



Prevalence of *Salmonella typhi* and intestinal parasites among food handlers in Mekelle University student cafeteria, Mekelle, Ethiopia



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ABSTRACT

Food borne diseases are one among the most significant factors affecting public health related issues globally. The related problems are high in the developing countries, due to the difficulties in adopting optimal hygienic practices during food handling. The aim of this study was to evaluate the prevalence of *Salmonella typhi* and intestinal parasites in the stool samples of food handlers in Mekelle University student cafeteria, in the city of Mekelle, Ethiopia. Food handlers, infected or carriers plays a role in the transmission of infections to the public especially in the society, community and to the patients in hospitals. A cross sectional study was conducted during the period of December 2012 to August 2013. Stool samples were collected from 307 food handlers in the student's cafeteria. Microscopic examination and culturing of the samples were performed for the isolation of intestinal parasites and *Salmonella* species, respectively. Out of the 307 food handlers enrolled in the study, one hundred sixty one (52.4%) stool specimens were positive for different intestinal parasites. *Entamoeba histolytica/dispar* was the most prevalent parasite (32.3%), followed by *Giardia lamblia* (4.9%) and *Schistosoma mansoni* (2.6%). In which four (1.3%) stool specimens were positive for mixed parasites. Only three (1%) *S. typhi* were isolated from the food handlers and evaluated for antibacterial sensitivity pattern against the commonly used antibiotics. Statistically significant analysis was seen between the intestinal parasite and sex ($X^2 = 6.603$, $df = 1$, $P = .007$), year of service ($X^2 = 21.2$, $df = 6$, $P = .002$) and level of education ($X^2 = 11.779$, $df = 4$, $P = .019$). Our investigation reveals that there is high prevalence of enteric pathogens among food handlers which indicates the improper hygienic practices and no standard protocols among the food-handlers who are working in the student's cafeteria. Hence, proper educations, protocols, training programs on the hygienic practices and regular medical checkup among food-handlers will help to control the prevalence of intestinal pathogens and parasites at certain limits.

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1. Introduction

Food borne diseases are major health problem of the globe. This situation is severe in developing countries due to low hygienic food handling practices. Around 70% of the cases of diarrheal disease in developing countries are associated with the consumption of contaminated food (WHO, 2007). Intestinal parasites and protozoan infections are the most common intestinal infections worldwide. It estimated that approximately 3.5 billion people are affected, and 450 million are ill due to these infections, the majority

being children. Transmission of intestinal parasites and enteropathogenic bacteria affected directly or indirectly through objects contaminated with faeces. These include food, water, nails, and fingers, indicating the importance of faecal-oral human-to-human transmission (Zaglool, Khodari, Othman, & Farooq, 2011).

Intestinal parasitic infections, which are associated with stunting of linear growth, physical weakness and low educational achievement in patients, especially children, are the major problems of public health in developing countries (Akhlaghi, Shamseddin, Meamar, Razmjou, & Oormazdi, 2009). Poverty, food habits, high population growth and low sanitation, and lack of health awareness are the most important factors for the occurrence of parasitic origin of food- and water-borne infections (Todd, Greig, Bartleson, & Michaels, 2007). There are many reports of intestinal

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parasites from food handlers from all parts of the world. However, the prevalence varies from place to place, sexes, ages etc. Few research work reported that the occurrence of intestinal pathogens in Ethiopia, Gonder and Hawassa, have revealed 29.21% and 63% respectively (Gashaw, Kassu, Moges, Tiruneh, & Huruy, 2008; Teklemariam, Roma, Solomon, & Erosie, 2000).

Salmonella typhi is one of the major causes of food and water borne gastroenteritis in human and remains as a causative agent for intestinal related health issues worldwide (Tsen, Hu, Lin, Huang, & Wang, 2000). The World Health Organization estimates 16 million new cases and 6×10^5 death rate for typhoid fever in every year (WHO, 2003, pp. 372–381). The main source of typhoid is asymptomatic carriers. An individual can asymptotically carries the typhoid-causing organism for days and years without showing any symptoms of typhoid fever. In such carriers, the typhoid organism continues to multiply in the gall bladder and reaches the intestine through the bile duct (Valli, Selvan, Sudha, Dhananjeyan, & Iyappan, 2010). Studies shows that the asymptomatic carriers from Jordan and Southern England reveals 6% and 12.3%, *Salmonella* spp. respectively (Al-Lahham, Abu-Saud, & Shehabi, 1990; Dryden, Keyworth, Gabb, & Stein, 1994). Another study done in Nigeria showed that 5.7% of *Salmonella* spp. A study conducted in Gonder town showed that *Salmonella* spp. absent in stool sample of food handlers (Tsen et al., 2000). On the other hand, prevalence study in Bahir Dar town showed that 1.6% food handlers found positive for *S. typhi* (Abera, Biadegelgen, & Bezabih, 2010).

