FOOD CONTAMINATION IN RESTAURANTS

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PROBLEM STATEMENT

Foodborne diseases are illnesses resulting from the consumption of food or drinks contaminated with pathogenic bacteria, viruses, or parasites. Food-borne diseases are an ongoing problem of concern as it has resulted in increased death rates (Soon, 2019). WHO claims that up to 30% of the population of industrialized countries suffer from food-borne diseases every year. In the United States alone, 76 million cases are registered, of which 325,000 are hospitalizations and 5000 deaths. Such outbreaks have an impact on the social and economic conditions of both the developed and the developing countries (World Health Organization, 2007).

Evidence shows that restaurants are more vulnerable to foodborne diseases (Angulo & Jones, 2006). 58% of the total cases reported in 2004 were linked to restaurants, which sums up to 75million cases (Choung, 2010). This clearly depicts that there is an upsurge in the number of people eating away from home, therefore, supporting the study saying that the restaurant industry is the major contributor of foodborne illness outbreaks. Hence, for the industry stakeholders, food safety becomes a pertinent issue.

The factors that are responsible for contamination can be distinguished into human factors and non-human (environmental) factors. Of this, human factors prompt 63% of the hygiene violations. The most common human factors that lead to the illness were temperature abuse (improper holding) (18%), poor personal hygiene of the food preparer (10%), and cross contamination (35%) (Choung, 2010). This is in line with a report from the World Health Organization that says, " the food handler can often be a major source of contamination" and to avoid transmission, "effective hand washing practice" by the food handler is essential (Adams & Motarjemi, 1999). Hence, handwashing was chosen as the food safety behavior of emphasis. However, this was opposed by Jan Mei Soon. He states that "effectiveness of hand washing practices may diminish post-hand washing when touching the sink faucet and restroom door handle/panel to exit". He elaborates on his position by adding “hand-contact surfaces in restrooms are unhygienic and can potentially re-contaminate washed hands upon touching unhygienic surfaces such as exit door panel or handle".

Previous studies on food safety knowledge and practices in food service establishments were based on ways to reduce the transmission from infected food handlers by creating awareness amongst them by providing educational training and carrying out food inspections (Choung, 2010). However, in spite of the training and the guidelines for effective hand washing, in 2004, it was observed that 73% of food workers were engaged in “improper” hand washing. This issue demands constant monitoring of the hands of food handlers using new technology-based solutions. The main way to overcome this until now has been using reinforcement in the form of posters or reminders of risk of transmission of foodborne pathogens which help to increase hand hygiene compliance (Soon, 2019). However, regardless of these initiatives, implementation on the part of food handlers lacks and it is of vital importance to understand the factors affecting it.

This social and healthcare problem needs to be addressed, for the health safety of consumers. The current study in this domain lacks on the problem of re-contamination of washed hands due to contact with unhygienic and infected areas such as door handles and other surfaces. Proper research to adapt new technological solutions would reduce the risk of foodborne illness transmission associated with the restaurants.

RESEARCH QUESTION I

What are the factors that impact the relationship between food handler's behavior intentions for hand washing and self-efficacy to perform hand washing behavior in restaurants?

Although a lot is known and studied on the preventive measures that food safety establishments should adopt and also the significance they hold in pertaining food safety, little is understood about food handlers' perceptions of the importance of these preventive measures and how frequently these measures are actually practiced in food service establishments like restaurants. Harris, in his work has mentioned the fact that structural environment plays a vital role in ensuring food handlers practice of food safety.

On answering this research question, we will be able to determine

- the correlation between attitudes, values and beliefs about food safety behaviour of food handlers that are demonstrated in food handling practices.
- the gap between food safety training and behaviour.
- the optimal combination of strategies to increase compliance and would provide a framework to guide handwashing interventions
- to understand the barriers that prevent food handlers from achieving adequate hand hygiene compliance
- components of food safety climate affecting food safety outcomes
- correlation between employee commitment and handwashing frequency

By addressing this research question, we would be able to understand the "nature" of the research problem. It would help us understand the limitations that each compliance method comes with and will eventually help when designing interventions to improve hand washing compliance. It will help us to know whether there is lack of knowledge of when to wash hands that results to poor handwashing compliance. It will help us determine if there is any negative impact of high workload on hygiene behaviour and hence eliminating or reducing hand washing behaviour allows employees to meet allocated requirements. All these food safety climate variables can be used as predictors of food safety behaviour. The result of this research will help to improvise organizational culture of safety to achieve desirable safety outcomes and hence reduce foodborne illnesses.

The research will adopt an explanatory based approach and the data will be analysed qualitatively as behaviours of the food handlers and the reasons for it will be studied and it will help us understand why there is lack of hand washing practice. Data collection strategy to address the handwashing frequency will be through a novel, interview-based method. The researcher will question the target participants, that is the food handlers, who will act as the data source. They will be interviewed to understand their practices and perceptions to hand washing behaviour and commitment in different situations.

RESEARCH QUESTION II

What are the factors that lead to the contamination of surfaces in a restaurant such as door handles and ultimately contribute to the re-contamination of washed hands of a food handler?

For a food handler, the best way to maintain hand hygiene is proper wash of hands. But there are high chances that the food operators adequately washed hands may get re-contaminated on coming in contact with the unhygienic surfaces. Jan Mei Soon emphasizes on the fact that "effectiveness of hand washing practices may diminish post-hand washing when touching the sink faucet and restroom door handle/panel to exit". (Soon, 2019)

The aim of addressing this research question will be to investigate the microbial contamination of contact surfaces. It will help determine which surfaces contain highest levels of contamination. There is a need for research on this as hygiene is not maintained as per the rules and regulations and these surfaces become the major reservoir of foodborne pathogens. The samples of surfaces will represent the microbial loads that would be expected on surfaces that food handlers would encounter.

