



Assessment of the Level of Gastrointestinal Parasites Infection among Food Vendors in Minna, North Central Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors ICJO, SP and LAA designed the study. Authors SCH and VAP and SSE wrote the protocol and performed the statistical analysis. While author GCE wrote the first draft of the manuscript. All authors read and approved the final manuscript.

Research Article

Received 18th March 2013

Accepted 14th June 2013

Published 12th July 2013

ABSTRACT

Aim: This study was undertaken to access the intestinal parasitic profile of food vendors in Minna Nigeria.

Study Design: This is a cross-sectional study conducted in Minna the capital of Niger state, North central Nigeria. Sample sizes were determined at random from the food vendors selling ready to eat food.

Place and Duration of Study: Samples were collected from the food vendors in Minna between June and December 2012.

Methodology: Samples were assayed for intestinal parasites using direct wet mount and formalin-ethyl acetate sedimentation techniques.

Results: This study showed that 104 samples out of 116 (89.66%) were positive for intestinal parasites; 70 samples (67.31%) represented single infections and 34 (32.69%) mixed infections. *Ascaris lumbricoides* eggs were found in 11 (10.58%), Hookworm 10

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(9.62%), *Trichuris trichiura* 4 (3.85%), *Giardia duodenalis* 15 (14.42%), *Entamoeba histolytica* 20 (19.23%), and *Taenia saginata* 10 (9.62%) respectively. A significant ($p < 0.05$) prevalence was found in females 92 (88.46%) and in mean age of 31 – 40 years 34 (32.69%). Eggs and cysts of intestinal parasites were found more in the food samples such as Beans portage (15.50%), Stew (6.00%), Soup (15.50%), Rice (14.00%), Salad (20.00%), Spaghetti (12.50%) and Chinchin (20.00%) respectively.

Conclusion: High prevalence of intestinal parasites in food vendors is a matter of great concern considering the effect which will lead to diseases outbreaks. The provision of food safety measures focusing on personal hygiene and periodical medical check-ups is highly advised.

Keywords: Food vendors; intestinal parasites; personal hygiene and road side food sellers.

1. INTRODUCTION

Gastrointestinal Parasites are mostly transmitted through food and contaminated water, but may also be spread from person to person through faecal-oral contact. Over 70 species of protozoan and helminthic parasites can infect humans through food and water contamination [1]. In developing countries, particularly those with tropical climates and at low altitudes, such infections remain a serious medical and public health problem. They are more prevalent among the poor, who are negatively affected by low socio-economic conditions, poor personal and environmental hygiene, over-crowding, and limited access to clean water [2]. Industrialization, urbanization and population growth have prompted people to migrate from rural to urban areas, forcing them to have their meals at any place at an affordable price. In urban areas, there is mushrooming of eating establishments due to increased demand.

Protozoa and helminthic parasites are responsible for the prevalence of diseases capable of affecting an individual's health. Intestinal parasitic infections are global health problems causing clinical illness in 450 million inhabitants, particularly children and women of reproductive age in developing countries [3]. Intestinal parasitic infections and helminths in particular, are associated with increased risks for nutritional anaemia, protein energy malnutrition, growth retardation in children, poor increase in body weight in pregnancy, intrauterine growth retardation, and low birth weight [4,5]. Children infected with soil-transmitted helminths have poor educational level and performance at school and a high level of truancy, thus impacting on their future earnings and productivity [6,7]. The most important soil-transmitted helminths are the common roundworm (*Ascaris lumbricoides*), the whipworm (*Trichuris trichiura*) and the hookworms (*Necator americanus* and *Ancylostoma duodenale*), which currently are a group of neglected tropical diseases [8].

Nigeria been a tropical country provides a favourable environment for gastrointestinal parasitic eggs and larvae. Intestinal parasites are associated with under nutrition, stunting, underweight and wasting in rural and urban children in Akwa Ibom State [9] and have adverse effects on the physical and mental development in poorly nourished community populations in Calabar [10].

The cost of eating from food vendor's stand is relatively cheap thereby providing more affordable means for people to obtain nutritionally balanced meals outside their home [11]. Although street food has become an indispensable part of both urban and rural diets, in Nigeria, some public health risk is associated with the consumption of street food. While it is

expected that street food meets the nutritional needs of consumers, it is also necessary to ensure its safety from contaminants and microorganisms.

Modern technologies such as refrigeration and modern cooking facilities have been used to prolong the storage, transport, and shelf-life of prepared foods, to minimize the risk of contamination by parasitic organisms. However, many food vendors lack the necessary facilities to prevent food contamination. A survey conducted by the Food and Agriculture Organization (FAO) in 2001 recorded a higher incidence of food borne illnesses in areas of increased food vendor activity [12].

