

# The incidence of feco-oral parasites in street-food vendors in Buea, south-west region Cameroon

\*Assob JCN<sup>1</sup>, Nde PF<sup>1</sup>, Nsagha DS<sup>1</sup>, Njimoh DL<sup>2</sup>, Nfor O<sup>3</sup>, Njunda AL<sup>1</sup>, Kamga HLF<sup>1</sup>

1. Faculty of Health Sciences, University of Buea, Cameroon
2. Faculty of Science, University of Buea, Cameroon
3. Faculty of Health Sciences, University of Bamenda, Cameroon

## Abstract

**Background:** The street-food industry lacks legal recognition, it operates in unstable and precarious conditions, involving women and men with minimal or no knowledge of hygienic food handling practices. Infective eggs, bacteria, toxins and cysts of faecal orally transmissible parasites are common agents responsible for food contamination in developing countries.

**Objective:** To determine the incidence of digestive faecal-oral parasites among street-food vendors in Buea, South-west region of Cameroon,

**Methods:** From March to May 2009, physical and laboratory analysis of stool samples of 150 randomly selected street-food vendors, residing in four different zones in the municipality were carried out. Information on environmental and personal hygiene was also collected.

**Results:** Results revealed that 56.7% of the sampled population was infected with faecal-oral parasites. The major faecal-oral parasites detected in stool samples were: *Entamoeba coli* (14.0%), *Entamoeba histolytica* (12.67%), *Ascaris lumbricoides* (11.33%), *Ankylostoma duodenalis* (10.67%). Childcare activities, lack of deworming, poor personal hygiene, poor sanitary and toilet facilities, were factors promoting the spread of faecal-oral infections.

**Conclusion:** Food vendors should be educated on personal hygiene and safe food handling measures. Regulatory procedures on environmental hygiene and regular medical and paramedical follow up of food vendors should be enforced.

**Key words:** Street-food vendors, Intestinal parasites, faecal-oral transmission

*African Health Sciences* 2012; 12(3): 376 - 380 <http://dx.doi.org/10.4314/ahs.v12i3.20>

## Introduction

Street food is common in countries with high unemployment rates, low salaries, non-frequent availability of work opportunities and social programmes<sup>1</sup>. Women are often owners or employers of this business with very low personal knowledge of hygienic food handling practices, and suggesting by inferences the precarious nature of hygienic conditions in their homes<sup>2</sup>. The vendors have spent much of their lives confronting all sorts of hardships including lack of access to health services, so it seems reasonable to suppose that their personal health status is commonly quite poor. They have minimal or no education, do not pay taxes and most do not belong to vendors association. Yet due to

family constraints such as playing a double role of both the mother and main provider of the household, they are forced to run such a business since it requires no special qualification or high budget and capital<sup>3</sup>. In general stalls and charts of street-food vendors are built at the least possible cost using a minimum of construction technology, and the food products sold are prepared, handled and processed according to traditional methods with no observance of even minimal sanitary standards<sup>2</sup>. Typically, toilets and lavatory facilities are not readily available which forces the vendors (and sometimes consumers) to use any available nearby area, without washing their hands properly afterwards. Street food vendors wash and rinse their utensils only once; this water is used repeatedly and replaced only after a dirty appearance<sup>4</sup>.

These are some of the factors that are responsible for food poisoning and rampant outbreaks of faecal-oral parasite infections in the developing world. Several other factors such as temperature, humidity, intermediate hosts, socioeconomic status, and customary nutrition of people each play a role in the distribution of intestinal

### \*Corresponding author:

Jules CN Assob  
Department of Biomedical Sciences  
Faculty of Health Sciences  
University of Buea  
P. O. Box 63  
Buea, Cameroon  
Tel.: 0023799629452  
Email: [juleclement@yahoo.fr](mailto:juleclement@yahoo.fr)

parasites. Economic problems may affect availability of safe water and so food and hand contamination with parasites through faecal-oral route may increase<sup>5</sup>. Ingestion of infective eggs and cysts of such parasites has been linked with the level of environmental and personal hygiene<sup>6</sup>.

