Food handling practice and associated factors among food handlers working in food establishments in Woldia town, Northeast Ethiopia

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Abstract

**Objective:** The aim of this study was to assess food handling practice and associated factors among food handlers working in public food and drink establishments in Woldia town, Northeast Ethiopia.

**Results:** Of the total 288 participated food handlers, 91.7% were females, and 82.3% were single, while 69.8% were literate. Ninety-four (32.6%) of them were under 15-20 years age and the median age was 23.3 year. The proportion of good food handling practice was 134 (46.5%)[95% CI (confidence interval): 41.00, 52.40]. Advanced age [AOR (adjusted odds ratio): 12.01; 95% CI 1.96-73.52], education (AOR=2.29; 95% CI=1.05-4.61), service year (AOR=2.43; 95% CI=2.08-3.17), received training (AOR=1.79; 95%CI=1.68-4.71), and inspection by regulatory personnel (AOR=2.24; 95%CI=1.05-3.09) were positively associated with food handler's food handling practices. This study showed that the food handling practice was poor. Age, education, service year, training received, and sanitary inspection visit by regulatory personnel were factors significantly associated with food handler's food handling practices. Food handling and safety training to food handlers, establishment owners, and regular sanitary inspection visits of public food service establishments by regulatory authority is compulsory.

**Introduction**

Foodborne illness is one of a major public health problem globally [1, 2]. In each year an enormous number of individuals are at increased risk and many of them get ill and die due to consumption of contaminated foods [2]. Due to the rise of urbanization and changes in standard of living led individuals to eat food away from their house frequently, resulting to the unlimited establishments of food service institutions which usually have poor sanitary conditions and lack of trainings on food handling [3].

Although food handling issues had risen steeply “in more affluent societies, the real catastrophe of foodborne diseases is played out in low-income countries” [2]. This could be due to the high proportion of improper food handling and unhygienic practices, the deficiency of food safety laws, the low level of food handlers’ knowledge, attitude and practice on food safety [1, 2]. Foodborne disease related morbidity and mortality in developing countries, particularly in Africa are steadily highest due
to low food handling and poor food hygienic practices at food preparation or service areas [4]. As few previous studies mentioned that the utmost contributing factors for potential foodborne pathogen outbreaks which had raised in food establishments are due to insanitary conditions of the food service establishments [5, 6], food handler’s poor personal and food hygienic practices [2, 5–10], and inadequate food handler’s food handling knowledge [11–13]. Obviously, food handlers can always contribute to ensuring food safety in the public food service establishments [14]. Kasturwar and Shafee (2011) had mentioned that 10–20% of foodborne illnesses are due to food contamination by food handlers [15]. This could be due to poor food handler’s personal hygiene, inappropriate food cooking measures and improper food utensil storage which can contribute “the way for pathogens to come into contact with food and cause foodborne illnesses in consumers” [16]. Hence, realizing food safety measures and possible factors which can be the source of foodborne disease are important for all food handlers in controlling and prevention of food contamination related diseases [17, 18].

Despite the food handlers being responsible to ensure food safety and hygiene in public food establishments, little is known about their level of food handling practices and the associated factors among establishment workers in the study area. Few previous Ethiopian studies conducted in Arbaminch, Diredawa and Debarq town revealed that the prevalence of good food handling practice was 32.6%, 52.4%, and 40.1%, respectively [19–21]. Therefore, it is important to conduct a repeated study aiming to assess food handling practice and associated factors among food handlers working in public food establishments in Woldia tow, Northeast Ethiopia.

Methods
An institutional based cross-sectional study was carried out from January to June 2017. Woldia is the capital of North Wollo Zone found in Amhara National Regional state. The town is found in the Northeast of Ethiopia, 370km away from the regional capital, Bahirdar, and 521km from the Ethiopian capital, Addis Ababa. There were a total of 408 legally registered food and drink establishments in the town, and a total of 956 (302 males and 654 females) food handlers were working in these establishments at the time of data collection [22].
All food handlers working at public food establishments in the town were the focus of this study. A total of 956 food handlers were used as the source of study population.

