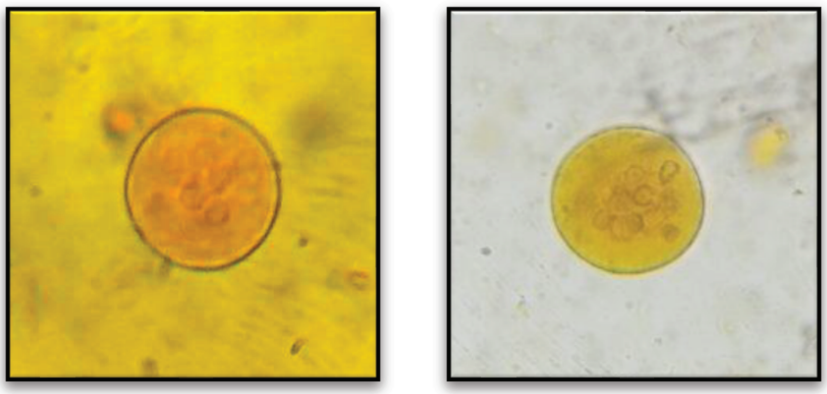

Figure 2: Actual photographs of amoeba cysts found in fecal samples.

4.3. Associated risk-factors

Several factors which predispose food handlers to risks of parasitic infections are shown in table 3.

Table 3: Food-related and personal hygiene risks.

Food-related risks	**No.**	**Infected (%)**	**p-value**
Eating raw fruits and vegetables	82	74	0.592
Not eating raw fruits and vegetables	9	8	
Eating unwashed fruits and vegetables	72	65	0.761
Not eating unwashed fruits and vegetables	13	22	
Eating raw meat	16	14	0.717
Not eating raw meat	75	68	
Eating street foods	80	73	0.239
Not eating street foods	11	9	
Drinking street-sold drinks (*buko, gulaman* etc.)	67	63	0.257
Not drinking street-sold drinks (*buko, gulaman* etc.)	24	19	
Eating with bare hands	72	65	0.764
Not eating with bare hands	19	17	
Drinking tap water	48	46	0.375
Not drinking tap water	43	36	
Personal hygiene risks			
Washing hands before eating meals	88	79	0.815
Not washing hands before eating meals	3	3	
Frequent cutting of nails	83	74	0.448
Seldom cutting of nails	8	8	
Owning a family toilet/private toilet	74	66	0.011
Not owning a family toilet/private toilet	17	16	
Washing hands after toilet	89	80	0.333
Not washing hands after toilet	2	2	

4.4. Food-related risks

Intestinal parasitic infection is usually linked to zoonosis, however, the quality of food taken by the food vendors and slaughterhouse workers can give light to the possible route of parasite transmission. Since most of the participants have a low economic status, they are likely to patronize affordable food for the consumers which happens to be usually cheap but unsafe [9].

There are 65 (79.2%) out of 82 infected participants eat unwashed fruits and vegetables while 74 (90.2%) eat raw fruits and vegetables ($p < 0.761$; $p < 0.592$).

Eating raw meat was not a common practice among most of the participants. There are only 16 (17.5%) out of 91 total participants practice eating raw meat with 14 of them infected with parasite/s ($p < 0.717$).

While early reports show high percentage of participants washing their hands before meal, there is also high percentage of participants eating with bare hands. From 82 infected participants, 65 (79.2%) of them do not usually use spoon and fork during meals ($p < 0.764$).

To cover the risks of waterborne parasitism, participants were asked regarding the water and the beverages they drink. Almost half of the participants do not drink tap water. Out of 82 infected participants, 46 (56.0%) of them drinks directly from the faucet without any treatment but 63 (76.8%) of them drink street-sold beverages like "buko" and "sago't gulaman" which may possibly mixed with tap water ($p < 0.257$).

Lastly, participants reported eating several types of street foods. There are 80 (87.9%) out of 91 total participants eat street foods. There are 74 (90.2%) of them infected with parasites ($p < 0.239$).

4.5. Hygiene and sanitation

Of the 91 participants, 88 (96.7%) reported washing their hands before eating meals but 79 (86.8%) of them are infected by parasites ($p < 0.815$). While the intensity and manner of washing their hands were not sought in this study, participants reported frequent cutting of nails. Fingernail plays a vital role in any fecal-oral human-to-human parasite transmission as long nails harbor the most microorganisms and most difficult to clean. Out of 82 participants detected with parasites, 74 (90.2%) of them answered

frequent nail cutting ($p < 0.448$). The surveyor made a discreet observational assessment of the cleanliness of the participants' hands and fingernails and was observed generally clean.

To further investigate the level of hygiene and sanitation, the participants were asked on owning toilet facility. Out of 91 participants, only 74 (81.3%) of them own a family or private toilet. There are 66 (72.5%) participants with private toilet who still acquired parasitic infection ($p < 0.011$). While the condition of latrines is important to understand risk factors, hand-washing after toilet use is also a good indicator. Majority of the participants understand the importance of washing their hands after defecation with only 2 participants, either infected or not, answered NO to this particular question ($p < 0.333$).

This study strongly supports existing findings on how lack of sanitary toilet facility may put the public at high risks of parasitic infections.

5. Conclusion and Recommendation

The results of this study demonstrate high prevalence of intestinal parasitic infection among food vendors and slaughterhouse workers in Metro Manila.

Food handlers are suspected to be carrying wide range of intestinal parasites and have been implicated in the transmission of many infections to the public. It is imperative to ensure that food handlers understand epidemiology of parasitic infections. This promotes intrinsic obligation in the most practical and economic control and prevention measures.

Large-scale study about the prevalence of intestinal parasitic infections among the food handlers in Metro Manila is highly recommended. Meanwhile, employers are advised to strictly consider personal hygiene and food handling training among their employees in order to prevent transmission of parasites to the consumers. While sampled participants appeared to be positive in intestinal parasites, employers are recommended to refer employees to medical doctor and to be given anti-protozoal/helminthic medications to avoid worsening of the condition.

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