In recent years, due to changing lifestyle, breakdown of joint family system and increase in number of working women has led to consumption of ready to eat foods. The individuals may be able to satisfy their taste and nutrition needs, but pays little attention to hygiene and food safety [13]. It is necessary to register all types of food establishment so that supervision and monitoring of hygiene of the food as well as the food vendors can be done. There are few registered food establishments in Minna, Niger state Nigeria. There are many sporadic cases of food borne diseases reported among the consumers. This study was undertaken with the objective to access the intestinal parasitic profile of food vendors and ready-to-eat food samples.

2. MATERIALS AND METHODS

2.1 Study Design

This is a cross-sectional study conducted in Minna the capital of Niger state Nigeria.

2.2 Study Area

The study was carried out in Minna, the capital of Niger State, North Central of Nigeria. It is located approximately on 9°36'50"N and 6°33'25"E in Sudan savanna. It covers a land area of 88km² with an estimated human population of approximately 1.0 million. The area has a tropical climate with a mean annual temperature, relative humidity and rain fall of 30,20°C, 61.00% and 1334.00mm respectively. The residences are predominantly Fulanies, Nupes, Hausas and Gwaries, most of who depend on open-air markets as the sole source of meat, fish, vegetables, and other foodstuffs. A sizable area is characterized by poor drainage and sanitation, and garbage dumps nearby. Vendors often operate near choked, polluted areas, with little or no access to clean water, and are often in close proximity to heaps of garbage that serve as favourable environments for intestinal-parasite transmission. Food vendors were randomly selected for screening from the various wards of Minna Metropolis (Fig. 1).

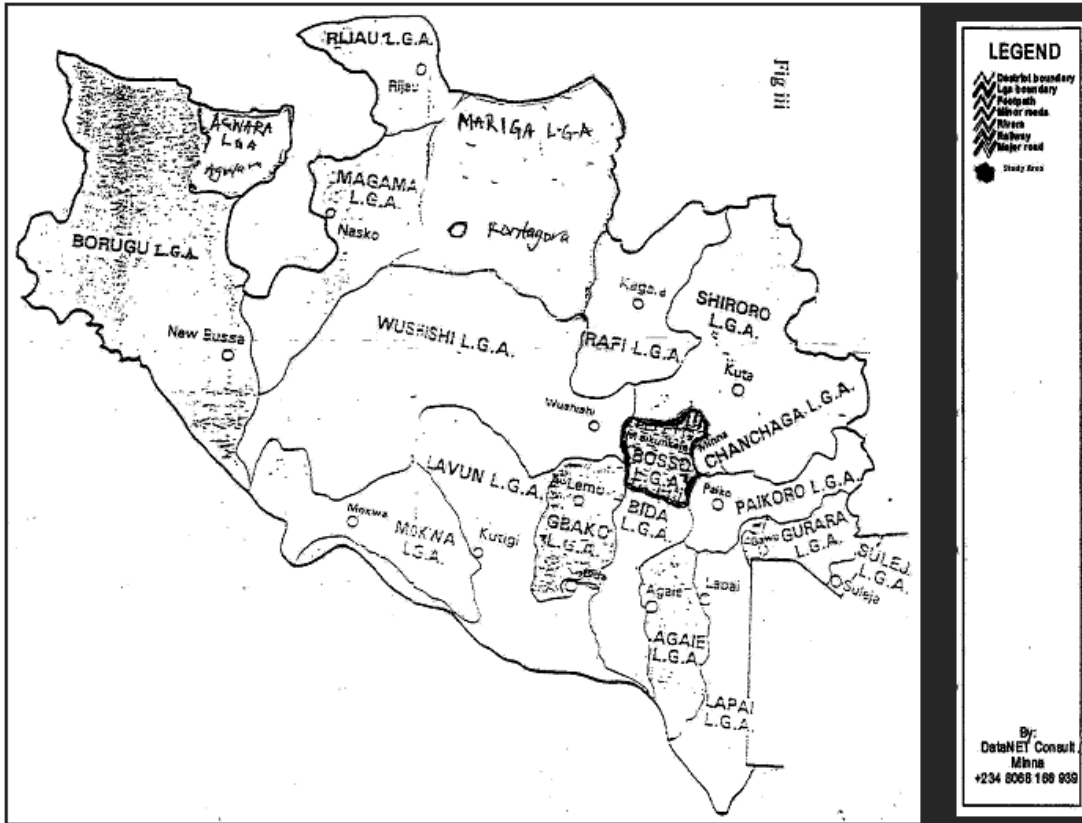


Fig. 1. Map of Niger State showing Minna (Bosso and Chanchaga LGAs) metropolis

2.3 Study Population and Sample

The study was carried out from June to December 2012, amongst food vendors working in Minna. A food vendors is any person who handles food, regardless of whether he actually prepares or serves it [14]. Of the 250 total food vendors contacted, 116 participated in the study. Those food vendors who were unwilling to give stool specimen and those who could not give their consent were excluded from the study. The inclusion criteria were: male and female food vendors selling foods to people. Informed consent was obtained verbally after informing them of the purpose of the study.