A single population proportion formula was used to calculate the sample size. The 95%CI, marginal error of 5%, the proportion (52.5%) of goood food handling practice [1], and 5% non-response rate was considered. Accordingly, the final sample size was calculated and corrected to be 288. All food handlers working in 408 food establishments of the town were recruited [22]. For proper sampling technique, total lists of establishments (408), and food handlers (956) were found at the town Trade and Industry Office. Then, lists and the total number of food handlers in each establishment was found from each establishment owners/managers at the time of data collection. Selection of food handlers based on number of food handlers in each establishment was done based on proportion (288/956)*100 = 30%). One food handler per establishment was selected. However, due to the presence of more than one food handler in each establishment, we used lottery method.

A structured interviewer administered questionnaire and observational checklist were used as the data collection tools. Three well trained, BSc nurses who had field data collection experience, one food safety and environmental sanitation expert, and one supervisor were involved in the data collection. Food handler’s food handling practices were assessed through an observational checklist and food handler’s self-response. Two days intensive training to the data collectors, sanitary inspection expert and the supervisor was given on the objectives of the study, confidentiality of the information, and the techniques during conducting the interview. Lastly, collected data was checked its completeness and cleaned for analysis.

The data collection tool was substantiated for its completeness. Cleaned, edited, and complete items were coded, and entered into SPSS version 20 for analysis. The results were presented using descriptive statistics. To identify the variables that were significantly associated with the outcome variable, binary logistic regression statistical model was used. We calculated Odds Ratio with 95%CI to show the strength of associations. All variables with less than 0.05 P-values in the bivariable analysis were entered into the multivariable logistic analysis. Variables with less than 0.05 P-values in the multivariable logistic regression analysis were considered as significantly associated with the food handling practices. The level of food handling practices was calculated by taking summation of eighteen criterias presented in Table S1. Each criterion was given a value of 1 for “YES” response and 0 for “NO” response. The sum of all these questions with “YES” responses were calculated and the average score of criteria’s was used as a cut-off point to categorize food handlers’ food handling practice. Food handler’s food handling practice with higher than mean value were categorized under good food
handling practice, whereas, those which score less than the mean were considered as having poor food handling practice [1].

Results

Sociodemographic characteristics

A total of 288 food handlers were participated, and the median age was 23.3 years. Of the total, 264 (91.7%) were females, while 237 (82.3%) were single. The majority, 201(69.8%) were literate, while 87 (30.2%) were illiterate. Only 42 (14.6%) participants had taken formal training on food handling and safety practices. More than half, 173 (60.1%) of them had served for about 1–5 years (Table 1).

Food handler’s food handling practices

Less than half, 134(46.5%)[95% CI 41.00, 52.40] had good food handling practice. More than three-fourth (77.1%) of the food handlers hadn’t worn outer garment/gown. The majority, 253 (87.8%) of them hadn’t covered their hair during food preparation, while 174 (60.4%) food handlers’ fingernails hadn’t short trimmed and unclean. In addition, 140 (48.6%) had worn any jewelry on their hand at the time of data collection. Again, 128 (44.4%) hadn’t used soap/detergent for washing dishes (Table S1).

Factors associated with food handling practices among food handlers

In the multivariable logistic regression; age, education, service years, training received, and sanitary inspection visit were factors associated with food handling practices (Table 2).

The result revealed that participants under 36–40 years age had higher odds of good food handling practices as compared to participants under 15–20 years age (AOR = 12.01; 95% CI 1.96–73.52).

Similarly, food handlers who had attained education up to grade twelve and above were 2.29 times likely to have good food handling practice than those who were illiterate (AOR = 2.29; CI 1.05–4.61).

In addition, food handlers who had 6–10 years’ experience had higher odds of good food handling practice than those who had served less than one year (AOR = 2.43; CI 2.08–3.17).

Food handlers who had received food handling and preparation training had higher odds of good food handling practice than these who didn’t received the training (AOR = 1.79; CI 1.68–4.71).

