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# FOOD HANDLER'S HYGIENE AND SAFETY MEASURES AMONG STREET FOOD SHOPS AND FOOD ESTABLISHMENTS: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

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## ABSTRACT

### BACKGROUND

In Tessema AG et al study, two hundred thirteen (52.5%) of food handlers had good food handling practices. The literature on food handlers' hygiene is limited in India, particularly in regions like Anantapuramu, where studies addressing the knowledge, practices, and epidemiological impact of food borne diseases remain scarce.

### AIMS AND OBJECTIVES

1. To study the hygiene practices of food safety among street cooked food handlers.
2. To study the determinants of food handler's hygiene practices in food establishments.
3. To enumerate acute health related complaints among food handlers.

### MATERIALS AND METHODS

Epidemiological investigation-Community Based Cross-sectional study on food handler's working in food establishments. The estimated minimum sample size is 384. Simple Random Sampling is used for data collection through pre-structured questionnaire. Data Analysis is done using tables, charts, chi-square test of significance.

### RESULTS

Total sample size is 394. The mean KAP score is 24.18 (67.2%). Maximum score recorded is 36 (100%) and the minimum score is 9 (25%). KAP score proportion more than 60% is considered as good KAP score while below 60% as poor KAP score. Around 276 subjects (70.1%) had good KAP score while 118 subjects (29.9%) had poor KAP score. The determinants identified for poor food handler's hygiene were observed as age below 25 years, male gender, low educational status, lack of

formal training on food safety, low income, low job experience and poor job satisfaction among food handlers.

**CONCLUSION**
The knowledge and practices of food handlers in the current study were observed to be quite low. Youth-oriented formal training on Food Safety, Awareness Campaigns and provision of accessible resources for hygiene maintenance are the need of the hour.

**KEYWORDS:** Food Handler's Hygiene, Food Safety, Food Establishment, Hand Washing.

## INTRODUCTION

According to the WHO, an estimated 600 million people fall ill annually due to contaminated food, resulting in 420,000 deaths and a loss of 33 million healthy life years (DALYs). Among these, foodborne infections claim the lives of 125,000 children under five each year, accounting for 40% of the total burden. Unsafe food costs low- and middle-income countries US$110 billion annually in lost productivity and medical expenses.[1] The 63rd World Health Assembly (2010) emphasized the Codex Alimentarius Commission's role in developing global food standards, encouraging active participation from developing nations.[2] Food handlers' hygiene is crucial in preventing illnesses caused by pathogens like Salmonella, E. coli, and Norovirus. Poor hygiene practices, such as inadequate hand washing, lead to outbreaks of diseases like diarrhea, typhoid, and cholera, particularly affecting vulnerable populations. Foodborne diseases contribute to antimicrobial resistance, cause 420,000 deaths globally, and impose economic burdens through healthcare costs and productivity losses. Regular training, adherence to hygiene protocols, and surveillance systems are vital for reducing this burden.[3]

In Alehegn Aderaw Alamneh et al study conducted in Ethiopia, the prevalence of poor food hygiene practices among food handlers working in food establishments was found to be 51.2% and in Ayehu Gashe Tessema et al study it was 47.5%. Being both a cooker and waiter, availability of personal protective equipment, presence of pipe water in the kitchen, presence of a supervisor, and separate dressing room were significantly associated with food hygiene practice among food handlers.[4,5]

In Lawrence Sena Tuglo et al study in Ghana, majority (84.3%) of Street Cooked Food Handler's (SCFHs) were females and 56.0% had not attended a food safety training course. This study showed that 67.3%, 58.2%, and 62.9% of SCFHs had good levels of KAP of food safety, respectively. About 87.2% showed a good attitude of separating uncooked and prepared meal before storage. Good KAP of food safety was higher among registered SCFHs compared to unregistered, SCFHs with secondary education, higher monthly income and among those who had training on food safety courses.[6]

Additional findings from the study done by Onyango AO et al reveal that food handlers experiencing loose stools had a higher likelihood of being infected with pathogenic *Escherichia coli*. The same study showed that around 53.8% of the *E. coli*pathotypes were resistant to tetracycline and 40.2% demonstrated multi-drug resistance. These results underscore the importance of monitoring gastrointestinal symptoms among food handlers and implementing stringent measures to curb the spread of multi-drug-resistant pathogens, especially in food-handling environments.[7]