The purpose of this research question is to understand the “causes” of the research problem. The need for this research to study the levels of microbial contamination of surfaces that food handlers may come in contact with would help suggest the best cleaning practices and procedures to reduce food contamination and ultimately, foodborne illnesses. It will help us know the risks of transmission of pathogens.

The research will adopt a quantitative based approach. Data collection strategy would be collecting samples of different surfaces that food handlers are bound to come in contact with after hand washing like door handles, gloves, napkins to name a few. Adenosine triphosphate (ATP) swabs of contact surfaces should be carried out, which will act as the data sources (Soon, 2019). The collected data will be analysed quantitatively. Also, a survey can be done to get a better understanding of the normal practices of food handlers.

RESEARCH QUESTION III

To what extent can technology be used to monitor the maintenance of hand hygiene of food handlers in food service establishments? How will this method be effective to the traditional training method?

No matter the number of food safety trainings the food operators are provided with, they lack on their part of implementing these safety practices. Previous studies have shown that food handlers' compliance with food safety rules and regulations is poor (Soon, 2019). Research shows that in only 27% of the work activities adequate hand washing took place. Harris's work also says that "73% of food workers were observed engaging in improper hand washing". These things prompt us to monitor the food safety practices of these food handlers.

The new knowledge here is the understanding of the new technology-based monitoring over the traditional monitoring which involved humans. The research on this aspect will help us to accurately monitor hand washing compliance behavior of food handlers in restaurants. Food safety practices would be monitored using technology which is not highly used in this sector for this purpose. This approach, without any hesitation and with some modifications depending on the place of usage, can surely be used in any situation where maintenance of hand hygiene is of utmost importance.

Answering this research question will help develop a "new way of solving" the research problem of food contamination in restaurants because of poor food handling practices. By addressing it, employee behavior will be monitored, which is foundational and necessary for gathering baseline levels of hand washing compliance. This will help us to solve the research problem in a way that we would have developed a better understanding of the reality and then be able to present a practical technology-based solution to monitor hand hygiene compliance. We can use radio-frequency identification (RFID) tags containing the details of food handlers and a server for receiving data connected via Zigbee technology to monitor the compliance with hand hygiene. Compliance with hand hygiene would be monitored, which eventually will lead to reduction in transmission of microorganisms and hence, will lessen the number of cases of foodborne illnesses to a large extent.

Moreover, this method will be effective over the traditional direct observations done by the manager in terms that there will be continuous monitoring unlike the other one. It will be more potential than the educational training of food safety held at food service centres as food handlers will be left with no choice, but to maintain hand hygiene.

The research will adopt an artefact-oriented approach as it will analyse the performance of the artefact, that is, the software in use. It is an experimental based research. It will adopt descriptive based approach. This approach is suitable as, at this stage, the RFID and zigbee based technology will be experimented. Analysis will be done on the data collected. Changes will be made and then it will be experimented again. Data sources will be the food handlers who have direct contact with food and hence have increased chances of contaminating the food. The data collected will be analysed. Changes will be made and again experimented.

COMPARISON OF RESEARCH QUESTIONS

On observing the comparison table (Table 1) of the three research questions below, we deduce that research question I focuses more on hand washing practices of the employees, where else research question III focuses on contamination of hand after hand washing. One major point is that research question III seems more feasible as it involves technologies that are currently in use in other areas. Though, complete adaptation won't make sense, but still, is helpful as a first step. However, study on research question I will be the most cost effective and less time consuming. Moreover, it holds the advantage that it will provide us a framework to guide handwashing interventions. Also, study on research question II will be novel, keeping in mind the fact that this area is unexplored.

Table 1 Table of comparison

VARIABLES OF COMPARISON	RESEARCH QUESTION I	RESEARCH QUESTION II	RESEARCH QUESTION III
Significance	• Understand the correlation between food handlers' attitude to hand washing behavior • Determine the gap between food safety training and behavior	Investigate the microbial contamination of surfaces that food handlers are bound to come in contact with	Better monitoring of compliance of hand hygiene using technology
Reliability	The behaviour of food handlers may change from one site to another depending on n number of factors. One solution or conclusion cannot be universal.	There can be lapse in maintaining hygiene even after knowing the surfaces with highest levels of contamination	Most reliable as use of technology leads to accurate monitoring of hand hygiene
Impact	Better hand washing behaviour of food handlers	Compliance of surface hygiene	Compliance of hand hygiene
Feasibility	Averagely feasible	Comparatively less feasible	Feasible
Cost	No cost	Medium cost	High cost
Urgency (priority in order)	2	3	1
Participants	Food handlers	Contact surfaces	Food handlers and technology
Time	N – hours	N + hours	N hours
Barrier	• Reliability of the answers of food handlers • Behavior varies from person to persona and place to place.	• Would require further research to get the levels of contamination at different intervals of time, that is, at peak time and non-peak time	• Breakdown of power • Loss of RFID tags • Extra expense on monitoring

		• Frequency of swab tests needs to be increased to get a better understanding	

Therefore, based on the variables of comparison as mentioned in the table above (Table I) and keeping in mind the purpose of the research, a further study on research question III is recommended. This research question is the most reliable one to reduce the risk of foodborne illness by maintaining hand hygiene of food handlers in food service establishments. Continuous monitoring of hands of food handlers will definitely reduce food contamination. The outcomes of this research question will provide a technology-based solution that can be adopted in restaurants to maintain hand hygiene of their employees. It is the most accurate and effective method for the research problem.

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