International Journal of Food Science and Biotechnology
2017; 2(1): 1-5
http://www.sciencepublishinggroup.com/j/ijfsb
doi: 10.11648/j.ijfsb.20170201.11

High Prevalence of Intestinal Parasite Carriage Among Food Handlers in the Gambia

Haruna S. Jallow[1, *], Abou Kebbeh[1], Olliemattou Sagnia[1], Baba Fofona[3], Sana M. Sambou[2], Yaya Camara[2], Ignatius Baldeh[1], Bakary Sanneh[1]

[1]National Public Health Laboratories, Ministry of Health and Social Welfare, Banjul, The Gambia

[2]Epidemiology and Disease Control Department, Ministry of Health and Social Welfare, Banjul, The Gambia

[3]Medical Microbiology Laboratory, Edward Francis Small Teaching Hospital, Banjul, The Gambia

Email address:

harunajallow@gmail.com (H. S. Jallow), kebbehabou@yahoo.com (A. Kebbeh), o.sagnia@gmail.com (O. Sagnia), bkfofana@yahoo.co.uk (B. Fofona), sanamsambou@hotmail.com (S. M. Sambou), immbaldeh@hotmail.com (I. Baldeh), sheikbakary@yahoo.com (B. Sanneh)

[*]Corresponding author

To cite this article:

Haruna S. Jallow, Abou Kebbeh, Olliemattou Sagnia, Baba Fofona, Sana M. Sambou, Yaya Camara, Ignatius Baldeh, Bakary Sanneh. High Prevalence of Intestinal Parasite Carriage Among Food Handlers in the Gambia. *International Journal of Food Science and Biotechnology.* Vol. 2, No. 1, 2017, pp. 1-5. doi: 10.11648/j.ijfsb.20170201.11

Received: January 29, 2017; **Accepted**: February 21, 2017; **Published**: March 9, 2017

Abstract: Background: Most of the world population is approximately infected with intestinal parasites, the burden of this infection is mainly found in people living in developing countries where hygiene and environmental sanitation are poor. Gambia is not an exception to this phenomenon of poor hygiene and sanitation, therefore is at high risk of intestinal parasitic burden. Thus, this study seeks to investigate the prevalence and risk factors of parasitic infections among food handlers who sells food at Lower Basic Schools in the West Coast Region in The Gambia. Methods: This cross-sectional descriptive study used 540 stool samples stored at 10% formaldehyde collected from different food handlers during a study titled (Prevalence and risk factors of fecal carriage of Extended Spectrum β-Lactamase producing Enterobacteriaceae amongst food handlers in Lower Basic Schools in West Coast Region of The Gambia). Stool samples were examined microscopically using both normal saline and iodine for identification of cysts and eggs, larval of intestinal parasites using direct microscopes. Statistical analysis was done using SPSS version 16 and Microsoft excel version 2010 software to determine the risk factors. Results: Of the 540 food handlers administered, 536 (99.3%) were females. It was found that 250 (46.3%) were intestinal parasite carriers. *Entameoba histolytica/dispar* 150 (46%) followed by *Giadia lamblia* 52 (16%), *E. coli* 40 (12.3%), *E. harmana* 20 (6.1%), Strongloides 18 (5.5%), *Ascaris lumbricoides* 14 (4.3%), *Iodamoeba butschlii*, 9 (2.8%), *Teania* spp. 6 (1.8%), *Diphyllobotrum latum* 3 (0.9%), *Hookworm* 3 (0.9%), *Fasiola hepatica* 2 (0.6%), *Hymenolepis dimunta* 2 (0.6%), *Tricguris Trichura* 1 (0.3%), *Fasiola Buski* 1 (0.3%), *Hymenolepis nana* 1 (0.3%) and *V. nana* 4 (1.2%) were the parasites identified from the studied. Most of the food handlers were certified for handling food 483 (89.4%) and 492 (91.2%) know the principle of food safety. Among the risk factors, living with domestic animals, lack of training in food handling and hand washing practices with P-value of (0.014), (0.017), and (0.056) respectively and 95% Confidence Interval was associated risk factors of intestinal parasite infections. Conclusions: This study showed high prevalence of intestinal parasites among food handlers. Training of food handlers on proper methods of food preparation and practice of good personal hygiene should be conducted on regular basis. Since, transmissions of intestinal parasites are by fecal-oral route, food handlers are important sources of infections. Epidemiological surveillance and quarterly screening of food handlers should be done by qualified personnel for isolation of intestinal parasites.

