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PARASITIC CONTAMINATION OF STREET FOODS FORM UNIVERSITY OF DHAKA CAMPUS: IMPLICATIONS FOR FAECAL–ORAL TRANSMISSION

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ABSTRACT: Street foods offer affordable, nutritious, and accessible food options for many urban residents in developing countries. Most university students in Bangladesh rely on street foods due to their appealing appearance. However, these foods are often prepared and served under poor hygienic conditions, making them potential sources of parasitic contamination and faeco-oral disease transmission. Considering the increasing demand for these food items among students, a study was carried out on 50 food samples comprising three types of foods: tamarind water of snacks (27 samples), fruit juices (16 samples), and sliced fruits (7 samples), and 50 corresponding fecal samples from vendors of Dhaka University Campus to assess the parasitic contamination in street foods. Food vendors were also asked to fill a questionnaire on their socio-economic and demographic profile and hygienic practices. It was found that 46 (92%) food samples were contaminated with 6 different types of parasites (*Blastocystis hominis*, *Cystoisospora belli*, *Hymenolepis diminuta*, *Hymenolepis nana*, *Ascaris lumbricoides*, and *Trichuris trichiura*); their prevalence ranged between 4% and 48%. Besides, 92% of vendors were infected with 7 different parasites; the highest prevalence was observed for *B. hominis* (66%). Out of 4 identified parasites in food and corresponding stool samples, *B. hominis* (40%) was the most prevalent parasite, followed by *C. belli* (32%), *A. lumbricoides* (26%), and *H. nana* (2%). Fisher's exact tests revealed that there was a significant association between the presence of *B. hominis* (p=0.002) and *C. belli* (p=0.001) in stool and its presence in food. We also found a significant association (at 5% significant level) between the presence of *C. belli* in food and the water sterilization practice of the food vendors (p-value=0.03). The study shows the serious health risks resulting from poor hygiene practices. So, we need to take immediate action to mitigate the significant public health risks, particularly those who consume street food in the area.

Key words: street food, Dhaka university campus, food vendors, parasitic contamination

INTRODUCTION

Street food is termed as cheap ready-to-eat foods sold in open spaces by vendors. Street foods are popular for their unique tastes, convenience as well as fulfilling the nutritional requirements of populations at affordable prices (Ackah *et al.*, 2011; Muzaffar *et al.*, 2009). Street food industry

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supports a large number of people by generating opportunities to earn in many developing countries (Choudhury *et al.,* 2011) and millions of men and women with inadequate education and skills depend on street food preparation and selling as a daily source of income (Ackah *et al.,* 2011).

Street foods can spread potentially life-threatening food-borne illnesses. Millions of people in developing countries consume drinks, meals and snacks sold by street food vendors and a considerable percentage of these consumers are more susceptible to food borne diseases such as food-poisoning, diarrhea, typhoid fever and cholera (Rane, 2011). Diseases which are transmitted in humans via food, water and waste water is a global issue wherein gastrointestinal diseases are one of the leading causes of mortality and morbidity.

Food handlers play a vital role in maintaining food safety at every phase of food manufacturing processes including processing, storage and preparation (WHO, 1998). Some of the major reasons for contamination of street foods include a lack of understanding in proper food handing, traditional processing techniques, atmospheric storage temperature, and poor personal hygiene of food handlers (Barro *et al.*, 2006; Menash *et al.,* 2002). The unhygienic practices of food handlers can lead to parasitic infestation in vendors and in turn contamination of food items can happen through faeco-oral route.

Since the development of street food business in Dhaka, Dhaka University Campus has become the biggest gathering place for street food vendors. Dhaka Medical College and Suhrawardy Udyan are located near the campus which is another reason behind this large gathering (Khatun & Sumiya, 2012). This institution comprises 275 acres of land where 50,000 people reside including around 44,000 students, 2,000 teachers, 4,400 staff members. The students mainly reside in the twenty residential halls allocated for them (University of Dhaka, 2025). The presence of street food vendors was observed in nearly all of the campus's open places (Farhana *et al.,* 2020) to fulfill the demand of a large number of potential customers.

In prior studies of Dhaka city considerable microbial and parasitic contamination have been documented in street foods and related ingredients. Additionally, it has been linked to poor vendor hygiene practices and unsafe water usage. For instances, Dhaka-based surveys reported contamination of school-vended items such as tamarind water, fruit juices, and sliced fruits with multiple intestinal parasites, including *Blastocystis hominis*, *Cystoisospora belli*, *Ascaris lumbricoides*, and *Trichuris trichiura.* Furthermore, lapses in water handling and utensil sanitation among vendors were also noted (Barua *et al.,* 2023). Recent Dhaka findings further associate water practices of vendors with parasitic risks to consumers (Barua *et al.,* 2024). In Bangladesh, additional work on raw salad vegetables which is a common component of street food has demonstrated parasitic contamination associated with vendor hygiene as well (Goshwami *et al.,* 2025). So, it is essential to know the current status of contamination of street food items in Dhaka university campus and to find out associated risk factors of vendors who vended this food to the customers. So far, no previous study has been carried out on the association between food item and health risk of consuming the contaminated food specifically in Dhaka university area. The primary aim of this study is to assess the parasitic contamination of street foods and also investigate the parasite infection in food vendors to investigate faeco-oral transmission of parasite from vendors to food and food to consumers.