Furthermore, food handlers who had inspected by regulatory personnel for the past six months had higher odds of good food handling practices than those who hadn’t inspected (AOR = 2.24; CI 1.05–3.09) (Table 2).
Factors associated with food handling practice in relation to sanitary inspection by regulatory bodies

Only 137(47.6%) [95% CI 42.00, 53.50] of public food establishments and food handlers were inspected by concerned authorities in the past six months. Food handlers who were working in establishments which were inspected by concerned bodies in the past six months had higher odds of proper storage of food utensils (AOR = 2.95, 95%CI 1.28–4.23), had trimmed fingernails (AOR = 3.38; CI 1.18–7.812), and had washed their hands after toilet with soap (AOR = 2.21; CI 1.03, 4.27) as compared with those who were worked in establishments which hadn’t (Table 3).

Discussion

Poor food handling practice is one of the foremost ways for foodborne disease transmission. It is important to give an emphasis for food handling practice by concerned regulatory bodies. Therefore, this study stipulates an understanding to the status of food handling practice on the study area.

This study had shown that good food handling practice was 134(46.5%)[95% CI 41.00, 52.40]. This result was lower than studies in Dangila 52.2% [1], Bahirdar 67.6% [4], Malaysia 54.7% [14], Nigeria 54.7% [23], and Mekelle 63.9% [24]. This difference could be due to differences in food handler's sociodemographic and environmental determinant variations in these study groups. The other possible suggestion might be due to improved sanitary inspection and regulation measures in these studies than our study settings.

The odds of performing good food handling among food handlers who were in advanced age (26–40 years) were higher as compared with those whose age were 15–20 years. This finding was in line with previous studies [25, 26], which had revealed that food handlers who were in advanced age had good food handling practices. This could be the fact that food handling practice behaviour can be improved when their age increased and develop experience to handle food safely.

Similarly, food handlers who had attained education above grad twelve were 2.29 times more likely to have good food handling practices as compared to illiterates. This result was consistence with the study conducted in Bahirdar, which revealed that food handlers who had formal education were 6.4 times more likely to have good food handling practices [4]. This is because the depth of knowledge could affect food handler’s food handling practices. This is also evidenced by other studies [14, 27,
Obviously, education aids to “enhance knowledge thereby to develop skills of food handlers to work according to the standard procedures to maintain food safety” [29].

In addition, the odds of performing good food handling practice among food handlers who had 6–10 years’ experience were 2.43 time higher as compared to those who hadn’t. This finding was consistent with the study in Bahirdar, which had revealed that food handlers who had greater than 2 years work experience were 3.4 times likely to have good food handling practice [4]. Similarly, Gizaw et al (2014) had mentioned that food handlers who had 3 years experience were 3.37 times likely to have good food handling practice [26]. Evidently, food handling practice status may raise as food handler’s service year increases [25]. This might be the reason that good food handling practice behaviour can be acquired by continuous practice; hence, food handlers who had such experience are in good position to enhance skills on food handling practice.

The odds of good food handling practice among participants who had received formal training were higher as compare to those who hadn’t. This is evidenced by few earlier studies [4, 28, 30, 31]. A study conducted in Bahirdar revealed that food handlers who received formal training were 4.7 times more likely to have proper food handling practices [4]. This might be training on food handling practice can improve food handler’s knowledge about foodborne illness and related food safety issues, and their food handling practice skills [17, 31], and this enables them to have better understanding and realize their responsibilities [31].

Furthermore, the odds of performing proper storage of food utensil, had trimmed fingernails, and had washed their hands after visiting toilet were higher among those who were worked in establishments which had been inspected by concerned regulator personnel in the past six months. These results were supported by earlier study, which revealed that “those establishments that had been supervised by regulatory bodies (at least once in the past six months) were more likely to fulfill the requirements of acceptable hygienic and sanitary practices” [22]. The possible reason for this result might be regular sanitary supervision visits of the establishments supported by education can improve and sustain food handler’s proper food handling practice and sanitary situations of the establishments. This study showed that the food handling practice was poor. Age, education, service year, training
received, and sanitary inspection were factors associated with food handling practices. Thorough training on food handling practice and safety to food handlers and owners/managers, regular sanitary inspection to food establishments is highly recommended to promote and ensure proper sanitation facilities in the establishments and food handler’s food handling practices.