Keywords: Food Handlers, Intestinal Parasites, Risk Factors, Prevalence, West Coast Region, The Gambia

1. Background

Parasitic infection is a public health threat globally, especially in developing nations with low level of education, poor sanitary conditions, and poor personal hygiene. The most common parasitic infections are caused by *Ascaris lumbricoides*, *Trichuris trichiura, Entamoeba histolytica* and *Giardia lambia* [1]. This prevalence depends on factors like climate, the practice of personal hygiene, education and socioeconomic status of the studied participants [2].

A desk review on the situation of Neglected tropical diseases in The Gambia was conducted, which revealed the paucity of data on soil transmitted helminthiasis (EDC, 2014). The subsequent mapping of soil- transmitted helminthiasis found the national prevalence of 4.5% among 10,400 school age children [15]. The same study found that the transmission was 50% in the capital city of the country. The prevalence of parasites is more common in school age children because of their frequent playing on the contaminated environment [2]. However, others studies have found that Food handlers could be the main contributors to the transmission of intestinal parasites through the food chain in the communities [2].

Food handlers with poor personal hygiene and working in food serving, place could contribute to the transmission of helminthes and protozoa. Food handlers infected with these intestinal parasites and excrete them may contaminate food with feces through their hands if not properly wash after defecation, or could either be through contaminated water or soil to foods and then to healthy individuals [3-5] Food handler is the main vehicle for the transmission of intestinal parasites which has been emphasized by many researchers. Food can be contaminated by other hazards which can cause other public health problems and thereby contributing to low economic productivity. As in many developing countries foods are prepared and sold by food vendors everywhere and sometimes under poor hygiene conditions which could lead to outbreaks of diseases of public health concern [1, 6]

This has proven that consumers are at high risk of being infected, therefore the food chain should be observed properly from the farm, preparation, transportation, preserving the food and distributing it help in avoiding contamination. Food handlers should have a good knowledge food safety principles and to know in particular the sources of contamination. Looking at the complication and the burden of parasitic diseases, it is prominent more control measures should be in place [5]. All this is possible with detailed research on the distribution and the risk factors associated with the infection. The reason for this study was to determine the prevalence of parasitic infections and the association of some epidemiological determinants.

2. Methodology

2.1. Study Design and Sites

A cross-sectional study was conducted in West Coast Region of the Gambia by the team of researchers. The region was targeted for sampling because it houses more than half of the Gambian population. This region is densely populated due to rural-urban migration for socioeconomic reasons. Most of the industries, social amenities and the majority of public and private health facilities are located in this region. The Lower Basic Schools (LBS) in this region were stratified into two educational regions, then districts and randomly selected as per the Ministry of Basic and Secondary Education's (MoBSE) approach of grouping schools.

A total 60 LBS, 30 from each region were selected randomly for the study in order to meet the 95% confidence interval of the school population. The sample size was calculated using the formula ($n=Z^2P$ (1-P) $/d^2$) yielding sample of the main study. Nine (9) food handlers were randomly selected and consented to participate in the study at each school. Schools with fewer food handlers were added from the neighboring school food handlers.

Single stool samples were collected from each consented food handler in a well label transparent and leak proof screw cap plastic container of about 30ml. The samples were immediately recorded by the field staff in the chain of custody form and samples were transported in a cold chain and delivery at the laboratory within 6 hours.

2.2. Data Collection and Laboratory Processing

The consented food handlers were interviewed by the field staffs with standardized questionnaires looking at their demographic information and other risk factors for the potential carriage of intestinal parasites.

All questionnaires were cross checked for accuracy and food handlers were instructed to put about 2g of uncontaminated fresh stool. Each sample was examined for proper labeling, collection procedure and the quantity was also examined. A portion of the specimen for the Extended Spectrum Beta-lactamase (ESBL) study and the remaining stool sample was banked in a Formal solution for the prevalence of Intestinal parasites. These banked samples were emulsified with the formalin solution and two drops was put on both ends of a slide and examined directly, one with lugol's iodine and the other without for the detection of larva of intestinal parasites, cysts, trophozoites and eggs. Futhermore, formal-ether concentration technique was used. 10X and 40X objective lens were used for both techniques.

The stool examination was done by two laboratory technologists with two different microscopes to look for the larvae of helminth, cysts, eggs and trophozoites.

