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Pathogenic microbiological study of meat ready-to-eat and its products in different hotels of Peshawar, Khyber Pakhtunkhwa Pakistan

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Abstract

This research study was conducted to investigate the microbial quality of food Ready to Eat Meats at popular Resturant of Peshawar Pakistan. For this purpose, 28 different food samples from different Hotels, including Seven samples of each product, these product includes processed meat (Tikka Karahi (7), Meat Karahii (Gosht Karahi) (7), Mutton Karahi (7), Chicken Karahi (7) were analyzed for Escherichia coli, Salmonella spp., Staphylococcus aureus and fungi isolation. Total Viable Count for all samples was also determined. The highest contamination of pathogenic bacteria was found with log average of 6 in Tikka Karahi in Pak Afghan Hotel the lowest log percentage was 3.87 in Marcopolo. In Gosht Karahi the highest log percentage was 5.88 in Islamia resturant and lowest was 3.69 in Sheeraz Hotel. In Mutton Karahi the highest log percentage was 6.05 in Usmania Hotel and lowest was 3 in Pak Afghan Hotel. In Chicken Karahi the highest log percentage was 6.88 in Pak Afghan Hotel and lowest 2.79 was in Marcopolo Resturant. The total viable counts observed for each type of microorganism were found in the ranges from 5.0×10^2 to 1.4×10^4CFUml^{-1}.

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Introduction

Meat showed good medium for the growth of Microorganisms. The major cause of food Born Diseases is bacteria, virus fungi and protozoa. In emerging countries such contaminants are responsible for food born diseases such as salmonellas, amoebiasis, shigellosis and Typhoid fever. World Health Organization (WHO) and food and Agricultural Organization of the United Nations (FAO) stated that diseases due to contaminated food is the most extensive health problem in the world (Edema *et al.,* 2005).

Presence of microorganisms showed that the food has been processed in unhygienic condition. Presence of Coliforms and Aerobic bacteria is a good indicator of determining the hygienic quality of meat. In food poisoning the most important bacteria is *Staph aureus*. It has been emphasized in the standards and in the by law that *Salmonella* type bacteria is not to exist in food. (İsmail and Belma 2002).

Safety of food is gained by the absence of pathogenic microorganisms (Omemu and Bankole 2005). The Hazard Analysis Critical Control Point (HACCP) idea is used to detect microbiological susceptible points in the food production process and processing, to determine the most suitable procedures of control to be applied, usually such methods as improved handling techniques, monitoring of temperature and more intensive supervision (Okonko *et al.,* 2008).

In the modern world the major health problems are food born diseases and poisoning. Developed and developing countries are largely affected by foodborne infections. Due to food born diseases not only effect people's health but effect the economy of the country(Carbas B *et al.,* 2012).Each year 22.8 million cases of Salmonellosis occurred with death rate of 37600 in South East Asia (Van TTH *et al* 2012).It lowdown the social and economic productivity of the countries (Pires *et al.,* 2012).For food poisoning and food related infections Salmonella and Staphylococcus aureus (S. aureus) are the most common pathogens(Costa *et al.,* 2012 ; Aydin *et al.,* 2011).

Meat as a source of protein is basic need of body nutrition (Chang *et al.,* 1991). In most countries, meat consumption increases as an economic improvement (Fuller., 1996). Microbial contamination of meat is a serious concern for both meat producers and consumers (Jayathilakan *et al.,* 2009). The microbiological quality of the raw meat and other ingredients, personal hygiene and any contamination during the process will determines the quality of end product in terms of microbial contamination (Elmali and Yaman 2005). Studies conducted on the microbiological quality of ground meat showed that it is a good medium for microbial growth that leads to foodborne infections and food toxications due to pathogenic bacteria (e.g. *E. coli*, *S. aureus*, *Salmonella* spp. and sulphide reducing anaerobes) (Bensink and Boland 1979; Jay, 1996).

Peshawar in the province of Khyber Pakhtunkhwa of Pakistan is a well-known venue for the consumers of processed meat such as, mutton, beef and chicken. But no significant work has been reported about the qualitative microbial analysis of ready to serve processed meat of this place. The aim of this study was to understand the pathogens prevalence and contamination rate in ready to serve meal of District Peshawar. This study will also help the authorities and owners to improve the quality of food and water of the study area to reduce associated health risks.

Material and methods

Samples were collected in sterile plastic bottle aseptically and brought to the laboratory of Food Microbiology Nuclear Institute for Food and Agriculture, Tarnab Peshawar and processed accordingly. The methodology used was same as described by (Elmacioglu *et al.,* 2010) with slight modifications.

Collection of Samples

Samples of processed meat (each of about 200g) were collected from various hotels in University Town Peshawar. The names of the hotels are (Pak Afghan

Hotel, Sheeraz University town, Baba fast foods, Usmania Resturant, Marcopolo, Islamia restaurant, Khyber Charsi. These samples which were collected from these hotels they include Tikka Karahi (7), Gosht Karahi (7), Mutton Karahi (7) and Chicken Karahi (7), were collected separately in sterile glass bottles aseptically. All the samples were keeping ice pads inside the box. All the samples were labeled and processed further for bacterial count.