Limitations
Due to this cross-sectional study design, the cause and effect relationship will not be shown and there will be observational biases.

Abbreviations
AOR: Adjusted Odds Ratio; CI: Confidence interval; COR: Crude Odds Ratio; WHO: World Health Organization.

Declarations
Author’s Contributions
MAR carried out the conception of the research idea, manage the data collection and involved in data analysis and manuscript preparation for publication; MTL and AAG participated in protocol development, data collection, analysis and reviewed the manuscript; GAL performed data analysis and interpretation of the results. All authors read and approved the final draft of the manuscript.

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Competing interests
The authors declare that they have no competing interests.

Availability of data and materials

Data will be available upon a reasonable request made to the correspondent author.

Consent for publication

Not applicable.

Ethical approval and consent to participate

The study was ethically reviewed and approved by Woldia University research review committee, and permission was also obtained from Municipality Office and district health department of Woldia town. Data was collected after written consent was found from the public food service establishment owners/managers and interviews follows full consent of the food handlers. Participants were assured that all information they provided was kept confidential and used only for the aim of this study.

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Tables

| Characteristics                                      | Frequency (n) | Percent(%) |
|------------------------------------------------------|---------------|------------|
| Sex                                                  |               |            |
| Male                                                 | 24            | 8.3        |
| Female                                               | 264           | 91.7       |
| Age (year)                                           |               |            |
| 15-20                                                | 94            | 32.6       |
| 21-25                                                | 90            | 31.3       |
| 26-30                                                | 78            | 27.1       |
| 31-35                                                | 17            | 5.9        |
| 36-40                                                | 9             | 3.1        |
| Marital status                                       |               |            |
| Single                                               | 237           | 82.3       |
| Married                                              | 49            | 17         |
| Divorced                                             | 2             | 0.7        |
| Educational attainment                               |               |            |
| Illiterate                                           | 87            | 30.2       |
| Grade 1-6                                            | 98            | 34         |
| Grade 7-12                                           | 90            | 31.3       |
| > Grade 12                                           | 13            | 4.5        |
| Religion of food handler                              |               |            |
| Orthodox                                             | 255           | 88.5       |
| Muslim                                               | 18            | 6.3        |
| Protestant                                           | 10            | 3.5        |
| Catholic                                             | 5             | 1.7        |
| Food handler’s monthly income(in birr)               |               |            |
| ≥500                                                 | 186           | 64.6       |
| <500                                                 | 102           | 35.4       |
| Food handling and hygiene training received          |               |            |
| Yes                                                  | 42            | 14.6       |
| No                                                   | 246           | 85.4       |
| If food handlers received training, does he/she certify?(n=42) | | |
| Yes                                                  | 7             | 16.7       |
| No                                                   | 35            | 83.3       |
| The service year of food handlers                     |               |            |
| <1 year                                              | 98            | 34.0       |
| 1-5 year                                             | 173           | 60.1       |
| 6-10 year                                            | 11            | 3.8        |
| > 10 years                                           | 6             | 2.1        |
| Characteristics                        | Food handling practice score | COR (95% CI) | p-value |
|----------------------------------------|-----------------------------|--------------|---------|
|                                        | Good | Poor |                                |         |
| **Sex**                                |      |      |                                |         |
| Male                                   | 17   | 7    | 1                               |         |
| Female                                 | 117  | 147  | 3.05(1.22-7.60)                 | 0.04    |
| **Age (years)**                        |      |      |                                |         |
| 15-20                                  | 58   | 36   | 1                               |         |
| 21-25                                  | 42   | 48   | 1.84(1.02-3.31)                 | 0.041   |
| 26-30                                  | 25   | 53   | 3.41(1.82-6.42)                 | 0.000   |
| 31-35                                  | 6    | 11   | 2.95(1.01-8.68)                 | 0.009   |
| 36-40                                  | 3    | 6    | 3.22(1.76-13.70)                | 0.013   |
| **Marital status**                     |      |      |                                |         |
| Single                                 | 107  | 130  | 1                               |         |
| Married                                | 27   | 22   | 2.95(1.01-8.68)                 | 0.025   |
| Divorced                               | 0    | 2    | -                              | -       |
| **Educational attainment**             |      |      |                                |         |
| Illiterate                             | 19   | 68   | 1                               |         |
| Grade 1-6                              | 40   | 58   | 2.41(1.21-3.78)                 | 0.016   |
| Grade 7-12                             | 65   | 25   | 1.11(1.05-2.21)                 | 0.001   |
| Grade >12                              | 10   | 3    | 2.08(1.02-5.34)                 | 0.0001  |
| **Food handler's monthly income (in birr)** |    |      |                                |         |
| ≥ 500                                  | 112  | 74   | 3.18(2.10-4.32)                 | 0.006   |
| < 500                                  | 22   | 80   | 1                               |         |
| **Service year of food handlers**      |      |      |                                |         |
| <1 year                                | 46   | 52   | 1                               |         |
| 1-5 year                               | 74   | 99   | 1.18(0.72-2.95)                 | 0.507   |
| 6-10 year                              | 8    | 3    | 1.33(1.08-2.33)                 | 0.018   |
| > 10 years                             | 6    | 0    | -                              | -       |
| **Food handling and preparation training received** |    |      |                                |         |
| Yes                                    | 22   | 20   | 1.76(1.40-3.46)                 | 0.012   |
| No                                     | 112  | 134  | 1                               |         |
| **The sanitary inspection**            |      |      |                                |         |
| Yes                                    | 86   | 51   | 3.28(1.17-6.45)                 | 0.000   |
| No                                     | 48   | 103  | 1                               |         |
Table 3: Food handler's food handling practices in relation to sanitary inspection by regulator personnel in Woldia town, Northeast Ethiopia.