2.4 Sample Analysis

Both wet mounts and Formal-ether Concentration Techniques were used for each specimen and examined by light microscopy at magnifications of x40 and x100, for species identification. Helminths were identified from their characteristic egg morphology, and protozoa from their cysts and/or vegetative forms. The microscopic work was done in the Department of Biological Sciences, Federal University of Technology, Minna.

2.5 Data Analysis

The collected data were analysed using SPSS version 15.0. The prevalence of parasites was presented as descriptive statistics, while the relationship between several variables (age, gender) and infection was determined by the chi-square test. The level of significance used was 0.05.

3. RESULTS

A total of 116 stool samples of food vendors were analysed. One hundred and four (104) of the stool samples (89.66%) tested positive for *Ascaris lumbricoides* 11 (10.58), Hookworm 10 (9.62), *Trichuris trichuira* 4 (3.85), *Giardia duodenalis* 15 (14.42), *Entamoeba histolytica* 20 (19.23) and *Taenia* species 10 (9.62) as single infections and *Ascaris lumbricoides* + Hookworm 5 (4.81), *Giardia duodenalis* + Hookworm 10 (9.62), *Entamoeba histolytica* + *Trichuris trichuira* 4 (3.85) and *Giardia duodenalis* + *Entamoeba histolytica* 15 (14.42) as mixed infections respectively (Table 1).

Out of the 116 food vendors recruited for this study, 12 (11.54%) males and 92 (88.46%) females were infected. Prevalence was highly significant in females compared to males using chi-square ($p < 0.05$) analysis. The subjects' age ranged from 10 to over 60 years and infection in the different age groups were 10 – 20 years 21 (20.19%), 21 – 30 years 20 (19.23%), 31 – 40 years 34 (32.69%), 41 – 50 years 24 (23.08%), 51 – 60 years 5 (4.81%) and over 60 years none respectively (Table 2). Significant infection ($p < 0.05$) was observed in the age range 31 – 40 years.

With regard to food samples *Ascaris lumbricoides* eggs were found in Beans portage (16.00%), stew (7.00%) and soup (16.00%), *Entamoeba histolytica* in rice (14.00%), salad (20.00%), stew (7.00%), Bambara (25.00%) and soup (16.00%), *Trichuris trichuira* in spaghetti (13.00%) and soup (16.00%) while *Giardia duodenalis* in chinchin (20.00%) (Fig. 2).

Table 1. Prevalence of gastro-intestinal parasites among food vendors (n=104) in Minna, North Central Nigeria

Parasites species isolated	No. (%)
Helminth eggs	
<i>Ascaris lumbricoides</i>	11 (10.58)
Hookworm	10 (9.62)
<i>Trichuris trichuira</i>	4 (3.85)
Protozoan cysts	
<i>Giardia duodenalis</i>	15 (14.42)
<i>Entamoeba histolytica</i>	20 (19.23)
Cestodes	
<i>Taenia saginata</i>	10 (9.62)
Mixed infections	
<i>Ascaris lumbricoides</i> + Hookworm	5 (4.81)
<i>Giardia duodenalis</i> + Hookworm	10 (9.62)
<i>Entamoeba histolytica</i> + <i>Trichuris trichuira</i>	4 (3.85)

Table 2. Presence of parasites by gender and age of food vendors (n=104) in Minna, North Central Nigeria

Variable/Genders	Parasites encountered	
	*Positive (n=104)	Negative (n=12)
Male	12 (11.54%)	5 (41.67%)
Female	92 (88.46%)	7 (58.33%)
Age (years)		
10 – 20	21 (20.19%)	1 (8.33%)
21 – 30	20 (19.23%)	2 (16.67%)
31 – 40	34 (32.69%)	6 (20.19%)
41 – 50	24 (23.08%)	2 (50.00%)
51 – 60	5 (4.81%)	1 (8.33%)
>60	0	0

* Infected food vendors.