MATERIAL AND METHODS

A total of 50 food samples were collected along with 50 stool samples of corresponding food vendors. Food vendors were also asked to fill a questionnaire on socio-economic and demographic profile and hygienic practices. The food samples included tamarind water of Fuchka, velpuri and chotpoti, sliced fruits (pineapple, pomelo, starfruit, hog plum) and fruit juices (Sugarcane, Aloe vera, papaya etc). Food and fecal samples were tested in the Public Health laboratory of Parasitology Branch in the Department of Zoology of University of Dhaka using a previously described method (Barua *et al.*, 2024). Statistical tests were done using R; Association between the presence of a parasite in food and its presence in stool was done using Fisher's exact tests.

Ethical approval: Ethical approval was obtained from the Faculty of Biological Sciences, University of Dhaka ethical review committee.

RESULTS AND DISCUSSION

This study assessed the parasitic contamination and risk of faeco-oral transmission in street foods and vendors from Dhaka University Campus. It revealed alarming levels of parasitic contamination in street foods and parasitic infection in street food vendors. Total 6 parasites were found in food sample and 7 parasites in stool samples from food vendors by microscopic observations.

Table 1: Socio-economic and demographic profile of vendors (N=50)

Parameters	Number	Percentage (%)
Age of vendors (years)		
21-30	6	12
31-40	22	44
41-50	22	44
Gender		
Female	0	0
Male	50	100
Level of education		
No formal education	45	90
Completed primary level	5	10
Completed secondary level	0	0
Completed higher secondary level	0	0
Monthly income		
5000-10,000	1	2
10,001-15,000	19	38
> 15,001	30	60
Marital status		
Married	49	98
Unmarried	1	2
Smoking Status		
Smoker	49	98
Non- smoker	1	2
Type of housing		
Slum	0	0
Rented house	50	100
Total	**50**	**100**

Table 2: Food handling practices of vendors (N=50)

Parameter	Number	Percentage (%)
Water source for preparing food		
Tap water	50	100
Tube well	0	0
Covering of food and materials		
Yes	10	20
No	40	80
Management of leftover foods		
Kept the foods if they do not get spoiled	41	82
Discarded	9	18
For packaging food		
Polythene	47	94
Thonga (paper box)	3	6
Frequency of washing utensils during food preparation		
Always	0	0
Often	4	8
Once in a while	46	92
Usage of reused water for cleaning utensils and equipments		
Yes	50	100
No	0	0
Cleaned utensils with soap		
Yes	0	0
No	50	100
Frequency of washing hand during food preparation		
Always	1	2
Often	2	4
Once in while	46	92
Never	1	2
Usage gloves during food preparation		
Yes	0	0
No	50	100
Total	**50**	**100**

Out of 50 vendors, all were male and aged between 21 to 50 years. 60% had monthly income more than 15000 BDT (Table 1). Hundred percent food vendors used tap water, only 20% covered food materials and 82% kept the food the next day if it didn't get spoiled (Table 2).

Table 3: Prevalence of different species of parasites found in food samples

Name of parasites	No. of samples	Contaminated samples	Prevalence (%)
Blastocystis hominis	50	24	48
Cystoisospora belli		22	44
Hymenolepis diminuta		2	4
Hymenolepis nana		4	8
Ascaris lumbricoides		19	38
Trichuris trichiura		4	8

It was found that 46 (92%) food samples were contaminated with 6 different types of parasites (*Blastocystis hominis*, *Cystoisospora belli*, *Hymenolepis diminuta*, *Hymenolepis nana*, *Ascaris lumbricoides*, and *Trichuris trichiura*); their prevalence ranged between 4% and 48% (Table 3).

Table 4: Comparison between prevalence of parasites found in different food samples

Name of parasites	No. of sample examined	Snacks		Sliced fruits		Fruit juices	
		Contaminated sample	Prevalence (%)	Contaminated sample	Prevalence (%)	Contaminated sample	Prevalence (%)
Blastocystis hominis	50	15	30	2	4	7	14
Cystoisospora belli		13	26	2	4	7	14
Hymenolepis diminuta		1	2	0	0	1	2
Hymenolepis nana		1	2	1	2	2	4
Ascaris lumbricoides		11	22	1	2	7	14
Trichuris trichiura		2	4	2	4	0	0

Table 5: Prevalence of different species of parasites found in stool samples

Name of parasites	No. of samples	Infected samples	Prevalence (%)
Blastocystis hominis	50	33	66
Cystoisospora belli		26	52
Diphyllobothrium latum		1	2
Hymenolepis diminuta		4	8
Hymenolepis nana		9	18
Ascaris lumbricoides		25	50
Trichuris trichiura		7	14

Besides, 92% of vendors were infected with 7 different parasites; the highest prevalence was observed in *B. hominis* (66%) while *D. latum* was detected in only one sample (Table 4). Out of 4 identified parasites in food and corresponding stool samples, *B. hominis* (40%) was the most prevalent parasite, followed by *C. belli* (32%), *A. lumbricoides* (26%), and *H. nana* (2%) (Table 6). These outcomes indicate a strong correlation between the hygiene practices of vendors and the faeco-oral transmission of parasites to consumers. These findings coincide with previously conducted studies in Dhaka city which also reported high levels of parasitic contamination among school-based street food vendors (Barua *et al.*, 2024).

