



Study on safety and quality aspects in restaurants based on HACCP in Allahabad city

Susmita Mandal^{1*}, Ajay Kumar Singh¹, Baljor Singh¹, Kunal Singh¹, Sweta Singh¹, Vinay Kr Pandey²

¹ Department of Food Process Engineering, SHUATS Allahabad, Uttar Pradesh, India

² Department of Bio Engineering, Integral University Lucknow, Uttar Pradesh, India

Abstract

In India the restaurant food sector has experienced significant growth in the past few decades due to population growth. Despite the economic benefits of the sector, it has been recognized as a potential hazard to public health and implicated as one of the most frequent settings for food borne illness outbreak. Restaurants are not appropriately following the food safety guidelines in the country. The main objectives of the study to identify the hazard, implementation of HACCP and barriers faced while implementing HACCP in casual dining restaurants of Allahabad City. It was conducted in forty casual dining restaurants of Allahabad city with visual inspection as well as distribution of questionnaire among the forty participants are Restaurants managers and food handlers. In additional sample of surface of knife, plate and table mop were taken from four kitchens of casual dining restaurants for microbial analysis. The samples were contaminated with the bacterial colonies of *E. coli*, *Salmonella enteritidis* and *Staphylococcus aureus* which may be responsible for food poisoning or food borne illness to customers. The result on this study of restaurants had shown that 55% of restaurants were licensed and 45% was not licensed and the result obtained from questionnaire reflects the food handlers of restaurants attitudes towards food safety and there hygienic practices most of them have extensive knowledge about food safety and food handlers maintain the hygiene in the kitchen unit of restaurants. 85% of the restaurants, HACCP is not been implemented due to lack of HACCP training, knowledge and proper record operation during their daily jobs are not been recorded by 90% of them.. The inspection was done on the casual dining restaurants and were subjected to critical control points at storage, Issue to kitchen units, preparation for cooking, cooking containers/ utensils and services to prevent from hazard which are occurs at these sources of restaurants to provide safe food to the customers. This study confirm the difficulties faced by the managers and food handlers of casual dining restaurants to effective implementation of HACCP system 87.5% lack knowledge about it, too complicated, no time and 90% of them do not have financial and Economical resources. Specific training program are needed for an adequate implementation of HACCP in casual dining restaurants of Allahabad city.

Keywords: HACCP, staphylococcus aureus, hazard

Introduction

A restaurant is a business which prepares and serves food and drinks to customers in exchange for money. Meals are generally served and eaten on the premises, but many restaurants also offer take-out and food delivery services. Indian restaurant industry is highly fragmented with more than 1.5 million outlets of which only around 3000 of them are from the organized segment. Organized segment includes Quick Service Restaurants (QSRs), Casual Dining, Cafes, Fine Dining and Pubs, Bars, Clubs and Lounges. The Indian restaurant industry is worth Rs.75, 000 crore and is growing at an annual rate of 7%. Dutta *et al.* (2008) conducted a study with restaurant consumers in the United States and India found that American consumers displayed a higher involvement in environmentally and socially responsible practices, while Indian consumers had a higher degree of involvement in health-related responsible practices. So previous researches had shown that Indian restaurant customers concerned about the hygiene, health, safety and sanitation. So it is important that the hoteliers and the restaurant operators ensure food safety for all the customers dining in the restaurants in order to fulfill the growing food safety need of the customers. Organized hotels and restaurants have already developed and implemented the food safety system covering their entire activities. The main area where the food contamination

could happen is the production area in the kitchen. To avoid any cross-contamination the operational level chef who is responsible for the production related activities in the kitchen should hold strong food safety knowledge. The knowledge of the chefs would ensure safe food production practices in the kitchen to understand the food safety knowledge of the operational level chefs working in the restaurant kitchen of standalone restaurants and the restaurants of star categorized hotels.

Food safety is the assurance that when food is consumed by a person, it does not cause any illness. To ensure food safety, a systematic, practical and scientific approach needs to be practiced at all times. This approach covers procurement of quality raw food materials, correct handling, proper storage, quality preparation and serving of food to customers which is safe for consumption. Hygiene needs to be practiced at each stage of this process. Standard rules for good hygiene that restaurants are expected to adopt include personal hygiene of staff members and operational hygiene. Good personal hygiene by the food handlers calls for Daily bathing, wearing clean work clothes, covering of head hair, trimmed nails without nail polish, not wearing any jewellery, Frequent washing of hands with Antibacterial soap solution before and after handling raw food, cleaning of wares. Use of disposable gloves for handling of food, which is to be served uncooked. Avoid handling of food if

suffering from any disease. If the food handler has any injury, it must be properly covered with suitable bandage. The purpose of this study was to establish food safety measures, hygienic practices and the present research paper specifically reviewed the perceived barriers, opinions and belief systems to compliance to food safety operating procedures among food handlers in selected casual dining restaurants of Allahabad City.

