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Prevalence and factors associated with intestinal protozoan and helminthic infections among certified food handlers in Eldoret town, Uasin Gishu county in Kenya

Abstract

Background: Food and water remain a major source of most these intestinal parasites with food handlers acting as reservoirs and transmission agents.

Objective: This study aimed at determining the prevalence and factors associated with intestinal parasitic infections among certified food handlers in Eldoret Town.

Methods: The study area was Eldoret town in Uasin Gishu County. Data collection took place between the month of May and June 2015. The cross sectional study enrolled 249 certified food handlers with valid medical certificates in various food establishments in Eldoret town.

Results: The overall prevalence of intestinal parasitic infection among the certified food handlers was 30.4% (58/191). *E. histolytica* (32.8%; n=19) was the most prevalent intestinal parasite. The prevalence of intestinal parasites differed significantly by food handlers' age groups, per capita monthly income, type of organic waste receptacle inside the food premise, and hand washing habit after visiting a toilet/latrine ($p<0.05$). Food handlers' failure to wash their hands after visiting a toilet/latrine was a risk factor associated with intestinal parasitic infections (OR, 0.35; $p=0.013$).

Conclusion: The high prevalence of intestinal parasitic infections reported among the certified food handlers in Eldoret is a clear indication of poor food handling practices in the town.

Keywords: protozoa, helminthic, parasites, intestinal parasites, food handlers

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Background

Intestinal protozoan and helminthic infections remain a major public health issue in the poorest regions of the world.[1–3] Such regions are usually characterised by poor levels of education, hygiene and sanitation practices, and a high disease burden[1,2,4] including intestinal parasitic infections. Food and water remains a major source of most intestinal parasites with food handlers being the reservoirs and transmission agents.[5,6]

Globally, studies on intestinal parasitic infections among food handlers are vast[5,7,8] In Kenya, the prevalence of intestinal parasitic infections among food handlers remains exceptionally high. This figure varies from 13.8 %[7] to 24 %.[9] A variance attributed to different to socio–demographic characteristics of the food handlers, climatic conditions and geographical location.

The population of Eldoret has increased rapidly over the last 15 years. As of March 2015, the town had more than 6,967 registered food handlers. Chapter 254 (Regulation 15) of the laws of Kenya governs certification of food handlers.[9] These include screening and ensuring food handlers comply with the law. A 6–month medical certificate is always issued to food handlers who successfully fulfil the requirements. However, there is always no follow–up to ascertain if the certified food handlers' remain healthy during the certification period. This include free from intestinal parasitic infections. This study therefore, aimed at determining the prevalence and factors associated with intestinal helminthiasis among certified food handlers in Eldoret Town.

Materials and methods

Study areas and population

The study area was Eldoret town in Uasin Gishu County. A cosmopolitan town located 315 km North West of Kenyan capital Nairobi and which serves as the headquarters of Uasin Gishu County. Data collection took place between the month of May and June 2015. The study enrolled only certified food handlers with valid medical certificates recruited from 108 registered food premises in Eldoret town.

Study design

The study was cross–sectional in design.

Data collection

Data was collected using a pretested interviewer administered questionnaire and a checklist. The questionnaire was used to capture socio–demographic characteristics, sanitation and hygienic practices of the food handlers. Data collectors were trained for two days on how to administer the questionnaire. A checklist was used to verify the

type of organic waste container inside the premise, the toilet facilities available and the status of the food handlers' fingernails.

Sample size and sampling technique

Six months prior to the study, the researcher, updated the database of all food handlers who came to apply for certification in the health department of the County. Valuable data, which would enable the researcher to trace the food handler after certification such as cell phone number and the premise where the food handler was working were entered into the database. A total of 2,407 food handlers successfully obtained their medical certificate during the study period. A sample size was calculated using a single population formula from this total. The researcher assumed a prevalence of 15.7%,[7] 95% confidence interval (CI) and a 5% margin error. Two hundred and forty nine randomly selected food handlers participated in the study.

Stool sample collection and processing

Stool samples were collected in a tight lid plastic container. The food handlers were trained on how to collect stool in the provided tight lid plastic containers. Microscopic parasitological assessments of the stools were conducted at Mount Kenya University, Eldoret Campus laboratories by a qualified technician. Both direct iodine wets mount and Formol ether concentration assessment as described elsewhere was employed.[10] Both direct iodine wet mount and Formol ether concentrations yielded the same results.

Data analysis

Statistical analysis was performed by SPSS version 20.0 for windows. Prevalence is reported in percentages. The chi–square test was used to compare prevalence among various groups. Significant factors at univariate level were further analysed using regression analysis after controlling for confounding. A p–value <0.05 was considered statistically significant.