Table 6: Prevalence of parasites found in food and stool samples of corresponding vendors

Name of parasites	Total sample	Food samples		Stool samples		Food and corresponding stool sample	
		Contaminated sample	Prevalence (%)	Contaminated sample	Prevalence (%)	Contaminated sample	Prevalence (%)
Blastocystis hominis	50	24	48	33	66	20	40
Cystoisospora belli		22	44	26	52	16	32
Ascaris lumbricoides		19	38	25	50	13	26
Hymenolepis nana		4	8	9	18	1	2

Blastocystis hominis (48% in food samples, 66% in stool samples), *Cystoisospora belli* (44% in food, 52% in stool) and *Ascaris lumbricoides* (38% in food samples, 50% in stool samples) were the most prevalent parasites identified in both food and stool samples (Table 6). The significant association between the presence of *B. hominis* and *C. belli* in both food and stool samples indicates the possibility of direct faeco-oral transmission through contaminated food handling. Furthermore, significant association between *Cystoisospora belli* in food and the water sterilization practice of vendor suggest hygiene of the street food vendors play a great role in transmission. Similar associations have been reported in previous studies from Bangladesh, Cameroon, Ethiopia, Nigeria and Brazil (Barua *et al.*, 2023; Assob *et al.*, 2013; Gemechu *et al.*, 2022; Idowu & Rowland, 2006; Colli *et al.*, 2013).

In the report of Barua *et al.* (2023) similar results were found where *Cystoisospora belli*, *Blastocystis hominis*, and *Ascaris lumbricoides* were identified as dominant parasites in school-based street foods. The prevalence of these parasites can be attributed to inadequate handwashing, reuse of contaminated water, lack of food covering, cleaning utensils without soap, inappropriate management of leftover foods, and lack of proper waste management among vendors which is similar to studies documented in the same area (Hassan *et al.*, 2017; Farhana *et al.*, 2020).

Food handling practices of vendors such as the use of untreated tap water among 100% of vendors for food preparation, 80% not covering the food, 82% keeping the leftover foods, 100% reusing water for utensil cleaning and the non-sterilization of water among 60% of vendors likely contributed to the contamination (Table 2). Unsafe water sources are one of the primary factors enabling the persistence of foodborne parasitic diseases in low- and middle-income countries (Cissé, 2019). Furthermore, unclean food environments and the presence of synanthropic flies could have also played a significant role in the mechanical transmission of parasites (Graczyk *et al.*, 2005).

Among all food types, tamarind water of snacks exhibited the highest contamination rate, especially with *B. hominis* and *C. belli* followed by fruit juices and sliced fruits (Table 4). This is consistent with earlier findings by Barua *et al.* (2023) and Barua *et al.* (2024) who also reported higher parasitic contamination in liquid-based street foods. From the socio-economic profile of vendors, it can be seen that 90% of them lacked any formal education, and 98% were smokers (Table 2). Lower levels of education significantly increase the likelihood for poor hygiene maintenance which has been reported in earlier studies (Kundu *et al.*, 2021; Mamun *et al.*, 2013; Faremi *et al.*, 2018).

The prevalence rates of parasite contamination in street foods were slightly higher in the Dhaka University campus study compared to broader studies. Therefore, it must be considered that the high population density and food demand on campus likely intensifies hygiene challenges. This informal food supply sector with its unregulated nature of street food vending and minimal governmental oversight (Imathiu, 2017) continues these risks (Nkosi & Tabit, 2021). Efforts to mitigate these risks must include mandatory training for street vendors on food safety, the establishment of designated street-food zones, and stricter regulatory inspections at regular intervals. India's Food Safety and Standards Authority (FSSAI) guidelines for street foods, integrate vendor training, licensing, and periodic health inspections. Bangladesh could benefit

from adopting structured interventions modeled after initiatives like this (Manes *et al.*, 2016; Reddy *et al.*, 2020).

A limitation of the present study is the dependency on microscopy alone for parasite detection. Future studies could use molecular techniques to identify cryptic and co-infections and better understand the complete parasitic burden. Furthermore, a broader sample size covering multiple universities will enhance application of the findings.

CONCLUSION

This study emphasizes the urgent need for food safety interventions. Targeting street food vendors within university campuses should be a prior concern because without improved hygiene standards and better regulation, students remain highly vulnerable to foodborne parasitic infections. Integrative policies combining education, regulation, and infrastructure improvement are essential to promote safer street food practices in Bangladesh.

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