Isolation of Pathogenic Bacteria

For isolation of Pathogenic bacteria selective media are used Bismith Sulfide Agar (BSA) for detection of Salmonella, Eosin Methylene Blue Agar (EMBA) for the detection of Ecoli, For Staphylococcus aureus Mannitol Salt Agar (MSA), for fungi Potato Dextrose Agar (PDA) and for total viable count were used for isolation of target microbes by pour plate technique following (Akbar and Anal 2013). Inoculated plates were incubated at appropriated temperature (37°C) for 24-48 hours.

Total Viable Count

Dilution (5 fold) of the samples in sterile distilled water were prepared and mixed well. An amount of amount 1 ml from each dilution was spread over nutrient agar the plates were then incubated at 37°C for 24 hours. After incubation visible colonies were observed, counted and CFU ml $^{-1}$ was calculated for total viable count in these samples.

Confirmation of Bacteria

Presumptive visible colonies on the specified media (BSA, MSA, EMBA) were further identified with the help of morphology (Gram's staining).

Statistical Analysis

The analysis was done by using the statistix software for windows.

Results and discussions

This is the first Research study showed that all the pathogenic bacteria under consideration in the study were present in the meat ready to eat and their products. It was found that the log percentage of Tikka Karahi of S. aureus, Salmonella, E. coli, and Fungi in Pak afghan hotel , Sheeraz hotel, Baba foods, Usmania, Marcopolo, Islamia restaurant and Khyber Charsi was 4.77, 5.54, 4.87, 5.94, 3.87, 5, 6 (Figure 1). For Gosht Karahi the log percentage was 4.09, 3.69, 4.75, 5.72, 4.60, 5.88, 4.87 (Figure 2), Mutton Karahi 3, 5.90, 3.91, 6.05, 3.79, 4.57, 5.69 (Figure 3) chicken Karahi 6.88, 5.96, 6.72, 4.86, 2.79, 5.88, 6.72 (Figure 4).The highest contamination of pathogenic bacteria was found with log average of 6 in Tikka Karahi in Pak Afghan Hotel the lowest log percentage was 3.87 in Marcopolo. In Gosht Karahi the highest log percentage was 5.88 in Islamia resturant and lowest was 3.69 in Sheeraz Hotel. In Mutton Karahi the highest log percentage was 6.05 in Usmania Hotel and lowest was 3 in Pak Afghan Hotel. In Chicken Karahi the highest log percentage was 6.88 in Pak Afghan Hotel and lowest 2.79 was in Marcopolo Resturant. The total viable counts observed for each type of microorganism were found in the ranges from 5.0×10^2 to 1.4×10^4 CFUml^{-1}, details are enlisted in Table 1.

Table 1. Microbial load of Different meat products sold at different Hotels.

Lab. No	S. aureus	Salmonella	E.coli	Fungi	TVC(CFUml^{-1})
Tikka Karahi					
TK–Pak Afghan Hotel	+ve	-ve	+ve	+ve	2.4×10^3
TK–Sheeraz University town	-ve	+ve	-ve	+ve	1.4×10^4
TK–Baba fast foods	+ve	-ve	+ve	+ve	3.0×10^3
TK–Usmania	-ve	+ve	-ve	-ve	3.5×10^4
TK–Marcopolo	-ve	-ve	+ve	-ve	3.0×10^2
TK–Islamia resturant	+ve	+ve	-ve	+ve	4.0×10^3
TK–Khyber Charsi	+ve	-ve	+ve	+ve	4.0×10^4

Gosht Karahi					
GK–Pak Afghan Hotel	-ve	+ve	+ve	-ve	5.0×10^{2}
GK–Sheeraz University town	+ve	+ve	-ve	+ve	2.0×10^{2}
GK–Baba fast foods	-ve	+ve	-ve	+ve	2.3×10^{3}
GK–Usmania	+ve	+ve	-ve	+ve	2.1×10^{4}
GK–Marcopolo	+ve	+ve	-ve	-ve	1.6×10^{3}
GK–Islamia resturant	+ve	-ve	+ve	-ve	3.1×10^{4}
GK–Khyber Charsi	+ve	+ve	+ve	-ve	3.0×10^{3}
Mutton Karahi					
MK–Pak Afghan Hotel	+ve	-ve	+ve	-ve	4.0×10^{1}
MK–Sheeraz University town	+ve	+ve	-ve	+ve	3.2×10^{4}
MK–Baba fast foods	-ve	+ve	+ve	+ve	3.3×10^{2}
MK–Usmania	-ve	+ve	+ve	+ve	4.5×10^{4}
MK–Marcopolo	+ve	+ve	-ve	+ve	2.5×10^{2}
MK–Islamia resturant	-ve	+ve	+ve	-ve	1.5×10^{3}
MK–Khyber Charsi	+ve	+ve	-ve	-ve	2.0×10^{4}
Chicken Karahi					
CK–Pak Afghan Hotel	-ve	+ve	+ve	-ve	3.1×10^{5}
CK–Sheeraz University town	+ve	-ve	+ve	+ve	3.7×10^{4}
CK–Baba fast foods	+ve	-ve	+ve	+ve	2.1×10^{5}
CK–Usmania	+ve	+ve	-ve	+ve	2.9×10^{3}
CK–Marcopolo	-ve	-ve	+ve	+ve	2.5×10^{1}
CK–Islamia resturant	+ve	+ve	+ve	-ve	3.1×10^{4}
CK–Khyber Charsi	-ve	+ve	+ve	+ve	2.1×10^{5}