The food sold on the streets is relatively cheap and readily available<sup>7</sup>. Lack of access to potable water supply and garbage disposal, and unsanitary environmental conditions further exacerbate the public health risk associated with street-food<sup>8</sup>. Though daily diet needs are met, the knowledge, attitudes and practices of street food vendors are primordial to reduce possible risks linked to improper handling of food at both macro and micro levels of food handling by street-food vendors<sup>1</sup>.

A study carried out in Abeokuta, Nigeria revealed that ninety-seven (97%) percent of the food vendors were infected with one or more faecal-orally transmissible parasites; parasites observed were: *Entamoeba histolytica* with a prevalence of 72%, *Ascaris lumbricoides* (54%), *Enterobius vermicularis* (27%), *Trichuris trichiura* (24%) and *Giardia duodenalis* (13%). Toilet facilities available to the vendors were mainly pit latrines and other related structures (75%). The study also revealed that hawkers mostly used dung hills for defecation and the few that washed hands after defecating did not use soap<sup>9</sup>.

A similar study was designed to determine the incidence of faecal-oral parasites in street-food vendors in Buea municipality with regard with activities like childcare, type of toilet facilities, personal and environmental hygiene.

## Methods

### Study area

Buea is the capital of the South-West Region of Cameroon with a population of two hundred thousand. The population has doubled within the last ten years, influenced by the presence of the University of Buea that was created in 1993, and numerous professional, secondary and high schools. The town is located 15kms away from the seashore, and 60 kilometres away from Douala, the economic capital of Cameroon. It is a fertile volcanic area lying on the slope of Mount Cameroon, the second highest mountain in Africa. Inhabitants are principally engaged in agriculture as the main economic activity, conditioned by the two seasons: the dry and wet seasons. Almost all the 254 ethnic groups found in Cameroon are represented in the area, attracted by

the Cameroon Development Corporation (CDC), a giant agricultural corporation. Hygiene and sanitation within the municipality has been largely compromised by the sudden increase in population, thus the generation of huge amounts of domestic waste.

### Study design

This was a prospective cross sectional study, carried out in four separate zones in the municipality of Buea: Molyko, Muea, Bolifamba and Soppo. Two rural zones (Muea and Bolifamba) and two urban zones (Molyko and Soppo) were chosen for this purpose. The study covered a period of three months extending from March to May 2009, a transitional period between the dry and wet seasons. Sixty percent (60%) of the total number of vendors in each zone participated in the study. Stool samples were collected from 150 randomly selected street-food vendors (who consented to be included in the study) and examined physically and microscopically (Wet preparation and formol ether concentration)<sup>6</sup>. Personal and environmental hygiene statuses were also considered. This involved questions on their level of education, economic background, health habits and status, source of drinking water, type of toilet facility, child care activities as well as their opinions and knowledge on faeco-oral parasites transmission, prevention and control. Field observations were also used to assess handling of food items and the activities of consumers. The Dummy marks grading was used (ranging from 1.0 for poor grade to 0.0 for very good grade). The personal sanitation indexes were summed up to get the zonal sanitation index. Indexes of 0.6 and above showed poor sanitation statuses while those of less than 0.4 to 0.0 showed high sanitation statuses

### Data analyses

A two-tailed Analysis of variance (ANOVA) was used to analyse the results obtained. The level of significance was set at  $p < 1\%$ .

### Results

A participant was defined as a street-food vendor who took part in the research once during the twelve weeks period. From the weekly random selection, week one recorded the highest number of participants (47.33%) and week ten the least (26.67%). Those who did not participate in the first week, participated in any of the following weeks, from week two (W2) to week twelve (W12). A total of

150 street food vendors participated. They were aged between 14-57 years old. The majority of participants (40%) were found in the age group 21-30, followed by participants aged between 31-40 (36%). Females (84.0%) were more represented than males (16.0%) (table 1). Soppo zone had the highest percentage of street food vendors (30%), followed by Molyko (26.67%), then Muea (22.67%) and lastly Bolifamba (20.67%).