Research on food handlers' knowledge, attitudes, and practices (KAP) regarding food safety reveals key trends and influencing factors. Across studies, 39.2%-67.3% of food handlers demonstrated good knowledge, 58.2%-70.3% had positive attitudes, and 56.3%-62.9% exhibited good food safety practices. Variables such as age, male sex, urban residence, higher education, and job roles (e.g., cooks) significantly influenced knowledge levels. Residence and education also shaped attitudes, while no consistent associations were found with practices. Notably, training improved knowledge but often failed to translate into improved attitudes or practices.[8-10]

Foodborne diseases hinder socioeconomic development by straining healthcare systems and affecting tourism and trade. In developing countries like India, increased dependence on market

foods and food delivery services due to lifestyle changes heightens vulnerability to foodborne infections, impacting health and quality of life. Limited literature on food handlers' hygiene exists in India, particularly in regions like Anantapur. This study aims to address this gap, with outcomes expected to reduce foodborne illnesses, enhance public health, and promote safer food practices. The aim of this study is to assess the hygiene practices of food safety among street-cooked food handlers and to identify the key determinants influencing these practices within food establishments. Additionally, the study seeks to enumerate acute health-related complaints commonly experienced by food handlers, providing valuable insights into their health status and its potential impact on food safety.

## MATERIALS & METHODS

An Epidemiological investigation was done by doing a community based cross-sectional study. Food handler's working in food establishments in the streets of Ananthapuramu town, A. P. were selected as study population. The estimated minimum sample size is 384. Sample size was estimated using the formula-

$n=4PQ/E^2$, where, P=51% (Alehegn Aderaw Alamnehetal study[4]), Q= 100-P, E = 10% of P.[11]

Data was collected using simple random sampling after taking an informed consent from the subjects, data was collected using a pre-tested structured questionnaire with 36 questions on knowledge, attitude & practices, information of socio-demographic factors, hygiene practices, food handling practices, personal hygiene which was designed based on previous available literature and WHO's five keys to safer foodi.e Keep clean, Separate raw and cooked food, Cook thoroughly, Keep food at safe temperature, Use safe water and raw materials; health related complaints among food handler's, chronic diseases , challenges faced to maintain hygiene etc were also collected. For every positive response in the KAP questionnaire, a score of "1" was awarded and for every undesirable answer a score of "0" was awarded. Therefore for KAP, a maximum score of "36" and minimum score of "0" was recorded for every subject; Above 18 (50%) score is considered as Good KAP score while below 18 (<50%) is considered as poor KAP score of a food handler.

Data was collected only after getting an approval from Institutional Ethical Committee/ concerned authorities like Municipal Health Officer, Food Safety Inspector & others. The data thus collected is analyzed using proportions, tables, bar graphs/charts, chi-square test of significance ($p<0.05$, significant) wherever applicable using "OpenEpi" online which is an open source software for epidemiologic statistics.[12]

## RESULTS

Total sample size is 394. The mean KAP score is 24.18 (67.2%). Maximum score recorded is 36 (100%) and the minimum score is 9 (25%). KAP score proportion more than 60% is considered as good KAP score while below 60% as poor KAP score. Around 276 subjects **(**70.1%) had good KAP score while 118 subjects (29.9%) had poor KAP score**.** Out of 394 subjects 44 subjects were below 25 yrs of age. Among them 30 (68.1%) showed good KAP score. Similarly out of 350 subjects above 25 yrs, around 246 (70.2%) showed good KAP score. There was a difference of 2.1% between two proportions which was falling short of statistical significance ($p>0.05$). Out of 394 sample, 312 are males and 82 are females. Among males, 217 (69.5%) scored above 60% of KAP score while among females 59 (71.9%) showed good KAP score. Female gender scored slightly higher KAP score than males. This difference in proportion was not statistically significant ($p>0.05$). Among those who scored above 60% KAP score majority of them finished high school studies i.e44 subjects (75.8%) followed by professional degree (75.7%), Illiterates (74.1%), Intermediate/diploma (68.5%), Graduates (67.3%), middle school certificate (65%) and lastly primary school certificate (58.3%). The difference between theses proportions was not statistically significant ($p>0.05$). (Fig 1)

Among total sample of 394, 96 subjects received training (formal/informal) while 298 did not receive any training in food safety and handling. The 71 subjects (73.9%) who have received

training showed good KAP score, while around 205 subjects (68.7%) who were not trained in food safety scored good KAP score. The difference between two proportions was falling short of statistical significance (p>0.05). (Table 1)

Around 162 subjects out of 230 (70.4%) who have a formal registration for their food establishment had better KAP score while 114 out of 164 subjects (69.5%) who did not register their food business showed good KAP score. The difference between two proportions was falling short of statistical significance (p>0.05). (Table 2)

The other factors studied for poor food handler's hygiene were observed as less than Rs. 25,000 monthly salary (30.2%), less than 5 years of job experience (30.8%) and poor job satisfaction (35.3%) which was falling short of statistical significance.