2.3. Statistical Analysis

The data were entered into the Epi Info database which was cleaned and checked for concordance before the analysis. The categorical data were analyzed using SPSS version 16 software. Pearson Chi-Square and fisher's exact test of crosstab method were used to look for the association of risk and socio-demographic factors to the prevalence of intestinal parasites. The statistical significant value was set at $P<0.05$.

3. Results

3.1. Demography

A total of 600 food handlers were enrolled in the study and 540 study participants with complete data set were included in the analysis. A total of 99.3% of food handlers were female with a mean age of 37yrs. Most of the study participant stayed less than 5km from the nearest health facility. The majority of food handlers has been selling and preparing food for not more than 4yrs and had been certified. Only (17%) of food handlers have been trained in food safety procedure and a high percentage of 91.2% acclaimed to know the principle of food safety as shown in table 1.

Table 1. *Demographic characteristics of the study participants.*

Characteristics	Number of respondents	%	P-value
Female Gender	536	99.3	0.452
Mean Age (yrs)	37		0.112
Staying in homes <5km from health facility	531	98.5	0.698
Raring domestic animals.	335	62.1	0.569
Length of handling/selling food for ≤4yrs	390	72.4	0.24
Trained for food handling	97	17.9	0
Certified for food handling	483	89.4	0.103
Know the principle of food safety	492	91.2	0.002

Prevalence of Intestinal Parasites

Out of the 540 study participants 250 (46.3%) were positive for different intestinal parasites of which 75 (14%) of the total infected study subjects are co-infected. A total of 262 (80%) of the parasites is protozoa while 64 (20%) are helminthes.

The most prevalence parasite is *Entameoba histolytica/ dispar* 150 (46%) followed by *Giardia lamblia* 52 (16%), *E. coli* 40 (12.3%), *E. harmana* 20 (6.1%), *Strongloides* 18 (5.5*%), Ascaris lumbricoides* 14 (4.3%), *Iodamoeba butschlii* 9 (2.8%), *Teania* spp 6 (1.8%), *Diphyllobotrum latum* 3 (0.9%), *Hookworm* 3 (0.9%), *Fasiola hepatica* 2 (0.6%), *Hymenolepis dimunta* 2 (0.6%), *Tricguris Trichura* 1 (0.3%), *Fasiola Buski* 1 (0.3%), *Hymenolepis nana* 1 (0.3%) and *V. nana* 4 (1.2%) were the parasites detected from the infected participants of whom 75 (14%) are co-infected as shown in table 2.

Table 2. *Type and prevalence of intestinal parasites among the food handlers.*

Parasites	Number	Percentage
E. histolytica/dispar	150	46
Giadia lamblia	52	16
Ascaris lumbricoides	14	4.3
Entamoeba coli	40	12.3
Strongloides Stercularis	18	5.5
Hookworm	3	0.9
Teania spp	6	1.8
Fasiola hepatica	2	0.6
Fasialo Buski	1	0.3
Iodamoeba butschlii	9	2.8
Diphllobotrum latum	3	0.9
V. nana	4	1.2
Hymenolepis dimunuta	2	0.6
Hymenolepis nana	1	0.3
Trichuris Trichura	1	0.3
Entamoeba harmana	20	6.1
Total	326	99.9

Intestinal parasitic infections and associated risk factors

The risk factors were examined for any linkage with parasitic infection among the study subjects. This study, which is the first of it's kind among food handlers in the Gambia showed the 46.3% of the study participants are infected with at least one parasite.

Living with domestic animals of P-value (0.014) was significantly associated with parasitic infection among the study subjects. It was seen that, people living with domestic animals are more likely to be infected with intestinal parasites than those living without domestic animals. Lack of Training (p=0.017), there is high significant association between parasitic infestations with food handlers that lack knowledge in food safety practices. The likelihood of infection was more common in the participants with little or no knowledge on food safety principles than the ones who have knowledge or idea of food safety principles. Diarrheal episode (p=0.042) in the last three (3) months had a significant association with the prevalence of both protozoa and helminthes infection among the food handlers tested than those with no diarrheal episode within the last three (3) months.

Normally washing hands with soap under running water (0.056) 95%, CI is not significantly associated with the rate of parasitic infection of food handlers. In addition, had a urinary tract infection in the last three months had no association with parasitic infection of both helminthes and protozoan as shown in table 3.