Food handlers with poor health and hygiene may be infected with wide range of enteropathogens and have been played a role in the transmitting intestinal infections to the public in the community and to patients in hospitals (Khurana, Taneja, Thapar, Sharma, & Malla, 2008). The spread of disease from food handlers was common and persistent health related issues in worldwide (Gashaw et al., 2008; Zain & Naing, 2002). There is scarcity of data about the prevalence of enteropathogenic among food handlers in Tigray. Therefore, the objective of this study is to assess prevalence of *S. typhi* and intestinal parasites among food handlers in students' cafeteria, Mekelle University.

2. Materials and methods

2.1. Area of study and its duration

Cross sectional study was conducted during the period of December 2012 to August 2013 at Mekelle University students' cafeteria.

2.2. Population study

Duration of this study, 307 food handlers were selected as volunteers, who by no means receive medical aid for any intestinal ailment and typhoid fever for last three months, who caters in student's cafeteria. Sample size ($n = 307$) were included in this study by taking margin of error ($d = 0.05$) and the confidence interval ($Z\alpha/2$) was 95%.

2.3. Sample collection and processing

Stool specimens were obtained from food handlers and collected in screw-capped containers and transported to Microbiology Laboratory of Ayder Referral hospital for microscopic examination and culturing process.

2.4. Isolation and identification for *Salmonella* species

All stool specimens were inoculated into Selenite F broth (OXOID, England) and incubated for 24 h at 37 °C. After the enrichment of the

culture, it underwent sub-culturing into *Salmonella* selective medium, Xylose Lysine Deoxychocolate agar (XLD) (OXOID, England) and incubated at 37 °C for 24 h. The possible presence of *Salmonella* species was indicated by the growth of red colonies, with or without black centered. Further identification of *Salmonella* species was carried out using the following standard biochemical tests: Indole, Methyl red, Voges-Proskauer, Citrate utilization (IMViC), motility and Triple Sugar Iron (TSI) agar. Antimicrobial sensitivity pattern was carried out by the Modified Kirby-Bauer disc diffusion method for the following commonly used antibiotics. Ampicillin (10 µg), Tetracycline (30 µg), Chloramphenicol (30 µg), Gentamycine (10 µg), Ciprofloxacin (5 µg) and Norfloxacin (10 µg) (OXOID, England).

2.5. Stool examination for ova and parasites

Microscopic examination (using Olympus CH 30 Microscope) of stool specimens was performed using direct wet mount at the collection sites. Further formol-ether concentration method for detection of ova and parasites was carried out at Ayder referral hospital.

2.6. Reference strain

Escherichia coli (ATCC 25922) obtained from Ethiopian Health and Nutrition Research Institute (EHNRI) was used as a quality control for culture and antimicrobial susceptibility test.

2.7. Statistical analysis

Statistical data analysis was performed by using computer software, SPSS version 16. Total study population for this prevalence calculated separately for different sex and age groups. Chi-square test and linear regression used respectively for comparison of the results obtained. P -value < 0.05 was considered as significant.

2.8. Ethical clearance

Ethical clearance for conducting this study had issued from Ethical Review and Research Committee, Mekelle University. Official permission procured from all the top-level management of the student's cafeteria, where this study was carried out. During core study, food handlers were informed about the purpose, importance, their anticipated benefits (free treatment, if positive). Moreover, given full rights and freedom to refuse, reject, or withdraw completely from this study. The written consent and signatures obtained from each participant those who are ready of their own for this study. Demographic data, hygiene, and health related issues, procedure, and process in handling food item were collected by using semi-structured questionnaires specially prepared for this purpose of study.

3. Results and discussion

Food handlers with improper hygiene might be the causative agent for the wide range of enteropathogens and been implicated in transmitting most gastro-intestinal infections to the public in the community and to patients in hospitals (Khurana et al., 2008). Therefore, this study demonstrates prevalence of *Salmonella* spp. and intestinal parasites among food handlers in students' cafeteria, Mekelle University.

This study comprises 307 food-handlers from the student cafeteria, which located in the three different campuses of Mekelle

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