

Microbiological Quality of Street Vended Mayonnaise Based Food from Kannur, Kerala

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ABSTRACT: This study was undertaken to determine the bacteriological quality of mayonnaise based ready to eat foods sold by street vendors and assess its antimicrobial resistance. Street vended food samples(n=60) collected from Kannur district, Kerala, India during the period of October-March,2017.Out of 60 samples analysed, 48(80%) samples showed the growth of E .coli. Klebsiella was isolated from 15(25%) samples . The highest level of resistant was found against Meropenem 63% resistance in E.coli and 60% in Klebsiella. High level of antimicrobial resistance against Ciprofloxacin also observed in present study. None of these samples screened in this present study within the limit of BIS regulations for Coliform and total aerobic bacterial counts.

KEYWORDS: Street vended, E.coli, Klebsiella, antimicrobial resistance.

I. INTRODUCTION

Street foods are sold in almost every country in the world. The FAO/WHO Codex Alimentarius Commission defines “street-vended foods” or its shorter equivalent “street foods” as ready-to-eat foods prepared and/or sold by vendors and hawkers especially in the streets and other public places. While street foods are an important source of ready-to-eat nutritious, low-cost meals for the urban poor, the health risk posed by such foods may outweigh their benefits. The street food sector has become an important component of food distribution system in many cities in both developing and industrialized countries, particularly for midday meals. However, certain street-vended food can pose significant risk to consumers due to microbiological contamination. The risk is dependent primarily on the type of food, the method of preparation and the manner in which it is held before consumption.

Laboratory analysis of samples of certain street-vended foods have shown high levels of total coliforms and in some cases, the presence of pathogenic bacteria such as Salmonella spp., Staphylococcus aureus, Clostridium perfringens, and Vibrio cholera. Street food has often been associated with travellers’ diarrhoea. Therefore, improvements in the safety of street food can not only improve public health, but also foster the development of the tourist sector. Besides communicating the hazards of street food, tourists should also be reminded of their role in avoiding food borne diseases. By following some basic rules, tourists can enjoy the local street-vended food and avoid becoming ill. In this regard, the WHO Guide on Safe Food for Travellers can be used to educate consumers on how to protect themselves and their families from food borne illness.

In addition to microbial hazards, street foods can become contaminated with high levels of toxic chemicals including pesticide residues, heavy metals, mycotoxins and unapproved food additives, such as textile dyes. Contaminants may also enter the food under the street conditions where dust and vehicular traffic raise pollution levels[1].

Worldwide, food-borne diseases are a major health burden leading to high morbidity and mortality. The global burden of infectious diarrhoea involves 3-5 billion cases and nearly 1.5 million deaths annually, mainly in young children, due to diarrhoeal disease caused by contaminated food and water. While many food-borne diseases may be self-limiting, some can be very serious and can lead to death particularly in children, pregnant women and older persons. The WHO South East Asia Region contributes to one third of the global deaths due to diarrhoea in children under five years of age. In India, the burden of food-borne disease is not known. Most food-borne diseases go unreported, only few are reported by the media, usually those with high morbidity and/or occurring in urban areas[2].

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Food borne diseases remain a persistent challenge to public health and the problems of food safety in the developed countries. The contamination of food products with infectious organism and their persistence growth, multiplication, toxin production has an important public health concern. With increase in urbanisation throughout the world the consumption of street foods or ready to eat foods is belongs common in almost all countries and the responsibility of food safety is shifting from final cook or consumer to the entire food.

Mayonnaise is an important ingredient for the manufacturing of various kinds of mayonnaise-based products. It can be used as a decorative element or raw material in production of salads, sauces and other delicacies. Mayonnaise is made by emulsification of vegetable oil and water phase of egg yolk. In general, water phase is composed of water, salt, sugar, vinegar, polysaccharides, additives and condiments, especially mustard. Mayonnaise is a relatively microbiologically stable product due to its high fat content and addition of acidic ingredients. Organic acids and other acidic ingredients are harmful to pathogens they also contribute the desirable flavour. Apart from the mayonnaise and the main components, starch sugar, spices, organic acids, preservatives, colour substances may be present in the product[3, 4]

Typical ingredients that are used without heat treatment are raw vegetables. They can introduce a very broad spectrum of microorganisms to the products.[4]Most of mayonnaise- based salads(MBS) are kept refrigerated to extend their shelf life. The pH level of the salad depends on the initial amount of inhibitory acids and preservatives, under chilled condition, shelf life varies between 2-8weeks.[3] It has been shown that some pathogens can survive in MBS for several weeks at 5°C.However commercial MBS, whether made for retail or foodservice are normally held at room temperature[23-25°C], till the opening moment[5].

II. RELATED WORK

Pathogens naturally present in one food may be transferred to other foods during food preparation if same cooking equipment and utensils are used without washing and disinfecting in between, especially in case of ready-to-eat foods. Inadequate cooking temperature with insufficient cooking, bacteria can multiply and produce toxins within the food. Many bacterial toxins are heat stable and may not be destroyed by cooking [2].