Table 3. *Risk factors of intestinal parasitic infections.*

Risk Factors	Number of Respondents	%	P-Value
Normally wash hands with soap under running water	535	99.1	0.056
Lack of Training on handling food	315	58.3	0.017
Living with domestic animals	12	2.3	0.014
Had diarrhea in the last three months	65	12	0.042
Had urinary tract infection in last three months	12	2.3	0.968

4. Discussion

Food handlers had been considered as the common route

of transmission of parasites and many diseases to consumers. This phenomena is common and an ongoing world-wide problem [1, 6, 11-13]. In our findings, most of the study participants working as food handlers in these schools are females, at an average age group of 37yrs. Similar studies in the Africa continent had shown a similar trend like that of Mohammedaman (72.6%) females, Addis Aklilu (77.9%), Mulat Dagnew (85.5%) and Fiseha Wadilo all shows where females dominated their studies. This could be women are more occupied with cooking and selling foods for their socioeconomic development [1, 4, 11, 14].

Mohammedaman mama of Ethiopia had seen the rate of parasitic infection is higher in the age group below 20 years. In reference to this study, our school age children are at risk of eating food contaminated with helminthes and protozoa from these infected food handlers.

The prevalence of the study participant infected with one or more intestinal parasites is 46.3%. This findings is similar to that of Tamirat Tefera, south west Ethiopia (44.1%), Addis Aklilu of Ethiopia (45.3%) prevalence, though our study is slightly higher, but in comparison with Mohammedaman mama (36%), Fiseha wadilo (33.68%) of Ethiopia and Mehdi Sharif 15.5% their studies are below in prevalence with ours. However, some of the studies are higher in species level, like the prevalence of *E. histolytica* are higher in Mohammedaman mama 48%, Aklilu 70.8% but higher than that of Mehdi sharif 5.5%. The variation of this prevalence could be due to the difference in climate conditions, personal hygiene, poverty and socio economic status of the studied subjects.

In our findings, we have seen different protozoa and helmintes. The highest pathogenic protozoa found in the study were *E. histolytica* (46%) follow by *Giadia lamblia* (16%) and the most prevalence helminthes were *Strongloides stercularis* (18%) follow by *Ascaris lumbricoides* (14%) and *Teania* spp. (6%). *E. histolytica* and *Giadia lamblia* are the frequent causes of diarrhea worldwide and are mainly associated with diarrhea infection in food handlers [3]. People in close contact with domestic animals, with average socioeconomic status and from poor resource countries are at high risk of getting this protozoa [7] which is similar with our finding and Gambia also being a poor resource setting country. These protozoa do not require the environment in their cycle, but can be directly consumed by customers via foods contaminated by food handlers. Therefore, food vendors having diarrhea should be exempted from cooking and selling food. High prevalence of the helminthes aforementioned could be as a result of lack of personal hygiene and the usage of poor quality water as also seen by [1, 4], because these helminthes are not a food borne pathogens and need treatment.

Lack of training of food handlers on proper method of food handling could contribute to poor personal hygiene, improper hand washing procedures by food handlers all leads to food borne diseases. Ingestion of the parasites by people, from contaminate hands as a result of working with contaminated vegetables that are from contaminated soils with eggs of parasites [2] contributes to parasitic infection.

In this study majority of the subject are females who are mainly engage in gardening for their consumption and their businesses and with this high prevalence of protozoan and helminthic infection, they can unnoticeably be transferred either through fecal-oral route, drinking or eating contaminated water and food or directly from person to person.

This study has identified lack of food handlers training, food handlers living with domestic animals and food handlers having or had diarrhea in the last three months are the risk factors for food handlers getting infected with parasites. The following limitation was noticed from this study, the antigen tests to differentiate *E. histolytica* and *E. dispar* was not available, the stools were banked samples, modern method to filter for *S. stercoralis* and hookworm were not looked at and scotch tape test for *E. vermicularis* was not done which could have led to for no recovery of *E. vermicularis*.

5. Conclusion

This study showed high prevalence of intestinal parasites among food handlers. Training of food handlers on proper methods of food preparation and practice of good personal hygiene should be conducted on regular basis. Since, transmissions of intestinal parasites are by fecal-oral route and food handlers are important source of infections. This has made of school children at high risk of getting contaminated by these infected food handlers. Epidemiological surveillance and quarterly screening of food handlers should be done by qualified personnel for isolation of intestinal parasites and treat the infected ones before handling foods.

Declarations

Ethics Approval and Consent to participate.

The study was approved by the Joint Gambia Government and Medical Research Council ethical committee with a number SCC1416. Signatures or fingerprint written informed consent were obtained from all the enrolled food handlers.

Consent for Publication

Written informed consent was obtained from all the enrolled food handlers by their signatures or fingerprints.

