

## Essential of Hygienic Practices on Bacterial Contamination in some Restaurants of Al- Karkh Area, Baghdad, Iraq

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### Abstract

This study aimed to evaluate good manufacturing practices in food safety of ten different restaurants in the Al-Karkh area of Baghdad, Iraq. Forty samples collected from were collected from knives, food cutting boards, tables, hands and nails workers in restaurants. In addition. 70 food handlers were selected. Through structured interviews, information on the checklist for Good Manufacturing Practices in Food Safety, Food handlers' general checklist for good hygiene, and Personal Hygiene Checklist were collected. The overall viable bacterial count before Good Hygiene Practices was significantly higher ( $P < 0.05$ ) than the total bacterial counts after Good Hygiene Practices. The highest viable bacterial counts before Good Hygiene Practices were recorded by food cutting boards ( $4.03 \pm 0.20$ )  $\log^{10}$  cfu/cm<sup>2</sup>, while ( $3.90 \pm 0.23$ ,  $3.51 \pm 0.18$ ,  $3.00 \pm 0.18$ )  $\log^{10}$  cfu/cm<sup>2</sup> from tables, hands and nails of workers and knives respectively. Although the results showed a non-significant difference in the viable bacterial counts after Good Hygiene Practices from 10 restaurants collected from the AL-Karkh area. The percentages were (100%) after the training and lecture about Good Hygiene Practices to all checklist points except special basins for washing hands was (90%). However, the results of the General Information of food handlers of Good Hygiene checklist and Personal Hygiene Checklist showed that there were significant differences ( $P \leq 0.05$ ) between the self-reported attitudes of food handlers before the one-week training and after Good Hygiene Practices.

### Keywords:

اساسيات الممارسات الصحية على التلوث الجرثومي في بعض مطاعم منطقة الكرخ ، بغداد، العراق

### الخلاصة

هدفت هذه الدراسة إلى تقييم ممارسات التصنيع الجيدة في سلامة الغذاء لعشرة مطاعم مختلفة في منطقة الكرخ في بغداد ، العراق. تم جمع هذه العينات من السكاكين وألواح تقطيع الطعام والطاولات والأيدي والأظافر في المطاعم. تم استخدام نفس إجراء العينات بعد تنفيذ ممارسات النظافة حيث كان العدد الإجمالي للبكتيريا القابلة للحياة من 10 مطاعم تم جمعها من الكرخ 40 عينة قبل GHP أعلى بكثير ( $P < 0.05$ ) من إجمالي عدد البكتيريا بعد GHP. تم تسجيل أعلى تعداد بكتيري قابل للتطبيق قبل GHP بواسطة ألواح تقطيع الطعام  $4.03 \pm 0.20$   $\log^{10}$  cfu/cm<sup>2</sup> بينما ( $3.90 \pm 0.23$  ,  $3.51 \pm 0.18$  ,  $3.0 \pm 0.18$ )  $\log^{10}$  cfu/cm<sup>2</sup> من الطاولات والأيدي والأظافر للعمال و السكاكين على التوالي. بالرغم من أن النتائج أظهرت عدم وجود فرق معنوي في الأعداد البكتيرية الحية بعد GHP من 10 مطاعم جمعت من منطقة الكرخ. بالإضافة إلى ذلك ، تقيم هذه الدراسة ممارسات النظافة الجيدة (GHP) في منطقة الكرخ ببغداد. حيث تم اختيار 70 عامل في الطعام من خلال المقابلات المنظمة ، تم جمع معلومات عن الخصائص الديموغرافية ، وقائمة مراجعة لممارسات التصنيع الجيدة في مجال سلامة الأغذية ، ومتعاملو الأغذية ، معلومات عامة عن قائمة مراجعة النظافة الجيدة ، وقائمة مراجعة النظافة الشخصية. كانت النسب (100%) بعد التدريب والقاء محاضرة حول GHP لجميع نقاط المراجعة باستثناء الأحواض الخاصة لغسيل الأيدي كانت (90%) بسبب صغر حجم المطعم وحوض الغسيل خارج المطعم. ومع ذلك ، أظهرت نتائج المعلومات العامة لمتداولي الطعام لقائمة مراجعة النظافة الجيدة وقائمة مراجعة النظافة الشخصية أن هناك فروقاً ذات دلالة إحصائية ( $P \leq 0.05$ ) بين المواقف المبلغ عنها ذاتياً لمتداولي الطعام قبل التدريب لمدة أسبوع واحد بعد GHP.

