Development of Handwashing Technique Observation Tool (HTOT) for Hand Hygiene Compliance Among Food Handlers

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ABSTRACT

Increasing cases of foodborne illness in Malaysia indicates that food handlers are still lacking in maintaining food safety at their premises. Food contamination by microbial agents commonly occur due to unsafe food handling techniques by the food handlers which includes inefficiency in washing their hands. Therefore, this study is conducted to develop Handwashing Technique Observation Tool (HTOT) to monitor the compliance of hand washing techniques according to the '7 steps of handwashing' technique by the Malaysian Ministry of Health. The tool is validated by experts in the field and inter-rater reliability analysis. Results showed that the total percent agreement between the experts on the tool's content was 100% for relevance and 87.5% for clarity. Cohen's kappa inter-rater reliability test showed a strong agreement between the raters ($\kappa = 0.808$; $p < 0.005$) on rating the subjects' handwashing technique scores. In conclusion, the developed HTOT is reliable to be used in monitoring the effectiveness of hand hygiene practices among food handlers in Malaysia

Keywords: Hand washing; Hand hygiene; Observation tool; Food handlers

INTRODUCTION

Foodborne illness has long been a problem in the world population (WHO 2015). In Malaysia, the highest recorded incidence of foodborne illness cases was in 2015 with an incidence rate of 47.3 per 100,000 populations (Malaysian Department of Statistics 2018). Food contamination events can occur at any stages of food processing by physical, chemical and microbial agents (Aung et al. 2019; Sharifa Ezat et al. 2013). The risk of food contamination mainly depends on the knowledge, attitude and practices of the food handlers themselves including their level of personal hygiene. Hence, food handlers play a crucial role in ensuring production of safe food to the population (Asim et al. 2019; Aung et al. 2019).

Hand hygiene is fundamental to the prevention of infectious diseases and also to the spread of foodborne pathogens in the food processing environment (Price et al. 2018; Soon 2019). Hands should be washed properly before handling food, during food preparation, between handling raw and cooked ingredients and among other tasks (Yap et al. 2019). Effective hand washing practices will help in eliminating or reducing the amount pathogens such as *Salmonella, Campylobacter* and *Escherichia coli* from the food handlers' hands (Fung et al. 2018). Literatures on monitoring of handwashing techniques were mostly focused on healthcare workers' compliance to handwashing at critical time when giving treatments to the patients (Boyce 2019; Boyce 2017; Masroor et al. 2017). Most studies related to hand hygiene among food handlers were based on surveys on their knowledge, attitude and self-reported practice as well as microbiological analysis of hand swabs samples (Tan et al. 2013; Tan et al. 2014; Lee et al. 2017). However, studies looking at the food handler's technique in washing their hands effectively and method or tools to assess this technique is fairly limited.

Therefore, this study aims to develop a simple observational tool for assessing effective handwashing techniques among food handlers that can be used in monitoring of hand hygiene compliance in the food industry settings.

MATERIALS AND METHODS

Development of the Handwashing Technique Observation Tool (HTOT) was based on the method described by Rodriguez et al. (2017) which include two phases: instrument construction and content validation. Ethical approval was received from the institutional ethics committee (Code: UKM PPI/111/8/ JEP-2019-482).

Instrument construction

The HTOT was designed based on the 7-steps to proper handwashing technique by the Malaysian Ministry of Health (Food Safety and Quality Division 2019) which consists of these steps:

1. Wash hands with sufficient amount of soap.
2. Scrub the palms.
3. Scrub each finger and between fingers.
4. Use fingernails to scrub palms.
5. Scrub the backs of hands.
6. Rinse hands completely under running water
7. Dry hands with clean towel or tissue.

All of the above items will be scored based on a 3-point Likert scale (Table 1). An additional item was added in the HTOT to score the time used by subject to wash their hands.