Author's Contribution

HSJ carried out the study design, sample collection, laboratory investigation, analysis of results and writing the manuscript. AK carried out laboratory investigation and analysis of results. OS Carried out laboratory investigation and participated in analysis of results. IB participated in the reviewing of the final manuscript. BS conceived of the study, participated in its design, coordination and helps draft the

manuscript. All authors read and approved the final manuscript.

Acknowledgement

The authors wish to acknowledge WHO Department of HSE/FOS for funding the project with a funding number SPHQ14-APW-3979., from which this study samples were stored. We acknowledge the Ministry of Health for the technical advices and uses of laboratory resources.

References

[1] M. Mama and G. Alemu, "Prevalence and factors associated with intestinal parasitic infections among food handlers of Southern Ethiopia: cross sectional study.," *BMC Public Health*, vol. 16, p. 105, Jan. 2016.

[2] E. Beatriz, S. Lauren, C. Rodrigues, and G. H. Bahia-de-oliveira, "detection of intestinal parasites in the environments of a public school in the town of diamantina, minas gerais state, brazil," no. 1, pp. 2–5, 2016.

[3] F. Kheirandish, M. J. Tarahi, and B. Ezatpour, "Prevalence of intestinal parasites among food handlers in Western Iran.," *Rev. do Inst. Med. Trop. São Paulo*, vol. 56, no. 2, pp. 111–4, 2014.

[4] M. Dagnew, M. Tiruneh, F. Moges, and Z. Tekeste, "Survey of nasal carriage of Staphylococcus aureus and intestinal parasites among food handlers working at Gondar University, Northwest Ethiopia," *BMC Public Health*, vol. 12, no. 1, p. 1, 2012.

[5] W. L. Rivera, J. A. D. L. Yason, and D. E. V Adao, "Entamoeba histolytica and E. dispar infections in captive macaques (*Macaca fascicularis*) in the Philippines," *Primates*, vol. 51, pp. 69–74, 2010.

[6] T. Tefera and G. Mebrie, "Prevalence and predictors of intestinal parasites among Food Handlers in Yebu Town, Southwest Ethiopia," PLoS ONE 9(10) e110621. doi:10.1371/journal.pone.0110621: vol. 9, no. 10, pp. 1–5, 2014.

[7] M. Elmi, "Food safety," Eastern Mediterranean Health Journal vol. 14, pp. 143–149, 1948.

[8] S. Paulo, "Prevalence of intestinal parasites among food handlers in western iran," *Rev. Med. S. Paulo:* vol. 56, no. 2, pp. 111–114, 2014.

[9] D. Oliveira, F. S. Ferreira, J. Atouguia, F. Fortes, A. Guerra, and S. Centeno-Lima, "Infection by Intestinal Parasites, Stunting and Anemia in School-Aged Children from Southern Angola.," *PLoS One*, vol. 10, no. 9, p. e0137327, Jan. 2015.

[10] S. helminthiases, "as a public health problem in children," 10.1371/journal.pntd.0002378:2011.

[11] A. Aklilu, D. Kahase, M. Dessalegn, N. Tarekegn, S. Gebremichael, S. Zenebe, K. Desta, G. Mulugeta, Y. Mamuye, and M. Mama, "Prevalence of intestinal parasites, *salmonella* and *shigella* among apparently health food handlers of Addis Ababa University student's cafeteria, Addis Ababa, Ethiopia.," *BMC Res. Notes*, vol. 8, p. 17, Jan. 2015.

[12] P. P. Duc, H. Nguyen-viet, J. Hattendorf, J. Zinsstag, P. D. Cam, and P. Odermatt, "Risk factors for Entamoeba histolytica infection in an agricultural community in Hanam province, Vietnam," *Parasit. Vectors*, vol. 4, no. 1, p. 102, 2011.

[13] M. Abdel-Dayem, R. Al Zou'bi, R. B. Hani, and Z. S. Amr, "Microbiological and parasitological investigation among food handlers in hotels in the Dead Sea area, Jordan.," *J. Microbiol. Immunol. Infect.*, vol. 47, no. 5, pp. 377–80, Oct. 2014.

[14] F. Wadilo, F. Solomon, A. Arota, and Y. Abraham, "Intestinal Parasitic Infection and Associated Factors among Food Handlers in South Ethiopia : A Case of Wolaita Sodo Town," vol. 9, pp. 18–23, 2016.

[15] Neglected tropical disease (schistosomiasis and soil transmitted helminths) mapping report *May-June, 2015.*