## Introduction

Improper food storage can cause foodborne illness, while cooked or food can be contaminated before consumption through contact with other foods or utensils carrying pathogens (1). In addition, handling raw meat and preparing other foods without thoroughly washing their hands in between tasks, individuals could become the source of food contamination. Additionally, cross-contamination is the spread of microorganisms from objects, people, or contaminated food to another material or food. This is particularly true if kitchen equipment or utensils are not thoroughly cleaned after each use (2). World health organization (3), reported that it is vital to handle food in a way that prevents the microorganisms present from having a chance to multiply by washing and drying hands prior to preparing any food, after handling raw restaurants (poultry, meat, fruits, and vegetables), and by making sure that food preparation equipment and areas are clear. Hazard analysis and critical control points (HACCP) can be defined as system of food safety management that is widely identified as effective and cost-effective approach to the control of food safety in the operations of food processing and is recommended by some of the organizations like International Commission on Microbiological Specifications for Foods and Codex Alimentarius Commission (4). HACCP is a set of rules and procedures for food services that focuses on risk assessments and process management rather instead of an end-product testing (5). In Iraq,

several food poisoning (FP) outbreaks have been reported at military camps, colleges, and other settings in recent years, but most have gone uninvestigated or unpublished (6). Foods consumed in food service businesses had been recognized as major foodborne outbreak causes, and some nations' national statistics have been updated to reflect (7,8).

## Materials and Methods

### Sample Collection and Processing

All of the samples for this study were collected from ten different restaurants in the Al-Karkh Area of Baghdad, Iraq, from November 2021 to April 2022. A total of 40 samples were collected. 20 samples taken from (Knives, Food cutting boards, Tables, Hands & nails (Workers)). were taken before and after applying good hygiene practices. These samples were separated into the following samples from knives, food cutting boards, tables, hands and nails workers in restaurants. The same samples procedure was used after good hygiene practices (GHP).

### Training

Following the collection of samples, an investigation and evaluation of restaurants , as part of the implementation of the Good Hygienic Practices Program, was performed by the general information of food safety, observation of good manufacturing practices for food-safety, and personal hygiene for ten restaurants, for seventy workers, identification of critical points for each restaurant , identification of food safety and personal hygiene weaknesses for each factor.

A training course was used to establish the good hygiene practices program. In each establishment, The training extended for week. The training included a lecture on food safety, microbiology, bacteria (types, reproduction, and disposal techniques), pollution, and the team worked on reducing food poisoning, controlling temperatures, food corruption, personal hygiene, cleaning and sterilization, insects, and rodents, according to the summary for three days. (9). Samples were collected for bacteriological examination after one week of practice application with restaurant workers and the application of good hygiene practices.

### **Total Viable Bacterial Count**

Inorder to produce varied dilutions, peptone water was employed as a diluent for the isolated bacteria (101, 102, 103, 104, 105,106). Duplicate Petri-dishes were cultivated with each of the above dilutions (10). Each of the foregoing dilutions was transferred to petri dishes and mixed with nutrient agar in one milliliter quantities (15 ml, 45-50°C). After that, the plates were cooled and incubated (48 hours, 37°C). Using a Quebec colonies counter, the number of bacterial colonies in each plate was counted.

The total number of colonies in the dilution dishes was multiplied by the dilution factor to get the bacterial concentration in the original samples. In cfu/cm<sup>2</sup>, the total number of bacteria in the original plate (colony forming unites per cm<sup>2</sup>) (10).

All samples were properly identified by sample type, date of collection, and source before being transported to the laboratory (Central Public Health Laboratory, Public Health Directorate, Iraqi Ministry of Health) in an icebox with freeze packs under completely sterile conditions for microbiological analysis.(11).

### **Questionnaire Design**

The questionnaire form was applied according to (WHO / FAO). The Food Handlers General Information of Good Hygiene Checklist (11 questions), Good Manufacture Practices of Food-safety Checklist (12 questions), and Personal Hygiene practices Checklist (hand washing) were all included in the questionnaires (11 questions). For each item, they must select "yes (found)" or "no (not found).

### **Statistical Analysis**

The Statistical Analysis System- SAS (2018) program was used to detect the effect of difference factors in study parameters. Two-way ANOVA and Least significant differences (LSD) post hoc test were performed to assess significant differences among means. T- test (Analysis of Variation-ANOVA) was used to significant compare between means (12).