Materials and Methods

The experimental lab work was carried out in Department of Food Process Engineering at Food Process Engineering Laboratory of Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Allahabad. This section comprise of detail regarding the material method

used for present study.

Material

It has been observed that consumptions of Restaurants food are quite popular in Allahabad, Uttar Pradesh by local people as well as by tourist, mainly because these regions are popular tourist destination in the country. So hygiene plays an important role in the Restaurants.

Knife, plate and table mop were used to analysis the microbial count of *E. coli*, *Salmonella enteritidis*, *Staphylococcus aureus* and Total Plate Count.

Plan of work

Table

Table 1

S. No	Parameters	Method	Analysis
1	Identification of hazard	Microbial analysis of Knife, plate, Table mop	Microbial load on the surface of knife, plate and table mop
		Survey	<ul style="list-style-type: none"> ▪ Attitude of food handlers about food safety in restaurants. ▪ Food handlers practices toward food born disease prevention.
2	Critical Control Point	Survey	Attitude of food handlers and manager regarding the HACCP System
		Visual Inspection at different sources	<ul style="list-style-type: none"> ▪ Storage
			<ul style="list-style-type: none"> ▪ Issue to Kitchen units
			<ul style="list-style-type: none"> ▪ Preparation for Cooking
			<ul style="list-style-type: none"> ▪ Cooking
			<ul style="list-style-type: none"> ▪ Containers/ Utensils
<ul style="list-style-type: none"> ▪ Service 			
3	Barriers	Survey	Barriers faced by food handlers while implementing HACCP in restaurants

Procedure

1. Suspended few grams of media to distilled water.
2. The media was heated to dissolve completely with the help of hot plate.
3. The mouth of conical flask was cover with cotton plug and then it was covered with fresh wrap.
4. The media and Petri dish was autoclave at 121°C for 20minutes.
5. Then kept the sterilized Petri dishes in hot air oven for drying.
6. Laminar air flow cabinet was properly clean with disinfectant solution.
7. The UV lamp and air flow was switch on for half an hour before starting the work and then switch it off.
8. Kept the media, Petri dishes and sample in the cabinet.
9. Labeled the Petri dishes.
10. The Bunsen burner was lightened and then pours the media in the Petri dishes.
11. Media was solidifying in the Petri dishes.
12. Burned the Bunsen burner and open the lid of the Petri dishes and then take the sample cotton swabs and swab it on the surface the media and close the lid.
13. Placed all the Petri dishes in incubator inverted way for 24 to 48 hours at 35°C - 37°C.
14. No of colonies develop at the end of the incubation period and then counted the colonies.

Results and Discussion

The present study entitles “Study on safety and quality aspects in restaurants based on HACCP in Allahabad City”, (Uttar Pradesh). This study was undertaken in Department of Food Process Engineering at Food Process Engineering Laboratory of Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS).

The result on this study of restaurants had shown that 55% of restaurants were licensed and 45% was not licensed.

Identification of hazard in casual dining restaurants.

Identification of hazard in Restaurants was determined by the microbial analysis of knife, plate and table mop from four different casual dining restaurants. Each Restaurants sample was collected to determine the bacterial colonies for *E. coli*, *Salmonella enteritidis*, *Staphylococcus aureus* and Total Plate Count by sampling swabbing method.

Microbial analysis to indentifying the hazard.

Forty eight samples were collected from four different Restaurants of Allahabad City to evaluate the presence of bacterial colonies for *E. coli*, *Salmonella enteritidis*, *Staphylococcus aureus* and Total Plate Count in knife, plate, table mop. Results are indicating in Table 4.1.

Table 2: Bacterial count of samples (knife, plate and table mop) for casual dining Restaurants.

S. No	Parameters	Samples	(R ₁)	(R ₂)	(R ₃)	(R ₄)
1	<i>E. coli</i>	Knife	38	26	29	32
		Plate	19	15	10	17
		Table Mop	11	8	7	12

2	<i>Salmonella enteritidis</i>	Knife	30	11	7	9
		Plate	8	2	5	3
		Table Mop	6	3	2	3
3	<i>Staphylococcus aureus</i>	Knife	17	11	12	8
		Plate	ND	ND	3	ND
		Table Mop	ND	ND	ND	2
4	<i>Total Plate Count</i>	Knife	412	460	332	484
		Plate	404	415	312	421
		Table Mop	382	397	277	408

Note: The value represent average of duplicate samples. R- Restaurant, ND- Not Detected.