The perceived common challenges faced by the food handlers in maintaining hygiene in their food establishments are lack of formal training in food safety & handling practices (32.4%), flies and rodents menace (31.4%), Vehicular pollution and dust (15.7%), nearby drainage/ spillage of water (12.4%), overcrowding or space constraints (3.3%), poor ventilation & lighting (2.6%) and unclean surroundings (2.3%). (Fig 2)

The morbidity profile of food handlers include arthritis or arthralgia (32.4%), diabetes mellitus (32.4%), convulsions (8.1%), hypertension (18.9%) and asthma (8.1%). (Table 3)

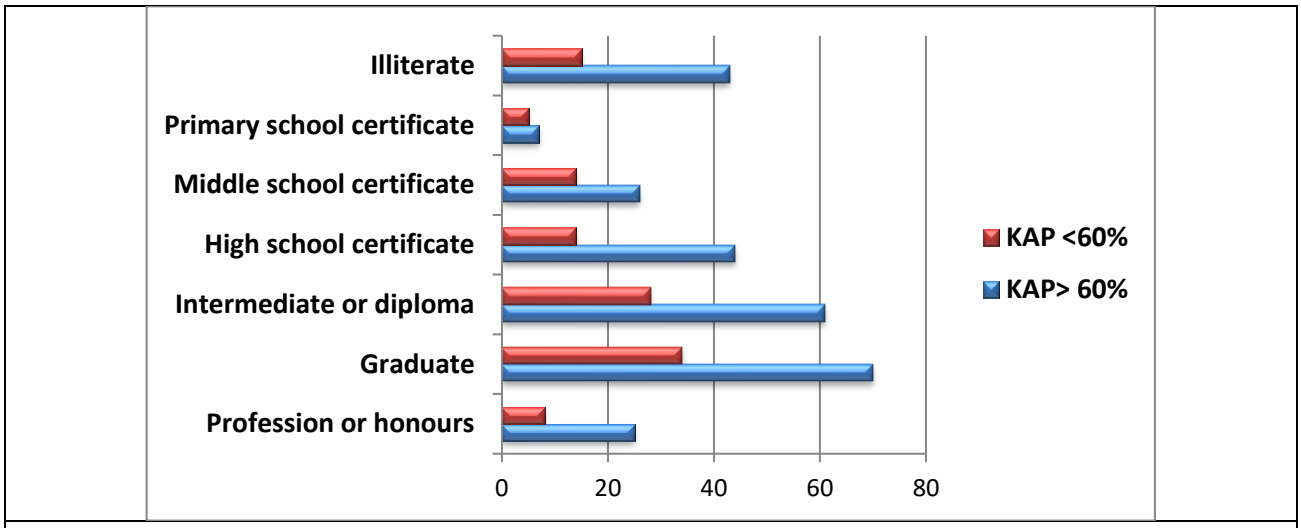


***Figure 1: Bar chart showing education of food handlers versus KAP scores***

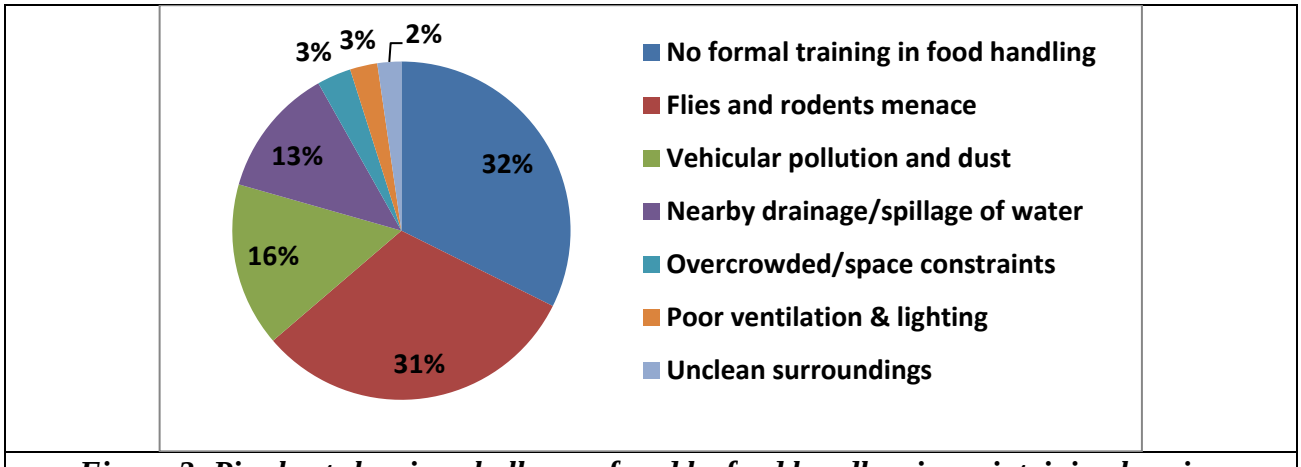


***Figure 2: Pie chart showing challenges faced by food handlers in maintaining hygeine***

| Training in Food Safety | Good KAP Score (>60%) | Poor KAP Score (<60%) | Total | Test of significance |
|---|---|---|---|---|
| **Yes** | 71(73.9%) | 25 (26.1%) | 96 (100%) | Chi-square test = 0.923(<3.84), p>0.05, Not Significant |
| **No** | 205 (68.7%) | 93 (31.3%) | 298 (100%) | |
| **Total** | 276 (70.1%) | 118 (29.9%) | 394 (100%) | |

***Table 1: Formal Training & Licensing in food safety versus KAP score of food handlers***

| Licenced Food Establishment | Good KAP Score (>60%) | Poor KAP Score (<60%) | Total | Test of significance |
|---|---|---|---|---|
| Yes | 162 (70.4%) | 68 (29.6%) | 230 (100%) | Chi-square test = 0.038 (<3.84), p>0.05, Not Significant |
| No | 114 (69.5%) | 50(30.5%) | 164 (100%) | |
| Total | 276 (70.1%) | 118 (29.9%) | 394 (100%) | |

***Table 2: Registration of food business versus KAP score of food handlers***

| Morbidity | Frequency (n) | Proportion (%) |
|---|---|---|
| Arthritis/Arthralgia | 12 | 32.4% |
| Diabetes Mellitus | 12 | 32.4% |
| Convulsions | 3 | 8.1% |