## **Results and Discussions**

### **Total Viable Bacterial Counts**

The overall viable bacterial count from 10 restaurants collected from AL-Karkh were 40 samples before GHP were significantly higher (P<0.05) than the total bacterial counts after

GHP, as showed in Table (1) The highest viable bacterial counts before GHP were recorded by food cutting boards ( $4.03 \pm 0.20$ )  $\log_{10}$  cfu/cm<sup>2</sup>, while ( $3.90 \pm 0.23$ ,  $3.51 \pm 0.18$ ,  $3.00 \pm 0.18$ )  $\log_{10}$  cfu/cm<sup>2</sup> from tables, hands and nails of workers then knives respectively. Although the results showed non significant difference in the viable bacterial counts after GHP from 10 the restaurants collected from AL-Karkh area

Table (1): Total viable bacterial counts ( $\log_{10}$  cfu/cm<sup>2</sup>) samples collected before and after good hygiene practices in ten different restaurants in AL-Karkh areas

Sources	Total viable bacterial counts before GHP	Total viable bacterial counts after GHP
Knives	A3.00±0.18c	B1.41±0.14a
Food cutting boards	A4.03±0.20a	B1.58±0.17a
Tables	A3.90±0.23ab	B1.68±0.17a
Hands & nails (Workers)	A3.51±0.18bc	B1.56±0.14a
LSD	0.51	

The different letter refere to significant differences ( $P < 0.05$ )

The results showed that the highest viable bacterial counts were significantly ( $P < 0.05$ ) isolated from the cutting board before the GHP and that might be related to un followed the FDA restriction to not used the cutting board for more than one kind of food (13). Also, the high bacterial viable count of tables, hands and nails of workers and knives were significantly ( $P < 0.05$ ) higher compared with total viable bacterial count

after the GHP food handlers had lower viable bacterial counts following GHP, as shown by the low level of correct attitudes these results were agreed with (14). who found in comparable study performed by in the department laboratories of the Technical Institute of Mosul, samples were taken from various locations, including hand swabs, surface and utensils, prepared foods, and tap water showed that (85.1 %) of germs from the kitchen were isolated. According to their study contaminated and pathogenic bacteria were isolated from workers' hands, swabs, surfaces, and utensils, as well as prepared food. Furthermore, Gram's negative bacteria had a high isolation rate of 59.3 %, whereas Gram's positive bacteria had a rate of 40.7 %. Also (15) Thirty-eight frozen and freshly prepared burger (local and imported) samples were collected from randomly selected supermarkets and fast-food restaurants in Jeddah. Yeasts/Molds had the highest count (204.3 CFU/ml) followed by total viable count (69.5 CFU/ml), *total coliforms* (16.2 CFU/ml) and *Escherichia coli* (10.0 CFU/ml). *Salmonellas pecies* were positive in 39.5% of samples. Fresh burgers had more counts of TVC, total coliforms, *Escherichia coli*, and *Bacillus cereus*.

Our study were approached to research in Doha, Qatar by (16), they showed that 77% of produce handlers claimed to wash their hands four times per day; however, this good self-reported practice was not reflected in the microbial assessment of produce handlers' hands that had total aerobic and coliform counts 2 log

CFU/cm<sup>2</sup> *Bacillus circulans* (40%), *Staphylococcus sciuri* (25%), and *Klebsiella pneumoniae* (17%) were the most common bacteria isolated from produce handlers' hands.

Another study by (17), were confirmed our finding that they found a total of 100 samples of two types of shawarma fast food (chicken meat Shawarma and red meat Shawarma) were collected from restaurants and cafeterias in Soran, Kurdistan region, Iraq. The percentages of Total Viable Bacterial Count TVC bacteria in chicken and red meat Shawarma were (82% vs. 94%), with values of (9 104 vs. 14 104) cfu/g, respectively. The percentages of *Coliform* contamination in the two groups were (10 vs. 14) %, with values of (27 102 vs. 2 103) cfu/g, respectively. Both varieties of Shawarma had high levels of *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Salmonella*, *Shigella* spp, and *Pseudomonas* bacteria (18, 12, 20, 24 and 2), respectively. *Staphylococcus aureus* and *Staphylococcus epidermidis* count (0.762) in chicken Shawarma had the greatest positive and significant ( $P < 0.01$ ) association coefficient.

The (18) found that the food staff have the influence and an extraordinary effect on the public health. The staff hygien practice at the site of food production is a key for in reducing and eliminating of the foodborne diseases and poisoning (19) which agreed with our results.