It was observed that high bacterial colonies of *E. coli* count and *Salmonella enteritidis* on all the samples (knife, plate and Table mop). *Staphylococcus aureus* was detected in four of the knife sample, one in plate and one in table mop. The bacterial colonies of *Total Plate Count* present on all the samples of knife, plate and table mop.

Food handlers practices toward food-borne disease prevention.

The result on food handler’s practices towards food –borne disease prevention showed that 50% use gloves when touch and distribute foods. The proportion that washes hands before using gloves is 45% and after using gloves is 37.5%. While 92.5% wears protective clothing when touch or distribute food. 95% don’t wears mask and 80% do not wear cap while touching and distributing food.

Implementation of CCP in casual dining restaurants

The critical control point is unique to the HACCP system in that preventive and control measures are focused on identified problems rather than to do everything known about sanitation with the hope that something will work to prevent a problem. Bryan. (1990)

In this study the implementation of CCP was done in six steps.

1. Critical Control Point
 - On the bases of survey which is attitude of manager and

- food handlers regarding the HACCP system.
 - Visual inspection of restaurant which was done in six steps.
2. Establish critical limits
 3. Establish monitoring procedures
 4. Establish corrective actions
 5. Verification procedures
 6. Record-keeping and documentation procedures

Critical Control Point

Attitude of respondents regarding HACCP System

The result on attitude of respondent regarding HACCP System showed that 85% of the kitchen units of Allahabad casual dining restaurants don’t implement HACCP System. Mostly 92.5% had no information about HACCP System. Managers and food handlers of 55% don’t think that HACCP is important for food safety. Proper record operation during their daily jobs are not been recorded by 90% of them. On asking about the prerequisites program 82.5% don’t think about it.

Establish monitoring procedures

Restaurants should conduct a planned sequence of observations or measurements to assess whether a CCP is under control and to produce an accurate record for future use in verification.

Table 3: Establish monitoring procedures at different steps of casual dining Restaurants.

S. No	Source	Monitoring procedure
1	Storage	▪ Check the storage facilities
2	Issue to kitchen units	▪ Check that kitchen slabs are clean
		▪ Check that knife, table mop and plats are properly clean
3	Preparation for cooking	▪ Check the proper separation of cooked and raw food. ▪ Check that food handlers maintain hygiene while cooking food.
4	Cooking	▪ Check temperature of cooking as per requirements.
5	Containers/ Utensils	▪ Check that the containers /utensils are properly clean.
6	Services	▪ Check the hygiene of service area.
		▪ Proper handling should be done.

Establish Corrective Actions.

If a critical limit isn't met during the process restaurants staff needs to have the tools and knowledge to take corrective action and ensure the contaminated food never reaches the end consumer.

All staff and food handlers who enter the restaurants should follow the requirements for personal hygiene and should receive documented training in personal hygiene, Good Manufacturing Practices (GMP), cleaning and sanitation procedures, personal safety, and their role in the HACCP program (Kisembi *et al.* 2010).

Every staff of casual dining restaurants of Allahabad city should have knowledge about HACCP and it should be implemented in every kitchen units.

Verification procedures

In casual dining restaurants verifications should be done on daily bases or periodically with the help of records, documents and analysis which are been maintained.

Verification should be done to check the Critical Control Points and corrective action which are adopted ad HACCP plans and are successfully prevent, reduce and remove food safety hazard.

Record-keeping and documentation procedures

Proper records should be maintain by managers of all activities occurs in restaurants. The documents should be maintained by them are:-

- Note about hazard which causing contamination to the

food.

- Proper records of customer complaints about food quality and their illness.
- Data about Critical Control Points.
- Data about corrective action was made.
- Information about the restaurants food handler's hygienic practices and knowledge about food safety (Kumar *et al.* 2009).

The purpose of this study was to determine barriers for HACCP in restaurants. A lack of understanding of HACCP was identified as one of the main barriers to its implementation 87.5% reported that they did not really know what HACCP is. While 82.5% reported that it was too complicated. The majority of managers and food handler's 80% do not have time for food safety issues. 75% of managers and food handlers don't see benefits of HACCP system and 90% found that HACCP is expensive. As a conclusion, lack of knowledge about HACCP and other food safety programs were identified as the main barriers for food safety. Training programs, both basic food safety and HACCP to support implementation of prerequisite programs and HACCP were suggested.