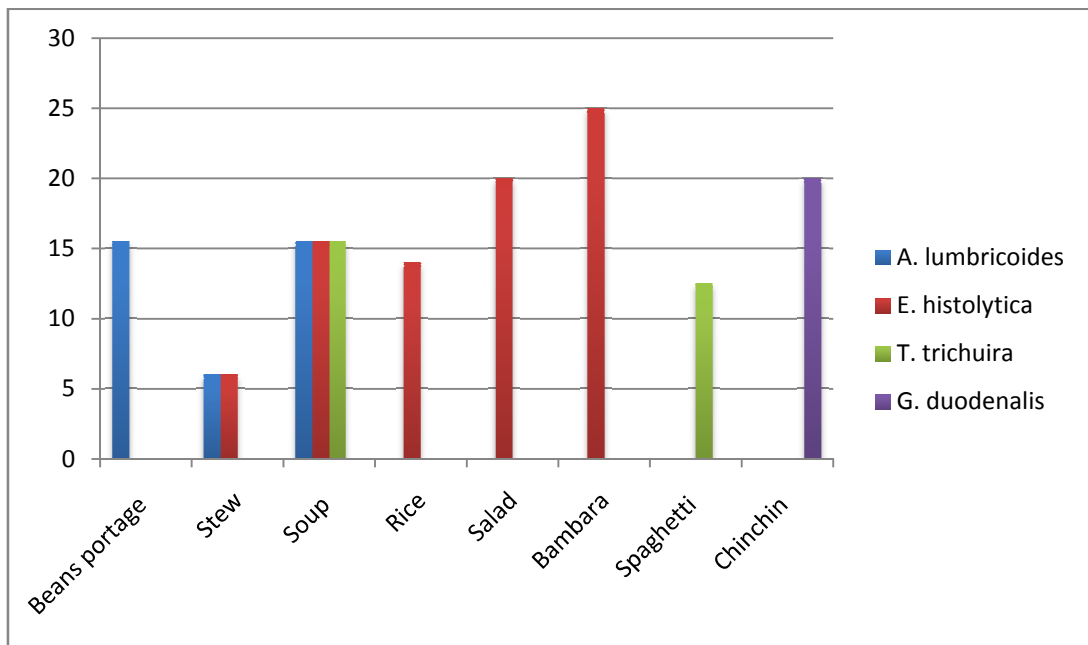


Fig. 2. Prevalence of gastrointestinal parasites in food samples from five food establishments in Minna, North Central Nigeria

4. DISCUSSION

Food borne disease outbreaks continue to be reported in literature. The most frequently identified factors contributing to the outbreaks are contaminated raw foods/ingredients, and poor personal hygiene of persons who handle foods, and there is overwhelming evidence that food handlers whose work involves touching unwrapped foods to be consumed raw or without further cooking or other forms of treatment (HIGH-RISK FOOD HANDLERS) are those most commonly implicated in foodborne outbreaks. The unhygienic handling of such foods constitutes a particularly grave risk [15].

In the present study subjects prevalence rate was high for gastrointestinal parasites in food vendors and also in food samples sold to consumers, indicating the poor health status, hygiene and unhygienic practices of the food vendors. Similar results were found in a study in Abeokuta (Nigeria) where the prevalence of parasitic infections among street food vendors was as high as 98.7% [16] and in the Federal Capital Territory of Nigeria where infection rates was also high [17], but these studies did not investigate parasites in food samples sold to consumers.

The study reveals that higher number of food vendors was females and the age range of 31 to 40 years had more intestinal parasites. In a similar study in Iran the prevalence of intestinal parasites was higher in men than in women, [18]. This different result may possibly be explained by differences in environmental factors and for the fact that women are usually indoors.

To best of our knowledge, this study is the first to reveal intestinal parasites in ready to eat food samples in this part of the country.

Most of the common intestinal parasitic infections of man are faecal borne infections and the transmission occur either directly hand-to mouth or indirectly through food and water. Their transmission within the community is predominantly related to human habits with regards to eating, defecation, personal hygiene, cleanliness and level of education. Their prevalence in the community can be used as an indicator of the living conditions, and environmental sanitation, as well as the socioeconomic status of the community. In order to meet the huge challenge of food safety in the 21st century, a coordinative and cooperative approach is required. This will be a major task of the public health community and will require the use of new methods of identifying, monitoring, and assessing of food-borne hazards, including the wide application of the hazard analysis and critical control point system.

5. CONCLUSION

In this study there was a high prevalence of intestinal parasites in stool specimens of food vendors and in some food samples sold to consumers indicating contamination, which might be due to unhygienic practices. An effective means of preventing the transmission of parasites from food vendors as food handlers via food to consumers is strict adherence to good personal hygiene and to hygienic food-handling practices.

ETHICAL CONSIDERATIONS

All work was performed according to the guidelines for human experimentations in clinical research stated by the Federal Ministry of Health of Nigeria. All food vendors gave oral informed consent before giving their stool samples.

ACKNOWLEDGMENTS

We wish to appreciate the food vendors who willingly participated in this study. We also express our gratitude to laboratory staff of the Department of Biological Sciences, Federal University of Technology, Minna, Nigeria for their support and assistance.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.

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