TABLE 1. Scoring method of Handwashing Technique Observation Tool (HTOT)

Item	Score	Description of score
Handwashing steps	0	Item not being attempted at all by subject
	1	Item was performed but not perfectly by the subject
	2	Item was performed perfectly by subject
Handwashing duration	0	Less than or equal to 10 seconds
	1	Between 11 – 19 seconds
	2	More than or equal to 20 seconds

Content validation

The constructed HTOT were sent to two experts in the field for content validation. A 4-point Likert scale critical appraisal tool was used by the experts which consists of relevancy scale and clarity scale (Table 2). Any additional comments by the experts were noted in the same critical appraisal form. Expert were chosen based on the following criteria: 1) worked in the food safety field for at least 5 years. 2) has been involved in any food premise monitoring activity for the past 3 years. The experts (n=2) involved in this study includes an academia with a Ph. D in food safety and an Environmental Health Officer from a district health office. Percent agreement were then calculated based on the scores given by the experts for each item in the HTOT (McHugh 2012).

TABLE 2. Critical appraisal scoring scheme used by the selected experts for HTOT content validation

Category*	Score	Description of score
Relevance of HTOT items	1	Item is not relevant to be included in the HTOT tool
	2	Item is somewhat relevant to be included in the HTOT tool
	3	Item is quite relevant to be included in the HTOT tool
	4	Item is highly relevant to be included in the HTOT tool
Clarity of language used	1	Language used for this item is unclear / not easy to understand
	2	Language used for this item is somewhat clear / somewhat easy to understand
	3	Language used for this item is quite clear / quite easy to understand
	4	Language used for this item is highly clear / very easy to understand

**Each item in the HTOT were scored for its relevance and clarity of language*

Inter-rater reliability analysis

After modifications of HTOT were made based on the feedbacks received from the field experts, an inter-rater reliability analysis was conducted to ensure correct representations of the items measured between the data collectors. Two data collectors from the team and 5 random respondents were chosen for this analysis. Written consent was obtained from the respondents. The respondents were asked to wash their hands while being observed by the data collectors. Data obtained from both data collectors were then subjected to Cohen's

Kappa analysis (Cohen 1960) using IBM SPSS Statistics version 23.

RESULTS AND DISCUSSION

Content validation by experts showed 93.75% agreement between the two experts. Specifically, the expert 100% agrees on the relevance of all items in the HTOT. This is expected as the items constructed in the HTOT were purely based on the 7-steps of proper handwashing guideline by the Malaysian Ministry of Health (Food Safety and Quality Division, MOH 2019). In terms of clarity of the language used for each of the item, results showed 87.5% agreement. This disagreement of clarity score was mainly due to the language used in item 1. Modifications were made on this particular item based on the recommendations given by the experts.

After conducting a trial run using the modified HTOT by two data collectors, Cohen's kappa inter-rater reliability test showed a strong agreement between the raters ($\kappa = 0.808$; $p < 0.005$) on rating the subjects' handwashing technique scores. Inter-rater variability is a one of the concerns in studies that includes observational scoring in the study design as huge variations in scoring by the data collectors would serve as a potential source of error to a study's reliability and accuracy of the data. It is a common practice where data collectors will be trained as a part of the study design to limit the amount of variability scoring using the observational tool (McHugh 2012).

Hand hygiene is an essential component in ensuring of safe food production and preparation for the consumer. In Malaysia, all food handlers are taught the correct way of effective handwashing method along with other safe food handling techniques during the mandatory food handler's training as required by the Food Act 1983 (Malaysia 1983). Although gloves may be used during the food preparation, it should be noted that the use of gloves cannot replace the need for proper handwashing. According to Yap et al. (2019), wearing gloves alone is not enough to prevent food contamination. The combination of washing your hands properly before using gloves is a recommended way.

Various studies on food handlers in Malaysia have reported that they have an overall good knowledge, attitude and self-reported practice on hand / personal hygiene (Noor Azira et al. 2012; Norrakiah et al. 2014; Rosnani et al. 2014). However, these self-reported surveys commonly contradict withhand microbiological swab analysis conducted on them (Lee et al. 2016; Tan et al. 2013). One of the main factor of these findings might be due to the ineffective way of handwashing techniques (Wong & Lee 2019). Food handlers and most likely the supervisors in the food industries may not realize that their usual method of handwashing is inefficient and is continuously risking their food products. By having a system that monitors compliance and effectiveness of handwashing among the food operators would help in reducing this risk. A simple observational tool such the HTOT would help the food industry managers in implementation of the monitoring system. The developed HTOT will also help the managers to identify the common mistakes and common missed areas of the hands during handwashing procedures of their employees. Therefore, further targeted intervention to overcome the problem could be conducted by the food safety managers.

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