

## Original Research Article

# The bacterial contamination of food handlers hands in Wad madani city restaurants, Sudan

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## ABSTRACT

**Background:** Food handlers may cross-contaminate raw and processed food stuffs as well as inadequately cook and store foods. These contributory factors are due to a lack of food hygiene awareness or implementation.

**Methods:** Study was conducted between (October to December 2017), 100 samples were collected randomly from hands of food handlers working in restaurants of Wad Madani city. A sterile quality swabs were used to collecting the samples from handlers after screened the hand of handler particularly around the fingers and palm. The swab was immediately sealed and transported to Al-bagea medical center laboratory for examination. One hundred questionnaires were designed to obtain information about food handlers knowledge and their personal hygiene. The data was analyzed by (SPSS v16<sup>th</sup>) system.

**Results:** The contaminated hands of food handlers by bacteria was 87%, the minimum colony forming unit (CFU) was ( $10 \times 10^6$  cfu/ml), 70% of handlers were educated and 55% of handlers were working in restaurants more than 5 years.

**Conclusions:** The study showed high level of education of food handlers and may be aware of the need for personal hygiene, they do not comprehend crucial aspects of hygiene such as cleaning of work surfaces and washing their hands by water and soap, so we need deep messages for health education of food handlers.

**Keywords:** Food handlers, Hands contamination, Bacteria, Wad madani, Sudan

## INTRODUCTION

Food handler mainly refers to people who directly touch open food as part of their work. They can be employed or agency staff. However, it also includes anyone who may touch food contact surfaces or other surfaces in rooms where open food is handled.<sup>1</sup>

Food handlers can contaminate the food by spreading bacteria on the surfaces that food will come into contact with, e.g. work tops and food packaging before it is used. And also contaminate other surfaces such as door handles that lead to transmission of bacteria to contaminate the other handler's hands who handle food directly.<sup>2</sup>

### Personal hygiene

Human beings are a significant reservoir for human pathogens, contaminated their skin, nose, hair, *etcetera*. and the protective measures like gloves and masks were reduce the potential for contamination of fresh produce during handling or after cooking.<sup>3</sup> The cleanliness and personal hygiene of worker or food handler that were handling the foods must be managed to minimize the risk of contamination.<sup>4</sup>

Restroom availability and hand washing stations use are critical to preventing contamination of produce by food handlers.<sup>5</sup>

Hand washing will reduce your risk of transmitting disease-causing microorganisms and other agents to people who eat the food were handled by contaminated hands. Hand washing by warm water it is comfortable and recommended with optimum duration to reduce the hand contamination.<sup>6</sup> The water temperature used in hand washing can also affect the solubility or emulsification of some soils.<sup>7</sup>

The (FDA) food code specifies a minimum hand washing water temperature of 38°C. Use suitable utensils like, tongs, gloves and hand washing was decrease the transfer of microorganisms from the hand to food.<sup>8</sup> However, gloves are not being an effective barrier alone for food handlers without education.<sup>9</sup>

### Foodborne illnesses

Foodborne illnesses it is any disease of an infectious or toxic nature caused by consumption of food. Foodborne illnesses was associated with over than 40 different kinds of bacteria, viruses, parasites, molds and it has been associated with cross contamination (39%).<sup>10</sup>

Contaminated foods may not look, taste or smell any different from foods that are safe to eat. The most common symptoms of infectious bacteria are diarrhea and vomiting.

Developing of foodborne illness it was different among people due to physiological status of human being, included pregnant women, young children, older adults, and people with weakened immune systems. Diarrhoeal diseases are linked to the deaths of an estimated 2 million people annually – mostly children – and most of these illnesses, including foodborne illness, are attributed to contaminated food or water. Bacteria are often naturally present in food, some bacteria can grow inside the refrigerator, *Listeria monocytogenes* it is one of them.