### Restaurant's and Worker Checklist

The checklist form was applied according to International guidelines (WHO/FAO) were restaurant workers questionnaire contained questions of mixed nature, closed-ended and open-ended (20). Self-Reported Attitudes of Food Handlers in order to evaluate their food safety perception. Designing the questionnaire in this way allowed the combination of quantitative and qualitative responses. The purpose of the questionnaire was to determine the extent of workers knowledge (20). The questionnaire also aimed to assess the kinds of anticipated problems workers skills they might encounter in undertaking GHP. Which include General Information of Good Hygiene Checklist and Personal Hygiene of the workers and food handlers in population 70 who were participated in the questionnaire, before and after GHP training from ten different restaurants in the AL-Karkh areas in Baghdad city.

Table (2) showed that checklist of Good Manufacture Practices of Food-safety for 10 different restaurants in Baghdad's Al Karkh area, as part of a research to evaluate the correct health practices for food safety based on international standards.

The survey showed that the highest percentage before applying GHP was (80%) from restaurants contain sufficient food preparation places. While, (50%) of restaurants were applied enough lighting in the prepared food place and room or place suitable for changing clothes. On the other

hand, (40%) of the restaurants were applies sufficient ventilation. The percentages of restaurants that applied separation of manufacturing stages (vegetables, raw food, sandwiches), correct method to dissolving food material and Basins for washing vegetables were (30%).

Table (2) Good Manufacture Practices of Food-safety Checklist

No	Questions	Before GMP	Before GHP%	After GMP	Before GHP%
1.	Food preparation places	8	80%	10	100%
2.	Separation of manufacturing stages (vegetables, raw food, sandwiches)	3	30%	10	100%
3.	Enough lighting inside the preparation place	5	50%	10	100%
4.	Ventilation inside the preparation place	4	40%	10	100%
5.	Monitors of Temperatures in preparation place, refrigerators and freezers	1	10%	10	100%
6.	Wash, clean and sterilize program	2	20%	10	100%
7.	Presence of chemicals used in cleaning	1	10%	10	100%
8.	Preparation and preservation of Fast meal no more than 2 hours under room temperature	2	20%	10	100%
9.	Correct method to dissolving material	3	30%	10	100%
10	Special basins for washing hands	2	20%	9	90%
11	Basins for washing vegetables	3	30%	10	100%
12	Available of room or place suitable for changing clothes	5	50 %	10	100%

The percentages of the restaurant that used correct wash, clean and sterilize program, Fast

meal preparation and preservation (no more than 2 hours under room temperature) and Special basins for washing hands were (20%). While the presence of monitors for temperatures in refrigerators and freezers and presence of any chemicals used in cleaning were (10%) in the different restaurants. The percentages were (100%) after the training and lecture about the good hygiene practice GHP to all checklist points except Special basins for washing hands was (90%) Because of the small size of the restaurant and the washing basin was outside the restaurant.

The purpose of this table (Good Manufacturing Practices of Food-Safety Checklist) is to provide comprehensive information on restaurant health conditions, to ensure that food safety regulations are effectively implemented, and that these standards and regulations are followed and applied by (Food Safety Implementation and Inspection Guidelines, Second Edition 2020), with support from the US Agency for International Development (USAID).

The most important stage in the preparation of food is the food processing stage, which is make by the staff whos responsebile for prevention of food poisoning cases (21, 22).

Foodborne illness can occur in the home kitchen due to improper food storage, also the contamination of the uncooked and cooked food can occur due to mixing with other food or due to contaminated tools and equipments (1). Furthermore, contaminated hands of people are important source of pathogens when dealing with

meats and other foods without accurately cleaning their hands. The contamination occurs due to hands, tools, or mixing of food is known as cross-contamination (2). Moreover, Kitchen sanitation is also a major concern when it comes to food safety. It is necessary to decrease the risk of contamination during the production and processing of foods by using of clean and disinfected tools, using of non toxic surface and material in the kitchen, and controlled humidity and temperature of the placement (23). The temperature of low than 5°C and more than 60°C is perfect temperature for decreasing and stop the reproduction of microorganism, so that the cooked food should not be placed more than two hours in the placement at room temperature. It is preferably to cooled and stored in the refrigerator (24).

The results of the General Information of food handlers of GHP (Table 3) and Personal Hygiene Checklist (Table 4) showed that there were significant differences ( $P \leq 0.05$ ) between the self-reported attitudes of food handlers before the one-week training and after GHP.