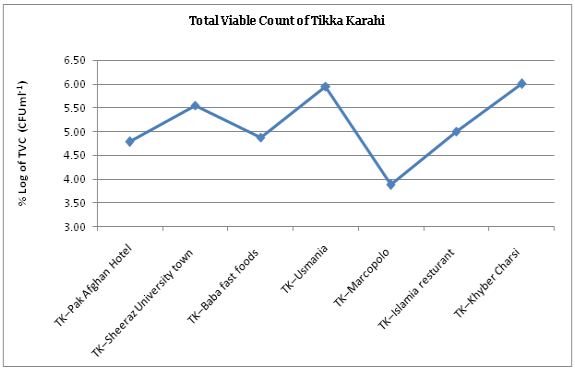

Fig. 1. Total viable count of Tikka karahi.

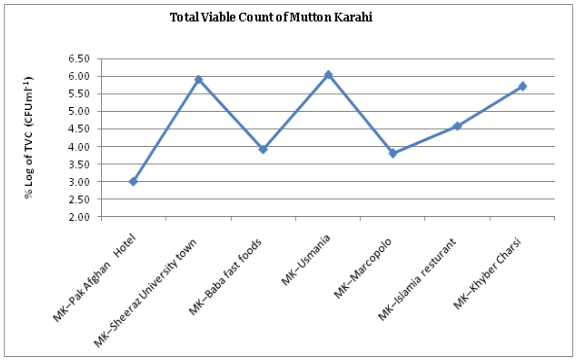

Fig. 3. Total viable count of Mutton Karahi.

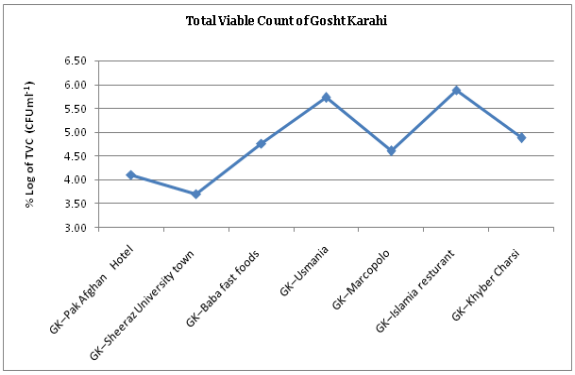

Fig. 2. Total viable count of Gosht Karahi.

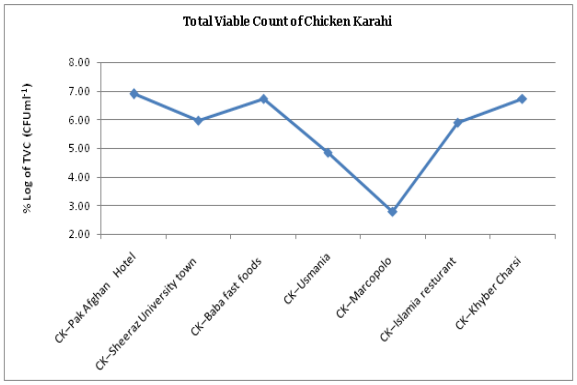

Fig. 4. Total viable count of Chicken Karahi.

In our study, the highest rate of contamination in the ready to eat serve meal was due to unawareness, little food safety and hygiene knowledge of serving and preparing staff. Majority of the cooking and catering staff working at these hotels was found nominally educated with limited food safety awareness and training exposure during their work period. Respective authorities are less attentive toward implementation of food safety laws and regulation to provide proper guidance on good hygienic practices. In the ready to serve cooked meats, contamination may occur due to the inadequate cooking, washing with contaminated unsafe water, unhygienic handling and cross contamination from unprocessed food materials. The poor sanitary condition can also be a contributing agent (Little *et al*., 2002) reported that pathogenic bacteria including S. aureus, E. coli and Salmonella in restaurants would transfer to cooked foods from handling staff or dishes.

Conclusion

It is concluded from the Research study that the ready to eat food of University Town Peshawar Hotels are contaminated with different food borne pathogens. The source of these pathogens induction in food is supposed to be the post cooking unhygienic handling, contaminating utensil and contaminated water. The contamination can be reduced with proper handling, provision of safe water and health hygiene awareness of the workers. Implementation of food safety laws and intervention of food and public health related authorities can help in reduction of foodborne illness and hospitalization related to unsafe water and food.

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