A food handlers infected with a 5 pathogens 3 of them were common bacteria; (*Salmonella typhi*; *E. coli* O157:H7 and *Shigella spp*), *Norovirus* and *Hepatitis A* virus.<sup>11</sup>

Food handlers will typically shed hundreds of thousands of pathogens in their feces that can be easily transmitted to food even when good hand washing practices are used.<sup>8</sup>

## METHODS

### Microbiology analysis

Study was conducted between (October to December 2017), among 100 food handlers working in restaurants of (Wad Madani big market, teaching hospital, dentistry hospital, kidney diseases hospital and the obstetrics hospital).

Response rate was 100% of all working food handlers. The questionnaire contains data about socio-demographic characteristics, risk factors for contamination and personal hygiene practices during dealing with food.

Notification was not given in advance, and extra hand hygiene was not allowed during the hand rinse sample collection. A sterile quality swabs was used to collecting the samples from participants after screened the hand of handler particularly around the fingers and palm. The swabs was immediately sealed and transported to Al-bagea medical center microbiology laboratory for examination; all media used in this study were from laboratory exercises in Microbiology.<sup>12</sup>

### Food handler questionnaire design

The questions were designed to obtain information about food handler's knowledge of personal hygiene, high-risk food groups, cross-contamination and cleaning.

The knowledge assessment part of questionnaire consisted of 08 multiple-choice questions each with (2 or 5) possible answers. The data was analyzed by (SPSS v 16<sup>th</sup>) system.

## RESULTS

Table 1 showed the gram stain (positive or negative) for bacteria were isolated from hands of food handlers, 78% of collected samples were gram positive bacteria:

**Table 1: Microbiological analysis of collected samples.**

Sample	Number	Percentage (%)
<b>Gram positive</b>	78	78
<b>G+ve cocci</b>	63	
<b>G+ve bacilli</b>	15	
<b>Gram negative</b>	09	09
<b>G-ve cocci</b>	03	
<b>G-ve bacilli</b>	06	
<b>No growth</b>	13	13
<b>Total</b>		100

N=100.

Table 2 showed the maximum and minimum colony forming unit (CFU/ml) for collected samples, maximum colony forming unit ( $6.2 \times 10^8$  CFU/ml).

**Table 2: Maximum and minimum colony forming unit for collected samples.**

Number of samples	Maximum CFU/ml	Minimum CFU/ml
<b>87</b>	( $6.2 \times 10^8$ ) CFU/ml	( $10 \times 10^6$ ) CFU/ml

N=87.

Table 3 showed the education levels among food handlers, 70% of food handlers were educated.

**Table 3: Questionnaires data analysis.**

Education level	Number	Percentage (%)
<b>Illiterate</b>	30	30
<b>Basic school</b>	55	55
<b>Secondary school</b>	12	12
<b>University graduate</b>	03	03
<b>Postgraduate</b>	0.0	0.0
<b>Total</b>	100	100

N=100.

Table 4 showed the healthy licenses and food handler's diseases through last two weeks, 81% have healthy licenses.

**Table 4: Showed the number of the health licenses and disease distribution among food handlers.**

Answer	No. of worker have a healthy license	No. of worker have any disease in the last two weeks	%
<b>Yes</b>	81	0.0	0.0
<b>No</b>	19	02	10.5
<b>Total</b>	100	02	

N=100.

Table 5 showed the use of tobacco among food handlers, 7% of handlers were use tobacco.

**Table 5: Use of tobacco among food handlers.**

Tobacco	Number	Percentage (%)
<b>Yes</b>	07	7
<b>No</b>	93	93
<b>Total</b>	100	100

N=100.

Table 6 showed the food handlers experiences, 55% of handlers have experience in food handler more than 5 years.

**Table 6: Food handlers experiences.**

Experiences	Number	Percentage (%)
<b>&lt;1 year</b>	12	12
<b>&gt;1 year</b>	33	33
<b>&gt;5 years</b>	55	55
<b>Total</b>	100	100

N=100.

## DISCUSSION

Food borne disease outbreaks continue to happen, despite the progress achieved in food quality and safety, the restricted research on food handlers and food handling

practices in food establishments indicates that food handling problems need to be high lightened.