In the current study table (3) showed that there were significant differences between before and after good hygiene practices means in general information of good hygiene checklist of seventy workers ( $n=70$ ) for 10 different restaurants in Baghdad's Al Karkh area which done by self-evaluation included several question as wearing hair cap (hat or hairnet) and using of disposable gloves, with regular changing of wound tape if there is any wound on the hand. Also touching the

nose, mouth, hair and skin while preparing food and smoking and eating in food preparation areas, nails are short and clean and when wounding covers all cuts or wounds on the hands or arms completely with waterproof wound tape, uniforms or aprons (or clothes) are clean at the beginning of the shift, coughing or sneezing directly on food, washing hands after coughing or sneezing, washing hands after blowing the nose and wearing a uniform or aprons outside the food preparation area, wearing jewelry while handling and preparation of food and use strong perfumes or after shaving disinfectant. While table (4) revealed that there were significant differences between before and after good hygiene practices in Personal Hygiene Checklist table to seventy workers ( $n=70$ ) for 10 different restaurants in Baghdad's Al Karkh area which done by the food handlers themselves by filling the checklist before and after the training and lecture depending on the self-reported attitudes.

It is important that the food processing staff should be healthy and have good medical record without any diseases (22).

Our results revealed that there were limited knowledge and practice about the GHP and PH that are important for food staff, which is presented by the low level of attitudes considered correct. This clearly confirmed that implementation of additional measures, including job training, as part of an effective strategy to control an establishment's food safety, which agrees with (25), who conducted a survey on food

handlers working in 5 cafes and 6 canteens on a university campus responding to a questionnaire about food hygiene. (26) who are emphasized on the steps of proper hygienic hand washing include several steps: washing and rubbing the hands and wrists with soap and profuse of clean water, rubbing between the fingers and the nails by using of a nail brush for 10 to 15 seconds; drying hands with hot air machine or towel paper; also using the towel paper for switch off the tap water to reduce cross contamination. (27) found that the using of food safety training programs was the most excellent program for ensuring useful training, which included both knowledge and behavior-based training. Furthermore, (28), who assessed knowledge and behavior of employees' by using of food safety training program in 31 restaurants located in the United States. They focused on the poor personal hygiene, cross-contamination, and time-temperature abuse. On the other hand, our results were similar to those found by (29), who found that the training program was significantly improved the handwashing knowledge and behavior without improving the general behavior. Also showed that the behavior had not significantly improved even though many behaviors had high knowledge scores. Therefore, the knowledge alone is not sufficient to changes the actual behavior. Furthermore, a study in Kuwait by (20) found that the training program should focus on the theoretical and practical aspects of knowledge and applied positive attitudes to promote good food safety practices. (30) found that the training

program of behavior was significantly improve handwashing behavior, while the training program of knowledge alone did not show significant improvement in handwashing performance.

The training program of hygiene practices for food staff should be performed in accurate steps by workers and wearing special protective clothes that are washable such as head cap and hand gloves to help secure their hygiene (23).

Another study revealed that the lack of accurate hand washing was the most neglected practice among the staff at the site of food processing and that contributed to cross contamination and food borne diseases. Also, found that 60% of the workers in the sites of food production did not wash their hands correctly after using the restroom (31, 32).

The (33) found that the number of bacteria on uncovered hand was significantly higher than that of the gloved hands among 180 persons of the staff at the site of food preparation. The most common bacteria found were *E. coli*, *S. aureus*, and *Bacillus* spp.

Our results were agreed with (20) and (16) they showed survey results revealed that none of the produce handlers had food safety knowledge or received training on safe produce handling practices.

In general, the humans are first source of contamination and the most carriers of microorganism that could be found externally on the hands, hair, mustach, clothes, and accessories. Also, internal factors that be presented by spit,



breath, and wound. A study by (34) revealed that the food processing workers were spreading 10,000 to 100,000 microorganisms every minute. Thus, workers should avoid certain behaviors at the production site, such as smoking, coughing, sneezing, chewing, and eating. They also should not wear accessories, watches, or hairpins (23).

Food safety training has been considered one of the most important ways to prevent or mitigate food contamination risks by adjusting the practices of handlers and improving their skills (7, 35, 36, 37, 38).

### **Conclusion**

The current study's results highlight that the degree of knowledge and attitudes. The methods of food handlers in Baghdad, Al-Karkh neighborhood were no good. Some areas of the limited knowledge, meanwhile, still need to be enhanced. These are notably connected to cross-contamination, time, and temperature control. Lack of understanding in these areas may have negative effects that raise the chance of contracting food-borne illnesses. Given the fast expansion of small and medium-sized restaurants in Baghdad and the rising demand for food handlers to serve these outlets, obligatory training is essential. The training should promote good attitudes toward food safety measures, be practical, not just theoretical, and be a part of a long-standing food safety culture. The success of food safety training depends heavily on the assistance, encouraging feedback, and

encouragement provided to food handlers by managers, supervisors, and trainers.