**Table 1: Distribution of enrolled participants according to age and sex**

Age range (years)	Participants		Total (%)
	Male (%)	Female (%)	
11-20	4 (2.7)	14 (9.3)	18 (12.0)
21-30	11(7.3)	49 (32.7)	60(40.0)
31-40	9 (6.0)	45(30.0)	54(36.0)
41-50	0 (0.0)	15(10.0)	15(10.0)
≥50	0 (0.0)	3(2.0)	3(2.0)
<b>Total</b>	<b>24(16.0)</b>	<b>126 (84.0)</b>	<b>150 (100.0)</b>

**Table 2: Prevalence of Parasite species**

	Zones (%)				Grand total
	Muea	Molyko	Soppo	Bolifamba	
<b>Total vendors</b>	<b>34</b>	<b>40</b>	<b>45</b>	<b>31</b>	<b>150</b>
<i>E. histolytica</i>	14 (41.18)	0	2(4.44)	3 (9.68)	19(12.67)
<i>E. coli</i>	4 (11.76)	9(22.50)	5(11.11)	3(9.68)	21(14.00)
<i>Ankylostoma duodenalis</i>	4 (11.76)	4(10.00)	2(4.44)	6(19.35)	16(10.67)
<i>A. lumbricooides</i>	2(5.88)	4(10.00)	7(15.56)	4(12.90)	17(11.33)
<i>G. lamblia</i>	2(5.88)	3(7.50)	0	0	05(3.33)
<i>E. vermicularis</i>	0	3 (7.50)	0	0	03(2.00)
<i>T. trichura</i>	0	2(50.00)	0	0	02(1.33)
<i>B. coli</i>	0	2(50.00)	0	0	02(1.33)
<i>Blastocystis hominis</i>	0	0	7(15.56)	0	07(4.67)
<b>Total parasites</b>	<b>26(76.47)</b>	<b>27(67.50)</b>	<b>23(51.11)</b>	<b>17(54.83)</b>	<b>92(61.33)</b>

All participants with multiple infections came from the urban areas (Molyko and Soppo). 81.18% of the infected street-food vendors were involved in childcare activities. Childcare activities were significantly associated with a greater percentage of the infected persons in the study. Only 7.06% of the infected food vendors had access to water system toilets while 92.94% used pit toilets. 11.76% of the street food vendors who claimed to have taken worm medication (less than 6 months ago) were still infected. 88.24% of infected persons had not taken worm medication within a period of two years (table 4).

The prevalence of faecal-oral parasites in street food vendors in Buea municipality was 61.33%. In each zone, faecal-oral parasites had the following prevalence: Muea-76.47%, Molyko-67.50%, Soppo-51.11% and Bolifamba-54.83%.

The parasite species found in Buea municipality in order of decreasing incidence included: *Entamoeba coli* (14.0%), *Entamoeba histolytica* (12.67%), *Ascaris lumbricooides* (11.33%), *Ankylostoma duodenalis* (10.67%), *Blastocystis hominis* (4.67%), *Giardia lamblia* (3.33%), *Enterobius vermicularis* (2.00%), *Balantidium coli* (1.35%), and *Trichuris trichiura* (1.33%) (table 2).

The most frequently encountered parasites varied from one zone to another: Muea zone- *E. histolytica* (41.18%), Molyko zone- *E. coli* (22.50%), Soppo zone- *A. lumbricooides* (15.56%) and *B. hominis* (15.56%), and Bolifamba zone- *A. duodenalis* (19.35%). Some street food vendors (8.24%) were infected with two or more species of parasites (table 3).