| Hypertension | 7 | 18.9% |
| Asthma | 3 | 8.1% |
| Total | 37 | 100.0% |

***Table 3: Morbidity Profile of Food handlers (Acute /Chronic)***

## DISCUSSION

In the present study the mean KAP score is 24.18 (67.2%). Around 276 subjects (70.1%) had good KAP score of above 60% while 118 subjects (29.9%) had poor KAP score below 60%.

In Alehegn Aderaw Alamneh et al study conducted in Ethiopia, the prevalence of poor food hygiene practices among food handlers working in food establishments was found to be 51.2% and in Ayehu Gashe Tessema et al study it was 47.5%.[4,5] In Engdaw GT et al study revealed a food safety practice prevalence of 37.6%;while more than half of the participants demonstrated good knowledge and attitudes, predictors of better food safety practices.[13] The majority scored "≥50 to <75" for knowledge (57.89%) and practice (47.7%) and "≥67 to <83" for attitudes (70.3%).[14] In Amegah KE et al study, 52.5% had good food handling practices.[15] The current study differs with all the above studies, may be due to higher cut off value for KAP scores in the current study. Across Hamed A et al, Isara AR et al & Zanin et al studies 39.2%-67.3% of food handlers demonstrated good knowledge, 58.2%-70.3% had positive attitudes, and 56.3%-62.9% exhibited good food safety practices.[8-10] The current study concurs with the above studies.

In the current research, majority of the study subjects belong to age above 25 yrs; age below 25 yrs (31.9%) was a determinant for poor food hygiene practices. In Dagnew Metal study, 67.5% were young adults aged 18-39 years.[16] In Meher MM et al study conducted in Bangladesh most of the street food vendors belonged to the age group of 35–44 years (34.21%).[14] In Malhotra Retal study, they found that the majority of food handlers were under 40 years of age (60.3%).[17] The current study differs with all the above studies.