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### **Conflicts of interest**

There is no conflicts of interest declared by the authors.

Table 3: Food Handlers General Information of Good Hygiene Checklist

No	Questions	Before GHP		Mean ± SE	After GHP		Mean ± SE	T-test
		Yes	No		Yes	No		
1.	Uniforms or aprons (or clothes) are clean at the beginning of the shift	30	40	0.428 ±0.11	70	0	1.00 ±0.00	0.339 *
2.	Wearing hair handles (hat or hairnet)	60	10	0.142 ±0.03	70	0	1.00 ±0.00	0.407 *
3.	Nails are short and clean	50	20	0.285 ±0.07	70	0	1.00 ±0.00	0.371 *
4.	Touching the nose, mouth, hair and skin while preparing food	60	10	0.875 ±0.12	0	70	0.00 ±0.00	0.392 *
5.	Smoking and eating in food preparation areas?	60	10	0.857 ±0.12	0	70	0.00 ±0.00	0.392 *
6.	Coughing or sneezing directly on food, washing hands after coughing or sneezing, washing hands after blowing the nose?	70	0	1.00 ±0.00	0	70	0.00 ±0.00	0.308 *
7.	Wearing jewelry while handling and preparing food?	50	20	0.714 ±0.09	0	70	0.00 ±0.00	0.291 *
8.	Use strong perfumes / after shaving?	40	30	0.571 ±0.08	0	70	0.00 ±0.00	0.266 *
9.	Wearing a uniform or aprons outside the food preparation area	70	0	1.00 ±0.00	0	70	0.00 ±0.00	0.308 *
10.	When wounded Cover all cuts or wounds on the hands or arms completely with waterproof wound tape?	50	20	0.285 ±0.07	70	0	1.00 ±0.00	0.371 *
11.	Wear disposable gloves if there is a wound on the hand. Change gloves and wound tape regularly?	60	10	0.142 ±0.03	70	0	1.00 ±0.00	0.407 *
		---	---	0.598 ±0.07	---	---	0.538 ±0.06	0.159 NS
* (P≤0.05).								

Table (4) Personal Hygiene Checklist

No	Questions	Before GHP		Mean $\pm$ SE	After GHP		Mean $\pm$ SE	T-test
		Yes	No		Yes	No		
1.	Wash hand After using the toilet	35	35	0.500 $\pm$ 0.02	70	0	1.00 $\pm$ 0.00	0.267 *
2.	Wash hands before, work, handling food and utensils?	9	61	0.128 $\pm$ 0.04	70	0	1.00 $\pm$ 0.00	0.352 *
3.	Wash hand after handling raw food?	8	62	0.114 $\pm$ 0.03	70	0	1.00 $\pm$ 0.00	0.307 *
4.	Wash hand after coughing, sneezing, eating, drinking, or smoking?	11	59	0.157 $\pm$ 0.07	70	0	1.00 $\pm$ 0.00	0.344 *
5.	Wash hand after licking fingers?	16	54	0.228 $\pm$ 0.06	70	0	1.00 $\pm$ 0.00	0.319 *
6.	Wash hand after every break?	13	57	0.185 $\pm$ 0.06	70	0	1.00 $\pm$ 0.00	0.363 *
7.	Wash hand after touching the blisters or sores?	14	56	0.200 $\pm$ 0.05	70	0	1.00 $\pm$ 0.00	0.286 *
8.	Wash hand after waste treatment	20	50	0.285 $\pm$ 0.07	70	0	1.00 $\pm$ 0.00	0.371 *
9.	Wash hand after cleaning	10	60	0.142 $\pm$ 0.03	70	0	1.00 $\pm$ 0.00	0.407 *
10.	Wash hand after changing dirty clothes?	0	70	0.00 $\pm$ 0.00	70	0	1.00 $\pm$ 0.00	0.500 *
11.	Wash hand After touching the ears, nose, hair, mouth, or any other parts of the body?	12	58	0.171 $\pm$ 0.04	70	0	1.00 $\pm$ 0.00	0.357 *
	Mean $\pm$ SE	--	--	0.192 $\pm$ 0.04	--	--	1.00 $\pm$ 0.00	0.380 *

\* ( $P \leq 0.05$ ).

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