**Table 3: Multiple Infections in some street food vendors**

Zones	Parasites identified	Infected vendors	Multiple infections (%)
Muea	26	26	00
Molyko	27	21	06 (85.71) (28.57)
Soppo	23	22	1(14.29) (4.55)
Bolifamba	16	16	00
<b>Total</b>	<b>92</b>	<b>85</b>	<b>07(8.24)</b>

**Table 4: Zone distribution of infected vendors according to childcare activities, type of toilet facilities used, worm medication and sanitation index**

Parameters	Muea	Molyko	Soppo	Bolifamba	Total
	Childcare activities				
No of street food vendors	34	40	45	31	150
No Infected	26	21	22	16	85
No & (%) Infected WCA	22 (84.62)	16(76.19)	17 (77.27)	14 (87.50)	69 (81.18)
No & (%) Infected WNCA	04 (15.38)	05(23.81)	05 (22.73)	02 (12.50)	16 (18.82)
<b>Type of toilet facility used</b>					
No Infected	26	21	22	16	85
No & (%) with flushing toilet	2(7.69)	2 (9.52)	0	2 (12.50)	06 (7.06)
No &(%) with pit toilet	24 (92.31)	19 (90.48)	22 (100)	14 (87.50)	79 (92.94)
<b>Worm medication</b>					
No Infected	26	21	22	16	85
No & (%) IWM	4(15.38)	4 (19.05)	2 (9.09)	0	10 (11.76)
No & (%) INM	22 (84.62)	17 (80.95)	20 (90.90)	16 (100)	75 (88.24)
<b>Sanitation</b>					
No of vendors	34	40	45	31	150
No Infected	26	21	22	16	85
Infection percentage (%)	76.47	52.50	48.89	51.61	56.67
Sanitation Index	0.7	0.5	0.3	0.6	0.6

No= number, WNCA =With No Childcare Activity, WCA=With Childcare Activity, IWM = Infected with Medication, INM= Infected with No Medication

Muea zone had the poorest sanitation status with a sanitation index of 0.7 and the highest incidence of faecal-oral parasite infection (76.47%). Bolifamba followed Muea closely, with a sanitation index of 0.6. Soppo had the best sanitation status with a sanitation index of 0.3, followed by Molyko with 0.5.

### Discussion

Communicable diseases are responsible for 45% deaths in the developing world, with poor environmental hygiene and sanitation being a major contribution to the propagation of pathogens of bacterial and parasitic origins<sup>10</sup>. A high percentage (56.67%) of street-food vendors in Buea municipality was infected by faecal-oral parasites. Though up to 93% of the street-food vendors have acquired primary education and above, their attitudes, personal and environmental hygiene, including hygienic food handling practices were generally poor. A very small proportion (17.5%) of stationary street-food vendors in Buea municipality has acquired formal training on hygienic food handling practices, but they lack

adequate means and an enabling environment in order to effectively and safely serve the population.

The two rural zones with the poorest sanitation indexes (0.7 and 0.6 respectively) and a higher percentage of infected food vendors (64.61%) were Muea and Bolifamba. This may be due to the lack of adequate supply of potable water in these zones. One of the most critical problems in street food vending is the supply of water of acceptable quality, in sufficient quantities for drinking, washing, cleaning and other operations<sup>11</sup>. Stream water of unacceptable quality is used for drinking, cooking and washing of hands and dishes. Since members of the household cover long distances to fetch stream water, maximum economy is made through repeated use or recycling. Water supply is indispensable in the business of street food vending<sup>11,12</sup>. In the urban zones (Molyko and Soppo), 50.59% of the vendors were infected. These areas which are overpopulated, though with fairly good sanitary indexes; contain the major slumps in the area. Due to high cost of living and high rental cost, most vendors live in shackle houses that are situated in

valleys and slump areas with increased chances of acquiring faecal-oral infections. Costa-Cruz et al<sup>13</sup> carried out a similar study in the city of Uberlandia in Brazil and found a higher infection rate of 60% among food vendors, and *Entamoeba coli* was equally the most prevalent parasite (14.0%), contradicting another research in Abeokuta, Nigeria (2004), in which *E. coli* was absent and the most prevalent parasite was *E. histolytica*<sup>9,14</sup>. Child-to-mother transmission, or child-to-food transmission through unhygienic manipulations is favoured by the fact that children are the most likely to become infected with faecal-oral parasites, by eating dirt or placing soiled fingers and toys in their mouths. This can be justified by the fact that a reasonable proportion (81.18%) of infected persons was strongly involved in childcare activities. *Ankylostoma duodenalis* ranked fourth (10.67%) in order of importance, in the studied population. The presence of this hookworm which is also known to be transmitted through feco-oral routes is an indicator that participants were exposed to soil infection.