The barriers can be overcome by:-

- Promote the HACCP System.
- Government should raise the awareness of HACCP.
- Adequate training is important for overcoming barriers related to human resource
- Managers must also implement HACCP, even with its attendant shortcomings and inherent problems and commit the financial resources necessary to train food service personnel thoroughly
- Restaurant managers and chefs may find available some physical and chemical tools necessary to monitor and verify with scientific certainty the critical control procedures implemented.
- Changing knowledge, attitudes and behavior of food handlers towards the HACCP system. (Walczak David. 2000)

Summary and Conclusion

Based on the results of the current study, it was concluded that,

- Most of Allahabad Restaurants were the reason of food-borne diseases because of the contaminated utensils therefore restaurants should be targeted for intensive inspection and improvement of the sanitary conditions of their facilities.
- The survey highlighted the potential risks of the sources in restaurant premises and the lack of knowledge about HACCP System among the restaurant staff in Allahabad City.
- The restaurants which implement HACCP in there restaurants are facing many barriers while implementing HACCP system in there restaurants premises.
- Barriers can be overcome by the providing food safety training to the employee of the restaurant premises.

The following recommendation is derived from the current study result.

- The identification of these attitudes can be used in the future development of training programs for the implementation of HACCP.

- It is recommended that foodservice managers and handlers utilize as much time as possible for food safety training and it would also be beneficial in helping to increase restaurant manager's awareness towards restaurants food safety and sanitation.
- The most beneficial outcome of this study would be that it increased restaurant manager's awareness of the importance of food safety, and sanitation. Furthermore it is hoped that this study increased foodservice operators awareness of a food safety program referred to as HACCP in casual dining restaurants of Allahabad City.

References

1. Adak GK, Meakins SM, Yip H, Lopman BA, O'Brien SJ. Disease risks from foods, England and Wales, 1996-2000. *Emerging Infectious Diseases*, 2005, 11(3).
2. Agyei-Baffour Peter, Sekyere Boateng Kofi, Addy Akosua Ernestine. Policy on Hazard Analysis and Critical Control Point (HACCP) and adherence to food preparation guidelines: a cross sectional survey of stakeholders in food service in Kumasi, Ghana, 2013;6(442):1-25.
3. Banna Hanin, Nawas Tarek. Salmonella: A Common Contaminant of Chicken Shawarma in RasBeirut Restaurants. *Journal of Environmental Science, Toxicology and Food Technology*, 2016;10(8):19-22.
4. Bolton DJ, Meally A, Blair ST, Dowell AD, Cowan C. Food safety knowledge of head chef and catering manager in Ireland, *Food Control*, 2008;9(3):291-300.
5. Bas Murat, Ersun Azmi S, Afak, Kivanc Gokhan. The evaluation of food hygiene knowledge, attitudes, and practices of food handlers in food businesses in Turkey. *Food Control*, 2006, 317-322.
6. Cates C Sheryl, Muth K Mary, Karns A Shawn, Penne A Michael, Stone N Carmily, Harrison E Judy et al. Certified Kitchen Managers: Do They Improve Restaurant Inspection Outcomes. *Journal of Food Protection*, 2009;2(72):384-391.
7. Cenci-Goga BT, Orteni R, Bartocci E, Codega A, Oliveira De, Clementi F et al. Effect of the Implementation of HACCP on the Microbiological Quality of Meals at a University Restaurant. *Food Borne Pathogen Diseases*, 2005;2(2):138-145. Consequences. Council for Agriculture Science and Technology.
8. Domenech E, Amoros AJ, Ganalu Perez M, Escriche I. Implementation and effectiveness of the HACCP and pre-requisites in food establishments. *Food Control*, 2011;22(8):1419-1423.
9. Dr Prabhu PM, Dr Shah RS. A Study of Food Handlers in Public Food Establishments in Maharashtra, India. *International Journal of Science and Research*, 2014, 1485-1489.
10. Haagsma J, Polinder S, Stein C, Havelaar A. Systematic review of food borne burden of disease studies: Quality assessment of data and methodology. *International Journal of Food Microbiology*, 2013;116(1):34-47.
11. Hatim A, Suliman S, Abdalla M. "Implementation of HACCP and food safety program in Al-Ain City Abu Dabi", *Journal of Food, Nutritional Disorders*, 2013;2(3):3.