| Characteristics                                                                 | Sanitary Inspection | COR (95% CI)   | p-value |
|---------------------------------------------------------------------------------|---------------------|----------------|---------|
| Storage of food utensils                                                        |                     |                |         |
| Proper                                                                          | 30                  | 20             | 1.55(0.29-2.01) | 0.005   |
| Improper                                                                       | 107                 | 131            | 1       |         |
| Food handlers with trimmed fingernails                                          |                     |                |         |
| Yes                                                                             | 72                  | 42             | 2.35(1.21-4.57) | 0.001   |
| No                                                                              | 65                  | 109            | 1       |         |
| Food handler's hair was covered                                                 |                     |                |         |
| Yes                                                                             | 28                  | 7              | 4.19(1.08-10.49) | 0.015   |
| No                                                                              | 109                 | 144            | 1       |         |
| Food handler wash his/her hands before starting the food handling               |                     |                |         |
| Yes                                                                             | 114                 | 115            | 1.64(0.36-3.16) | 0.034   |
| No                                                                              | 23                  | 36             | 1       |         |
| Washing hands after visiting toilet with soap and water                         |                     |                |         |
| Yes                                                                             | 134                 | 133            | 3.17(1.48-9.58) | 0.001   |
| No                                                                              | 3                   | 18             | 1       |         |
| Washing utensils using three compartments                                       |                     |                |         |
| Yes                                                                             | 86                  | 48             | 3.28(1.17-7.45) | 0.048   |
| No                                                                              | 51                  | 103            | 1       |         |
| Using soap/detergent for washing dishes                                         |                     |                |         |
| Yes                                                                             | 90                  | 70             | 3.45(1.28-7.73) | 0.004   |
| No                                                                              | 47                  | 81             | 1       |         |
| Stored perishable ready-to-eat foods in the refrigerator (n=226)                 |                     |                |         |
| Yes                                                                             | 53                  | 7              | 2.17(0.17-4.47) | 0.002   |
| No                                                                              | 70                  | 96             | 1       |         |

Supplementary Files

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