Ethical consideration

The study obtained ethical clearance from Mount Kenya University ethical committee. Informed consent was obtained from all food handlers who participated in the study. Participation was purely voluntary. Microscopically confirmed cases of intestinal protozoa or helminthic infections were referred to the nearest public health facility for treatment.

Results

Socio–demographic characteristics of the food handlers

Two hundred and forty nine food handlers with valid medical certificates were screened for intestinal worms between the month of May and June 2015. The food handlers were between the ages of 18 and 57 years, with a mean age of 23.9 years. The majority of the food handlers were above 25 years (n=205; 82.3%). Most of the food handlers who participated in the study were females (n=168; 67.4%). Seventy–six (30.5%) food handlers were illiterate, 25.7% (n=64) educated to primary level, 26.5% (n=66) to secondary and 17.3% (n=43) to tertiary level. The majority of the certified food handlers interviewed were based in urban centres (n=146; 58.6%), trimmed their hands (n=160; 64.3%), had access to basic toilet facilities (n=170, 68.3%), worked in a food premise with closed organic waste receptacle (n=177; 71.1%), wore shoes (n=218; 87.6%), and had access to safe drinking water (n=170; 68.3%). A high proportion occasionally washed their hands after visiting a toilet/latrine (n=127; 51.0%) (Table 1).

Table 1 Number and distribution of intestinal parasites among the food handlers' socio-demographic characteristics

Intestinal Parasites						
Socio-demographic characteristics	**E.h n=19 (32.8%)**	**A.l n=11 (19.0%)**	**T.t n=9 (15.5%)**	**G.i n=7 (12.0%)**	**Hookworm spp n=12 (20.7%)**	**p-value**
Age						
≤25	11 (57.9%)	1 (9.1%)	2 (22.2%)	0 (0.0%)	1 (8.3%)	0.001
26-35	6 (31.6%)	9 (81.8%)	4 (44.4%)	6 (85.7%)	4 (33.3%)	
≥35	2 (10.5%)	1 (9.1%)	3 (33.3%)	1 (14.3%)	7 (58.3%)	
Gender						
Male	6 (31.6%)	3 (27.3%)	6 (66.7%)	2 (28.6%)	3 (25.0%)	0.284
Female	13 (68.4%)	8 (72.7%)	3 (33.3%)	5 (71.4%)	9 (75.0%)	
Level of education						
Illiterate	9 (47.4%)	5 (45.5%)	1 (11.1%)	4 (57.1%)	6 (47.4%)	0.295
Primary	5 (26.3%)	2 (18.2%)	6 (66.7%)	1 (14.3%)	5 (26.3%)	
Secondary	3 (15.8%)	1 (9.1%)	2 (22.2%)	1 (14.3%)	1 (8.3%)	
Tertiary	2 (10.5%)	3 (27.3%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	
Area						
Peri-urban	7 (36.8%)	4 (36.4%)	1 (11.1%)	1 (14.3%)	0 (0.0%)	0.190
Urban	10 (52.6%)	6 (54.5%)	0 (0.0%)	4 (57.1%)	10 (83.3%)	

