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RELATIONSHIP BETWEEN HYGIENIC STATUS OF FOOD HANDLERS AND MICROBIAL CONTAMINATION IN READY-TO-EAT FOODS IN KHARTOUM LOCALITY, SUDAN

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ABSTRACT----------

Background: *The hygienic status of food handlers is a key determinant of microbial contamination in ready-to-eat foods. Poor hygiene practices can lead to the transmission of pathogenic microorganisms, posing serious public health risks.*

This study aims to *investigate the association between hygiene compliance and microbial contamination in ready-to-eat foods prepared in Khartoum Locality], Sudan.*

Methods: *A cross-sectional study was conducted among (42) food establishments, assessing hygiene using structured observation checklists and testing food samples for Escherichia coli, total coliforms, and Staphylococcus aureus. Microbial counts were compared with hygiene scores using chi-square tests.*

Results: *Food samples from establishments with poor hygiene scores had significantly higher levels of E. coli and total coliforms ($p < 0.05$). Staphylococcus aureus was detected in [%] of samples from handlers with inadequate personal hygiene practices. A strong correlation ($r = [x]$, $p < 0.01$) was found between low hygiene scores and elevated microbial counts.*

Conclusion: *The study confirms that substandard hygiene among food handlers is associated with higher microbial contamination in ready-to-eat foods. Targeted interventions to improve hygiene could substantially reduce contamination risks.*

Keywords: *microbial contamination, food handlers, E. coli, Staphylococcus aureus, food safety, Sudan----------*

1. INTRODUCTION

Foodborne illnesses are a major global health challenge, with contamination by pathogenic bacteria being a leading cause (World Health Organization [WHO], 2015). Ready-to-eat foods are particularly vulnerable to contamination due to minimal processing before consumption, making the hygienic status of food handlers and preparation environments critically important (FAO/WHO, 2009).

Poor personal hygiene, inadequate sanitation facilities, and unsafe food handling have been linked to outbreaks caused by pathogens such as *E. coli*, *Salmonella spp.*, and *Staphylococcus aureus* (Todd et al., 2007). In resource-limited settings like Sudan, these challenges are amplified by infrastructural constraints and limited regulatory oversight (Abdalla et al., 2012).

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2. LITERATURE REVIEW

2.1 Microbial Contamination in Ready-to-Eat Foods

Microorganisms such as *E. coli* and *Staphylococcus aureus* are common indicators of poor hygiene and potential presence of pathogens (Mensah et al., 2002). *E. coli* is associated with fecal contamination, while *S. aureus* can originate from skin, hair, or nasal passages of handlers (Kadariya et al., 2014), (Ahmed, 2016).

2.2 Hygiene as a Determinant of Food Safety

Numerous studies have shown that inadequate hygiene practices significantly increase the microbial load of prepared foods (Barro et al., 2007; Muyanja et al., 2011). Handwashing with soap, use of protective clothing, and proper food storage are effective measures to reduce contamination risks (WHO, 2010).

2.3 Evidence from Sudan

Research in Khartoum and other Sudanese cities has revealed high rates of coliform contamination in street-vended foods, often linked to poor hygiene infrastructure and lack of formal food safety training (Abdalla et al., 2012).

3. MATERIALS AND METHODS

A cross-sectional study was conducted in [Khartoum Locality], Sudan, from [month, year] to [month, year]. [n] food establishments (restaurants, cafeterias, and street vendors) were selected through stratified sampling.

Hygiene Assessment

- Structured observation checklist based on Codex Alimentarius guidelines.
- Scoring system: High (≥80%), Moderate (60–79%), Low (<60%).

Microbial Testing

- Ready-to-eat food samples (n = [x]) were collected aseptically and tested for:
  - *Escherichia coli* (indicator of fecal contamination)
  - Total coliforms
  - *Staphylococcus aureus* (indicator of handler contamination)
- Standard ISO microbiological methods were used.