Bacterial food poisoning is a common illness which could be caused by Staphylococcus species, Bacillus cereus, Salmonella. An early report associating food poisoning with Bacillus species was made in 1906 when Lebanese described the outbreak in a sanatorium where 300 inmates and staff developed symptoms of profuse diarrhoea, stomach cramps and vomiting. A spore forming Bacillus was isolated from meatballs incriminated meal. Although Lebanese named the organism Bacillus peptonificans, the properties described resemble those of Bacillus cereus[6].

This study was undertaken to determine the bacteriological quality of mayonnaise based ready to eat foods sold by street vendors and assess its antimicrobial resistance. This study also aims to find out the presumptive coliform count by multiple tube technique and analyse the total aerobic bacterial count by spread plate technique.

III.METHODOLOGY

The study was conducted in School of Health Sciences, Kannur university over a period of 6 months. Collection of samples : Street vended food samples(n=60) collected from Kannur district,Kerala, India during the period of October-April,2017.The samples were purchased into a sterile specimen containers, under aseptic condition and immediately transported to the laboratory for microbiological analysis. Information regarding recipe's was collected along with each sample. Portions of mayonnaise area collected by using sterile spoon or spatula, and it to be homogenised in a pestle and mortar or in the homogeniser with buffered peptone water. About 10 g of mayonnaise part to be taken and it mix with 45 ml of buffered peptone water.

Isolation and identification of bacteria : 0.1 ml of aliquot of sample were streaked on MA and Blood agar plate and incubated at 37°C for 24 hours. Based on the Gram staining, colony morphology on blood agar and macconkey agar and biochemical reaction organisms were identified by the standard microbiological techniques.

Antibiotic susceptibility test : Isolated organisms were subjected to antibiotic susceptibility testing on Mueller Hinton agar plates by Kirby Bauer's disk diffusion method[7]. Using antibiotics like Ampicillin, Ciprofloxacin, Meropenem, Cefotaxime, Ceftazidime and Imipenem. Plates were incubated at 37°C for 24h.The result was interpreted as either sensitive, intermediate or resistant as per CLSI guidelines[8].

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For Aerobic Plate Count: 1ml of samples were mixed with 9ml of buffered peptone water and mixed by gentle shaking in sterile conical flask for several minutes, followed by serial dilution in the same diluent. The serial dilutions were prepared up to 10^{-6} . From suitable dilution tubes 0.1ml was spread by means of a sterilized glass spreader onto the entire surface of nutrient agar plate. This process was done in duplicate for each selected inoculated plates were inverted and incubated at 37°C for 24-48 hours. The number of colony forming units /ml is calculated by multiplying the number of bacteria by the dilution factor. Results were reported as means of colony forming unit/ml.

For the detection of the Most Probable Number(MPN) of Coliforms : Single strength macconkey broth and double strength macconkey broth were prepared. Multiple tube method was performed. All the tubes were incubated at 37°C for 24-48 hours. After the Incubation period, the tubes were examined for the presence of both acid and gas production in the Durham's tubes. Those tubes showed both acid and gas were considered positive. Those tubes showed negative results were incubated for another 24 hours period and examined again for both acid and gas production. These results were recorded and interpreted from the MPN tubes and recorded.(According to Mccrady's chart)

IV. RESULTS

Among the 60 Mayonnaise based foods, 30 samples were chicken sandwich and each 15 samples were chicken shawarma and vegetable sandwich. All the food samples contaminated with bacteria. A total of 74 bacteria were isolated from these food samples. More than one type of bacteria were isolated from 13 samples. Table 1 depicts the bacteriological profile of mayonnaise based food.

SI NO	NAME OF MAYONNAISE BASED FOODS	NUMBER OF TESTED	NUMBER OF CONTAMINATED	E COLI	KLEBSIELLA	ENTEROBACTER	PROTEUS	PSEUDOMONAS AERUGINOSA	COAGULASE NEGATIVE STAPHYLOCOCCUS
1	CHIKEN SHAWARMA	15	15	13	9	1	0	0	2
2	CHIKEN SANDWICH	30	30	26	4	2	3	3	0
3	VEGETABLE SANDWICH	15	15	9	2	0	0	0	0
	TOTAL	60	60	48	15	3	3	3	2

TABLE 1: BACTERIOLOGICAL PROFILE OF MAYONNAISE BASED FOOD ITEMS.

Out of 60 samples analysed, 48(80%) samples showed the growth of E .coli. Klebsiella was isolated from 15(25%) samples . Proteus ,Pseudomonas aeruginosa and Enterobacter were isolated from each of 3(5%) samples. 2(3%) samples were shows the growth of coagulase negative staphylococci. Enteric pathogens like Salmonella and shigella species were not detected in the samples screened.