Food handlers act as a vehicle for microorganisms causing a potential risk to the public health.<sup>13</sup> In this study 99 (99%) of the studied food handlers were males, food handlers were of low educational levels (30% illiterate, 55% basic school, 12% secondary school, 03% university graduated) which made them unaware of food safety practices.

Prabhu and Shah were reported that food handlers could pose a potential risk to food safety due to their low educational background and hence, may have little or no understanding of the risks of microbial or chemical contamination of food or how to avoid them.<sup>14</sup>

On current evidence, washing hands with soap can reduce the risk of diarrhoeal diseases by 42-47% and interventions to promote hand washing might save a million lives.<sup>15</sup>

In addition to low educational level, there is no attended informal food hygiene training courses, this means that the majority of the studied food handlers would not be aware of the practices to be followed during food processing in restaurants. Participants' hands were contaminated with one or more potentially food borne contaminants.<sup>16</sup>

The contamination percent of all samples were Gram positive bacteria 78% of all samples (G +ve cocci 63% / G +ve bacilli 15%) and Gram negative bacteria 09% of all samples (G –ve cocci 03% / G –ve bacilli 06%).

## CONCLUSION

In spite of the high educational level and experiences of food handlers in their work on restaurants and food services, but the bacterial contamination in their hands was very high or in risky rate. So we need messages of health education to increasing their personal hygiene and the proper methods for dealing, preparing and buying the foods to customers without cross-contamination form worker hand.

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## REFERENCES

1. Cruickshank JG. Food handlers and food poisoning; training programmes are best. *Br Med J*. 1990;300:207–8.
2. Audit Commission. Environmental Health Survey of Food Premises. HMSO, London: 1990.
3. Mudey AB, Kesharwani N, Mudey GA, Goyal RC, Ajay K, Dawale AK, et al. Health status and personal hygiene among food handlers working at food establishment around a rural teaching hospital in Wardha District of Maharashtra, India. *Global J Health Sci*. 2010;2(2):198-206.
4. Allwood PB, Jenkins T, Paulus C, Johnson L, Hedberg CW. Hand washing compliance among retail food establishment workers in Minnesota. *Journal of Food Protection*. 2001;67(12):2825–8.
5. Guzewich J, Ross MP. Evaluation risks of microbiological contaminations. 1999.
6. Bennett JV, Holmberg SD, Rogers MF, Solomon SL. Infectious and parasitic diseases. In: Amler RW, Dull HB, eds. *Closing the gap: the burden of unnecessary illness*. New York: Oxford University Press; 1987: 102-114.
7. Greig JD, Todd EC, Bartleson CA, Michaels BS. Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 1. Description of the problem, methods, and agents involved. *J Food Prot*. 2007;70(7):1752-61.
8. U.S. Food and Drug Administration. Retail Food Protection; Employee Health and Personal Hygiene Handbook; 2010.
9. Lyneh, RM, Elledge P, Hanumanthaiah S, Boatright D. A preliminary evaluation of the effect of glove use by food handlers in fast food restaurants. *J Food Prot*. 2005;68(1):187-90.
10. Your Guide to the Consumer Price Index. Minister of Industry. Canada. 1996. Catalogue No. 62-557-XPB.
11. Instituto Brasileiro de Geografia e Estatística, “Pesquisa de orçamento familiar despesas rendimento e condicoes de vida”, IBGE, 2010.
12. Harley JP. Laboratory Exercises in Microbiology 5th. Texas. USA: 2002.
13. Campos AKC, Cardonha AMS, Pinheiro LBG, Ferreira NR, Azevedo PRM, Stamford TLM. Assessment of personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil. *Food Control*. 2009;20(9):807–10.
14. Prabhu PM, Shah RS. A study of food handlers in public food establishments in Maharashtra, India, *Int J Sci Res*. 2014;3(7):1485-9.
15. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community; A Systematic Rev. *Lancet Infect Dis*. 2003;3(5):275-81.
16. Scallan E, Hoekstra RM, Angulo FJ, Tauxe RV, Widdowson MA, Roy SL, et al. Foodborne illness acquired in the United States—major pathogens. *Emerg Infect Dis*. 2011;17(1):7-15.

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