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Table Continued

Intestinal Parasites						
Socio-demographic characteristics	**E.h n=19 (32.8%)**	**A.l n=11 (19.0%)**	**T.t n=9 (15.5%)**	**G.i n=7 (12.0%)**	**Hookworm spp n=12 (20.7%)**	**p-value**
Rural	2 (10.5%)	1 (9.1%)	8 (88.9%)	2 (28.6%)	2 (16.7%)	
Per capita monthly income						
≤Ksh.5000	7 (36.8%)	5 (45.5%)	5 (55.6%)	1 (14.3%)	1 (8.3%)	0.003
Ksh.5001-10,000	5 (26.4)	2 (18.2%)	4 (44.4%)	5 (71.4%)	11 (91.7%)	
≥Ksh.10,001	7 (36.8%)	4 (36.4%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	
Water source						
Safe	10 (52.6%)	6 (54.5%)	8 (88.9%)	3 (42.9%)	8 (66.7%)	0.310
Unsafe	9 (47.4%)	5 (45.5%)	1 (11.1%)	4 (57.1%)	4 (33.3%)	
Hand washing before meals						
Occasionally	2 (10.5%)	6 (54.5%)	3 (33.3%)	5 (71.4%)	6 (50.0%)	0.083
Often	12 (63.2%)	3 (27.3%)	2 (22.2%)	0 (0.0%)	3 (25.0%)	
Rarely	5 (26.3%)	1 (9.1%)	3 (33.3%)	2 (28.6%)	2 (16.7%)	
Always	0 (0.0%)	1 (9.1%)	1 (11.2%)	0 (0.0%)	1 (8.3%)	
Shoe wearing habit						
No	2 (10.5%)	0 (0.0%)	1 (11.1%)	2 (28.6%)	1 (8.3%)	0.429
Yes	17 (89.5%)	11(100.0%)	8 (88.9%)	5 (71.4%)	11 (91.7%)	
Type of organic waste receptacle inside the premise						
Open	1 (5.3%)	4 (36.4%)	5 (55.6%)	3 (42.9%)	1 (8.3%)	0.014
Closed	18 (94.7%)	7 (63.6%)	4 (44.4%)	4 (57.1%)	11 (91.7%)	
Basic toilet facility						
Absent	3 (15.8%)	3 (27.3%)	4 (44.4%)	0 (0.0%)	1 (8.3%)	0.139
Present	16 (84.2%)	8 (72.7%)	5 (55.6%)	7(100.0%)	11 (91.7%)	
Finger nails status						
Trimmed	9 (47.4%)	5 (45.5%)	6 (66.7%)	1 (14.3%)	7 (58.3%)	0.289
Untrimmed	10 (52.6%)	6 (54.5%)	3 (33.3%)	6 (85.7%)	5 (41.7%)	
Wash hands after visiting a toilet/latrine						
Never	4 (21.1%)	1 (9.1%)	2 (22.2%)	2 (28.6%)	0 (0.0%)	0.030
Occasionally	7 (36.8%)	7 (63.6%)	6 (66.7%)	5 (71.4%)	12 (100.0%)	
Often	8 (42.1%)	3 (27.3%)	1 (11.1%)	0 (0.0%)	0 (0.0%)	

E.h, *E. histolytica*; *A.l*, *A. lumbricodes*; *T.t*, *T. trichiura*; *G. intestinalis*

Prevalence of intestinal parasites

Five types of intestinal parasites namely *E. histolytica,* hookworm *spp, A. lumbricodes, T. trichiura* and *G. intestinalis* were found in the stools of 58 certified food handlers in Eldoret town. The overall prevalence of intestinal parasitic infection among the certified food handlers was 30.4% (58/191). *E. histolytica* (32.8%; n=19) was the most prevalent intestinal parasite found in the stools of the food handlers followed by hookworm *spp* (20.7%), A. *lumbricodes* (19.0%), *T. trichiura* (15.5%), and then *G. intestinalis* (12.0%). The prevalence of intestinal parasites differed significantly by food handlers' age groups, per capita monthly income, type of organic waste receptacle inside the food premise, and hand washing habit after visiting a toilet/latrine (p<0.05).

The prevalence of *A. lumbricodes* (n=9; 81.8%) and *G. intestinalis* (n=6; 85.7%) was significantly higher among food handlers aged 26–35 years ($\div^2$ =1.019; p=0.001). Food handlers whose per capita monthly income were between Ksh.5001–Ksh.10, 000 reported significantly high prevalence of *G. intestinalis* (n=5; 71.4%) and hookworm *spp* (n=11; 91.7%) ($\div^2$ =22.925; p=0.003). Premises with closed organic waste receptacles had the highest number of

food handlers with *E. histolytica* (n=18, 94.7%) and hookworms (n=11; 91.7%) ($\div^2$ =12.422; p=0.014) while those who occasionally washed their hands after visiting a toilet/latrine reported a significant higher prevalence of *A. lumbricodes* (n=7; 63.6%), *T. Trichiura* (n=6; 66.7%), *G. intestinalis* (n=5; 71.4%) and hookworm (n=12; 100.0%) ($\div^2$ =17.037; p=0.030).

Predictors of intestinal parasitic infection(s)

Of the 11 predictors analysed, only availability of toilet facility and hand washing after visiting a toilet were associated with intestinal parasitic infections in univariate analysis (p<0.05). No association was found between age, gender, level of education, area, per capita monthly income, water source, hand washing before meals, shoe wearing habit, types of organic waste receptacle in the premise, finger nails status and intestinal parasitic infections (p>0.05) (Table 2). In multivariate analysis, failure to wash hands after visiting a toilet/latrine was found to be a risk factor associated with intestinal parasitic infections (OR, 0.35; p=0.013) (Table 3).