We extended our study to reveal the antibiotic resistance patterns of the isolated colonies. The widespread use of antibiotics in animals which are used as human food, has resulted in the emergence of novel antibiotic resistant microorganisms that can be transmitted to human through the food chain and involve human health threat[9,10]. In our study it was observed that E.coli were the predominant isolates and it showed resistance against Cefotaxime (48%), Ceftazidime(46%), Imipenem(48%) and Meropenem(63%). Where as Klebsiella showed 47% resistance against both Cefotaxime and Ceftazidime and 60% resistance against Meropenem. Present study also revealed the highest level of resistant against Ciprofloxacin by both E.coli and Klebsiella (57% ,60%). The total coliform count is widely regarded as the reliable indicator of water quality. In this present study total of all 60 samples were shows more than 10 per 100 ml. Total bacterial counts in these contaminated food samples were $> 10^7$ cfu/ml. As per Bureau of Indian Standards (BIS) regulations, the total bacterial count in these foods should not be exceeds 25×10^4 /ml. and Coliform count should

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not exceeds more than 100/ml. None of these samples screened in this present study within the limit of BIS regulations for Coliform and total aerobic bacterial counts, indicating the high levels of contamination. High total aerobic counts shows the presence of live bacteria in the samples were indicates the high degree of infection. The presents study were shows the faecal contamination all of the 60 samples ,i.e. unsatisfactory for consumption. High coliform count and presence of E.coli indicates faecal contamination in food samples and suggesting possible risk of infection involved.

V. DISCUSSION

Food is one of the basic need of the human body. In this present study the microbial quality of street vended mayonnaise based foods were evaluated. These types of food may causes many types of diseases in human body includes as street vended foods made in a very short period of time in which all hygienic procedure may not be maintained, may cause food born diseases .diarrhoea, food poisoning ,typhoid, gastro intestinal problems etc.

According to the study of Lock and Board(1995)[11], they examined the 30 mayonnaise based samples from city of Dhaka. Out of these 30 samples ,22 samples showed the growth of Salmonella enteritidis. But in our study enteric pathogens like Salmonella and Shigella species were not detected in the samples screened.

The present study showed the growth of Klebsiella from 15(25%) samples .Proteus Pseudomonas aeruginosa, Enterobacter from each of 3(5%) samples. and 2samples showed the growth of Coagulase Negative Staphylococci. Study on the microbial safety of ready to eat foods; meat pie, beef sausage roll and egg roll, peeled orange, walnut and apple vended on highways; Onitsha-Owerri, South east, Nigeria, revealed the contamination of these foods by pathogens which include; Salmonella spp., S. aureus, E. coli, B. cereus, Shigella spp., Enterococci, A. niger and Pseudomonas (Oranusi and Braide, 2012)[13].

The current study show the highest level of resistant was found against Ciprofloxacin by both E.coli and Klebsiella (57% ,60%) followed by Meropenem, it has 63% and 47% resistance for E.coli and Klebsiella respectively. Similar observation was seen in study conducted by Gosling R J et al (2012) that the prevalence of resistance to ciprofloxacin was significantly higher in E.coli isolated from Turkeys in Great Britain[14].

Subratty A.B et al (2004) in their article "A Survey of Hygiene Practices among Food Vendors in Rural Areas in Mauritius" reveals that food vendors were quite aware of the appropriate hygienic conditions required for handling and preparing foods[15]. It was found that the majority of vendors did not put their knowledge into practice, as they perceived that their products were of relatively low risk to consumers. For over half of the vendor's households, the main income was derived from street food vending. It is concluded that further health education is required for food vendors.

A high degree of microbiological contamination of the street vended foods sold at the retail outlets in Kannur, Kerala has been detected in the present study. But the enteric pathogens like Salmonella and Shigella were not detected in the 60 mayonnaise based food samples screened. The high rate of bacterial contamination indicates the poor sanitary practices with improper transport and storage of ingredients under non-aseptic conditions. Although gastrointestinal tract infection outbreaks from the city were not reported during the study period. Antibiotic resistant bacteria are present in some of the ready to eat foods and may serve as a source of human exposure to antibiotic resistant bacteria. The highest level of resistant was found against Meropenem 63% in E.coli and 60% for Klebsiella. High level of

antimicrobial resistance against Ciprofloxacin also observed in present study by both E.coli and Klebsiella (57% ,60%) followed by Cefotaxime, it shows 48% resistance in E.coli and 47% in Klebsiella. In E.coli,48% resistance was observed against imipenem whereas Klebsiella shown 40% resistance against imipenem.

VI.CONCLUSION

Among the isolates from samples tested, only E.coli is the significant pathogen. However presence of other organisms could be attributed to unhygienic condition during preparation, handling and serving of street vended foods. These foods may also get contaminated if the food preparation machines are exposed to dust and flies. Mixing of these foods with mayonnaise can increase the incidence of mayonnaise being linked to food-borne illness, so freshly prepared mayonnaise can be used to prevent the food poisoning. Health education of the vendors and strict implementation of the hygienic standards may help to reduce the contamination rates.

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