Regulations governing the functioning of the street-food industry in Cameroon exist, but require draconian measures to enforce them. The situation is aggravated by the fact that none of the vendors had access to safe running water close by their stalls for cooking and washing of dishes, though 7.06% had access to water system toilets. Similar studies also noted that street-food vendors wash and rinse their utensils only once, and the same container of water is used repeatedly until it becomes very dirty<sup>4</sup>. Since it is practically impossible to guarantee the peoples' health without safe water, the availability of adequate water is a vital requirement for personal and environmental hygiene. This implies that stationary street-food vendors must guarantee the sufficiency of potable water for drinking, preparation of all kinds of foods and sufficient running water for all washing operations.

### Conclusion

Food should be prepared in a place set aside exclusively for that purpose, while the place of preparation should be kept clean at all times and should be far from possible sources of contamination (garbage, waste water, flies, rain, dust and animals). Vending stalls should be well designed and constructed such that they are easily cleaned and maintained.

Good food handling practices will alleviate suffering due to ill health, promote the tourism industry and minimise the economic loss of treating illnesses in the community that could have been prevented in the first place.

### Acknowledgement

We appreciate the Health Department of CACALF (NGO) for giving us the laboratory space for analyses of specimens.

### References

1. WHO/FAO Food Standard Programme, Alinorm, 1990; P 91.
2. Arambulo P, Almada CR, Cuellar JS & Belotto AJ. *Street Food Vending In Latin America, A Special Report*. Bulletin of PHO 1992; 28(4) 1-11.
3. Obiamiwe B A, Nmorsi P. Human Gastro-Intestinal Parasite in Bendel State, Nigeria. *Angrew Parasitol*. 1991;32:177-136
4. Muinde O.K. and E. Kuria. Hygiene and Sanitary Practices of Vendors of Street Foods in Nairobi, Kenya, *African Journal Of Food Agriculture Nutrition And Development*, 2005; 7, 1-15.
5. Yilmaz H, Akman NY and Goz. Distribution of intestinal parasites in two societies with different socio-economic status in Van. *Eastern Journal of Medicine*. 1999; 4:16-19.
6. Garcia L and Bruckner D. *Diagnostic Medical Parasitology*. 3<sup>rd</sup> edition. California: ASM 1997; 34-49, 219-2440.
7. Tedd L, Liyanarachchi S and Saha R. (2003). *Energy and Street Food DFID KaR Project R7663*. Final Project Report. 9-21.
8. WHO. *Street Food in Africa*, Food Research Institute, 2004, 1-4.
9. Idowu OA and Rowland SA. Oral fecal parasites and personal hygiene of food handlers in Abeokuta, Nigeria. *African Health Science*. 2006; 6: 160-164.
10. Cavalini LT, Ponce de Leon ACM. Morbidity and mortality in Brazilian municipalities: a multilevel study of the association between socioeconomic and healthcare indicators. *International Journal of Epidemiology*, 2008; 37:775-785.
11. Adetokunbo OL, Herbert MG, Short textbook of public health medicine for the tropics, 4th edition, Oxford University Press inc, London 2003; 417p
12. WHO, Informal Food Distribution Sector in Africa (Street foods): Importance and Challenges. 2005; 1-10.
13. Costa-Cruz JM, Cardoso ML and Marques DE. Intestinal parasites in school food handlers in the City of Uberlandia (Minas Gerais), Brazil. *Rev Institute Medical Tropical Soa Paulo* 1995; 37:191-196.
14. Costa-Cruz JM and Cardoso ML. Intestinal parasites in cooks and their helps in the city of Uberlandia, Minas Gerais Brazil. *Rev Institute Medical Tropical Soa Paulo* 1997; 38: 100-107.