Table 2 Univariate model showing association between intestinal parasitic infection among food handlers and socio-demographic characteristics

	Intestinal Parasitic Infections		
Potential predictors	**Absent n=191**	**Present n=58**	**p-Value**
Age			
≤25	29 (15.1%)	15 (25.9%)	0.262
26–35	104 (54.5%)	29 (50.0%)	
≥35	58 (30.4%)	14 (24.1%)	
Gender			
Male	61 (31.9%)	20 (34.5%)	0.694
Female	130 (68.1%)	38 (65.5%)	
Level of education			
Illiterate	51 (26.6%)	25 (43.1%)	0.071
Primary	45 (23.6%)	19 (32.8%)	
Secondary	58 (30.4%)	8 (13.8%)	
Tertiary	37 (19.4%)	6 (10.3)	
Area			
Peri-urban	57 (29.8%)	13 (22.4%)	0.231
Urban	108 (56.6%)	38 (65.5%)	
Rural	26 (13.6%)	7 (12.1%)	
Per capita monthly income			
≤Ksh.5000	89 (46.6%)	19 (32.8%)	0.083
Ksh.5001–Ksh.10,000	83 (43.5)	27 (46.6%)	
≥Ksh.10,001	19 (9.9%)	12 (20.6%)	
Water source			
Safe	135 (70.7%)	35 (60.3%)	0.117
Unsafe	56 (29.3%)	23 (39.7%)	
Hand washing before meals			
Occasionally	48 (25.1%)	22 (37.9%)	0.056
Often	54 (28.3%)	20 (34.5%)	
Rarely	63 (33.0%)	13 (22.4%)	
Always	26 ()	3 (5.2%)	
Shoe wearing habit			
No	25 (13.1%)	6 (10.3%)	0.573
Yes	166 (86.9%)	52 (89.7%)	
Type of organic waste receptacle inside the premise			
Open	58 (30.4%)	14 (24.1%)	0.072
Closed	133 (69.6%)	44 (75.9%)	
Basic toilet facility			
Absent	68 (35.6%)	11 (19.0%)	0.016
Present	123 (64.4%)	47 (81.0%)	
Finger nails status			
Trimmed	132 (69.1%)	28 (48.3%)	0.118
Untrimmed	59 (30.9%)	30 (51.7%)	
Wash hands after visiting a toilet /latrine			
Never	74 (38.7%)	9 (15.5%)	0.010
Occasionally	87 (45.6%)	37 (63.8%)	
Often	30 (15.7%)	12 (20.7%)	

Table 3 Multivariate model showing association between intestinal parasitic infection among food handlers and socio-demographic characteristics

	Intestinal Parasitic Infections			
Potential predictors	**Absent n=191**	**Present n=58**	**OR**	**p-Value**
Toilet facility				
Present	68 (35.6%)	11 (19.0%)	0.40	0.099
Absent*	123 (64.4%)	47 (81.0%)		
Wash hands after visiting a toilet/latrine				
Never	74 (38.7%)	9 (15.5%)	0.35	0.013
Occasionally	87 (45.6%)	37 (63.8%)	1.46	0.392
Often*	30 (15.7%)	12 (20.7%)		

Discussion

The presence of the five intestinal parasites in Eldoret is a clear indication that the prevailing environmental conditions in the town favours the transmission of a wide range of intestinal parasites. The estimated prevalence of intestinal parasites among food handlers in Eldoret town was 30.4%. A higher prevalence of intestinal parasitic infection than that reported in Nairobi of 13.8%.[7] Temporal variations in intestinal parasitic infections are not unique in Kenya.[11] The variation could be due to socio–demographic characteristics of the food handlers, climatic conditions and geographical location of the study sites. Rainfall for instance, plays a significant role in the development and transmission of intestinal parasites. The wet and humid environment enhances the persistence of the protozoic and helminth eggs and cysts in the soil. In Kenya, evidence has shown

that, the prevalence the prevalence of intestinal parasites tends to be high between May and June.[9] This is a heavy rainfall season and coincides with the months data collection was carried out in this study.

Clean and safe drinking water is a major challenge in Eldoret town. Most drinking water is contaminated with faecal matters mainly attributed to the faulty sewerage system.[12] A possible explanation as to why *E. histolytica* was the most predominant intestinal parasites among the certified food handlers in this study. A similar finding, reported by another study conducted in Eldoret a year ago.[9]

The highest prevalence of intestinal helminthiasis reported among the certified food handlers in Eldoret is a major public health concern. It is a clear indication of poor food handling practices in the town. The current state poses a major health risk not only to the food handlers, but also to the consumers who rely on the services offered by these food handlers. Considering that, food handlers are good vehicles for transmission of intestinal parasitic infections.[5,13–15] To prevent such transmission from taking place, there is need to conduct regular screening of food handlers issued with medical certificates. Food handlers should be encouraged to wash their hands frequently after visiting a latrine or toilet. Regular supply of certified food handlers with antiamoebic and anti–helminthic medications could also help in lowering the high prevalence of intestinal parasitic infection observed in this study.