In the current study, male gender (30.5%) was a determinant for poor KAP score of less than 60%. In IsaraAr et al study, male sex was very much associated with poor food hygiene practices.[9] In Endgaw GT et al study, predictors of better food safety practices included being female gender.[13] In Meher MM et al study, most of the Street Food Vendors (SFVs) were males (92.86%).[14] In Chen H et al study, groups with lower knowledge levels on food safety were males.[18] The current study concurs with all the above studies.

In Lawrence Sena Tuglo et al study in Ghana, majority (84.3%) of Street Cooked Food Handler's (SCFHs) were females.[6] In Dagnew M et al study, the key findings include demographics as 85.5% of food handlers were females.[16] In Okojie OH et al study, 88.2% of respondents were females, with predominantly poor knowledge of food hygiene.[19] The present study differs with the above studies.

In the current research, among those who scored above 60% KAP score majority of them finished high school studies i.e 44 subjects (75.8%) followed by professional degree (75.7%), Illiterates (74.1%), Intermediate/diploma (68.5%), Graduates (67.3%), middle school certificate (65%) and lastly primary school certificate (58.3%).

In Meher MM et al study, 46.99% of food handlers completed their primary education.[14] In studies conducted by Tuglo LS et al, Hamed A et al, Isara AR et al, Zanin LM et al, Engdaw GT et al, Teferi SC et al, Andualem A et al and Raji IA et al stated that higher educational status have significant impact on food handlers hygiene levels.[6,8,9,10,13,20,21,22] The current study concurs with all the above studies. In Chukwuocha UM et al study educational level of food handlers did not significantly impact their hygiene levels.[23] The current study differs with the above study.

In the present study, it was observed that lack of proper training in food safety (26.1%) was associated with poor food hygiene practices. In Lawrence Sena Tuglo et al study in Ghana, 56.0% had not attended a food safety training course.[6] The common risk factors identified were lack of hygiene training in Girma A et al study in Ethiopia. [24] Malhotra R et al and Isara AR et al studies highlight that around 50% of food handlers lacked training in food hygiene.[9,17] In Zanin LM et al study, training improved knowledge but often failed to translate into improved attitudes or practices.[10] Prior exposure to hygiene training improved food handler's hygiene in Lee JH et al study.[25] In Meher MM et al study, 93.61% of subjects had no food safety training.[14] Teferi SC et al and Andualem A et al both studies emphasize the need for food safety training.[20,21] Food safety training has proven effective in improving knowledge and attitudes toward hand hygiene practices while enhancing food safety behaviors in Soon JM et al and Amegah KE et al studies.[15, 26] The current study concurs with all the above studies.

In the current research, food handlers with low income of less than Rs. 25,000/month (30.2%) were associated with poor KAP scores.

Good KAP of food safety was higher among higher monthly income individuals In Lawrence Sena Tuglo et al study in Ghana.[6] Groups with lower knowledge levels often include individuals with lower-income earners in Chen H et al study.[18] The present study concurs with the above studies.

In the present study, food handlers with low job experience of less than 5 yrs (30.8%) were not practicing food hygiene properly in the food establishments.

Longer work experience correlated with better hygiene practices in Chukwuocha UMetal study. [23] Hygiene practices among food handlers are influenced by internal factors like work experience in Lee JH etal study.[25] The present study concurs with the above studies.

In the current research, poor job satisfaction (35.3%) among food handlers was associated with poor KAP scores.

In the present study, unregistered food business (30.5%) with any formal government body observed to be practicing food hygiene improperly.

In Tuglo LS et al study, good KAP of food safety was higher among registered Street Cooked Food Handler's compared to unregistered food establishments.[6] The present study concurs with the above study.

## CONCLUSION & RECOMMENDATIONS

The knowledge and practices of food handlers in the current study were observed to be quite low. The determinants for poor food handler's hygiene were observed as age below 25 years, male gender, low educational status, lack of formal training on food safety, low income, low job experience and poor job satisfaction among food handlers.

To address the observed gaps in food handlers' knowledge and practices, it is recommended to implement mandatory and regular food safety training programs, focusing on hygiene practices and the prevention of foodborne diseases. Targeted awareness campaigns should prioritize younger, male food handlers and those with lower educational levels to improve their understanding and adherence to safety protocols. Enhancing job satisfaction through better incentives, improved working conditions, and support systems can help mitigate the effects of low income and poor job experiences. Additionally, mentorship programs where experienced food handlers guide new recruits can foster practical knowledge sharing. Finally, policy interventions should enforce strict hygiene protocols and establish monitoring mechanisms within food establishments to ensure compliance and accountability.

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