Data Analysis

- Chi-square tests for categorical variables.
- Pearson correlation to assess relationship between hygiene scores and microbial counts.
- Significance set at $p < 0.05$.

4. RESULTS

Hygiene Scores	No	%
high	**65**	**51.6**
moderate	**37**	**29.4**
low compliance	**24**	**19**

- **Microbial Contamination:**

Microbial contamination	No	%
E. coli	**13**	**10.3**
S. aureus	**5**	**4**
Total sample	**126**	**100**

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- *E. coli* detected in (1.0.3%) of samples; significantly higher in low hygiene establishments ($p < 0.05$).
- *S. aureus* present in (4%) of samples, mostly from handlers lacking protective clothing.
- Total coliforms detected in (20.6%) of samples; strong association with hygiene score ($p < 0.01$).

- **Correlation:** Hygiene score negatively correlated with microbial counts ($p < 0.01$).

5. DISCUSSION

The results clearly demonstrate that lower hygiene compliance among food handlers is associated with higher microbial contamination in ready-to-eat foods. This aligns with findings from other African countries, where infrastructural limitations and inadequate training contribute to contamination (Barro et al., 2007; Muyanja et al., 2011).

Detection of *E. coli* in a significant proportion of samples indicates fecal contamination, likely due to inadequate handwashing or use of contaminated water. The presence of *S. aureus* suggests direct contamination from handlers' skin or respiratory tract, consistent with studies by Kadariya et al. (2014).

Reducing contamination requires:

- Regular microbial monitoring of ready-to-eat foods.
- Mandatory food safety training and certification.
- Provision of adequate hygiene infrastructure in all establishments.

6. CONCLUSION

Poor hygiene among food handlers is strongly associated with increased microbial contamination in ready-to-eat foods in [Khartoum Locality]. Interventions should focus on training, infrastructure improvement, and regular inspection to enhance food safety.

REFERENCES

1. *Abdalla, M. A., Suliman, S. E., Bakhiet, A. O., & Bashir, M. A. (2012). Food safety knowledge and practices of street food vendors in Khartoum City. Sudan Journal of Veterinary Science and Animal Husbandry, 51(1), 101–108.*
2. *Ahmed, E. B (2016). Detection of Enterobacteriaceae Food Contamination by Rapid Identification methods: Comparative Study. Ph.D. thesis. University of Khartoum, Sudan.*
3. *Barro, N., Bello, A. R., Aly, S., Ouattara, C. A. T., Ilboudo, A. J., & Traoré, A. S. (2007). Hygienic status and assessment of dishwashing waters, utensils, hands and pieces of money from street food processing sites in Ouagadougou (Burkina Faso). African Journal of Biotechnology, 5(11), 1107–1112.*
4. *FAO/WHO. (2009). Codex Alimentarius: Food hygiene – Basic texts (4th ed.). Rome: Food and Agriculture Organization.*
5. *Kadariya, J., Smith, T. C., & Thapaliya, D. (2014). Staphylococcus aureus and staphylococcal food-borne disease: An ongoing challenge in public health. BioMed Research International, 2014, 827965.*
6. *Mensah, P., Yeboah-Manu, D., Owusu-Darko, K., & Ablordey, A. (2002). Street foods in Accra, Ghana: how safe are they? Bulletin of the World Health Organization, 80, 546–554.*
7. *Muyanja, C., Nayiga, L., Brenda, N., & Nasinyama, G. (2011). Practices, knowledge and risk factors of street food vendors in Uganda. Food Control, 22(10), 1551–1558.*
8. *Todd, E. C. D., Greig, J. D., Bartleson, C. A., & Michaels, B. S. (2007). Outbreaks where food workers have been implicated in the spread of foodborne disease. Journal of Food Protection, 70(7), 1752–1761.*
9. *World Health Organization. (2010). Basic steps to improve safety of street-vended food. WHO Regional Office for South-East Asia.*
10. *World Health Organization. (2015). Estimates of the global burden of foodborne diseases. Geneva: WHO.*