Hand washing among food handlers in Eldoret town after defecation is inadequate.[9] This may explain why failure to wash hands after visiting a toilet in this study, was a risk factor associated with intestinal parasitic infections. The food handlers who failed to wash their hands after visiting a toilet or latrine might have touched infected toilet/latrine surfaces, objects, or faecal matter after defecation. This unhygienic practice might have contaminated their hands with deposits of the parasite eggs, which possibly could have been swallowed on handling and eating solid foods with unwashed hands.

Conclusion

The study revealed a high prevalence of intestinal parasitic infections in Eldoret town. Five types of intestinal parasites namely *E. histolytica,* hookworm *spp, A. lumbricodes, T. trichiura* and *G. intestinalis* were found in the stools of 58 certified food handlers in Eldoret town. The prevalence of intestinal parasites differed significantly from the age group of the food handlers, per capita monthly income, type of organic waste receptacle inside the premise, and hand washing habit after visiting a toilet/latrine. Food handlers' failure to wash their hands after visiting a toilet/latrine was a risk factor associated with intestinal parasitic infections. The highest prevalence of intestinal parasitic infections reported among the certified food handlers in Eldoret is a clear indication of poor food handling practices in the town. The current state poses a major health risk not only to the food handlers, but also to the consumers who rely on the services offered by these food handlers.

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Competing interest

The author has no competing interest.

References

1. Okyay P, Ertug S, Gultekin B, et al. Intestinal parasites prevalence and related factors in school children, a western city Sample–Turkey. *BMC Public Health*. 2004;4:64.
2. Wegayehu T, Tsalla T, Seifu B, et al. Prevalence of intestinal parasitic infections among highland and lowland dwellers in Gamo area, South Ethiopia. *BMC Public Health*. 2013;13:151.
3. Abera B, Biadegelgen F, Bezabih B. Prevalence of Salmonella typhi and intestinal parasites among food handlers in Bahir Dar Town, Northwest Ethiopia, *Ethiop J Health Dev*. 2010;24(1):46–50.
4. World Bank. World Development Report 1993. Investing in Health, World Development Indicator. Oxford Univer Press. Oxford; 1993. p. 25–36.
5. Andargie G, Kassau A, Moges F, et al. Prevalence of bacteria and intestinal parasites among food handlers in Gondar Town, Northwest Ethiopia. *J Health Popul Nutr*. 2008;26(4):451–455.
6. de Rezende CH, Costa–Cruz JM, Gennari–Cardoso ML. Parasites among food handlers in public schools in Uberlandia (Minas Gerais), Brazil. *Rev of Pan Sal Pub*. 2007;2:392–397.
7. Kamau P, Aloo OP, Kabiru E, et al. Prevalence of intestinal parasitic infections in certified food–handlers working in food establishments in the City of Nairobi, Kenya. *J Biomed Res*. 2012;26(2):84–89.
8. Idowu OA, Rowland SA. Oral faecal parasites and personal hygiene of food handlers in Abeokuta, Nigeria. *Afr Health Sci*. 2006;6(3):160–164.
9. Biwott, GK, Wanjala PM, Ngeiywa M. Prevalence of gastrointestinal parasitic infections among food handlers in Eldoret municipality, Kenya. *J Bio Agr Healt*. 2014;4(27):160–171.
10. Cheesbrough M. District laboratory Practice in Tropical Countries. India: Cambridge Univers Press; 2004. p. 192–195.
11. Nyarango RM, Aloo PA, Kabiru EW, et al. The risk of pathogenic intestinal parasite infections in Kisii Municipality, Kenya. *BMC Public Health*. 2008;8:237.
12. Kwedho GO. Commercialization of water services in Eldoret Municipality and its influence on the work culture of the employee. *J Water Mgt*. 2009;12:133–139.
13. Crompton DWT. Ascaris and ascariasis. *Adv Parasitol*. 2001;48:285–375.
14. Morenikeji OA, Azubike NC, Ige OA. Prevalence of intestinal and vector–borne urinary parasites in communities in south–west Nigeria. *J Vect Borne Dis*. 2009;46(2):164–167.
15. Heukelbach J, Winter B, Wilcke T, et al. Selective mass treatment with evermectin to control intestinal helminthiasis and parasitic skin diseases in severely infected population. *Bull World Health Organ*. 2004;82(8):563–571.