Prevalence of *Escherichia coli* in indigenous Chicken meat; A Pakistan’s

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**Abstract**

The consumers in the world now a day are more worried and paying attention to the health aspects and side effects of the food they are eating. Chicken is famous for its taste its nutritional composition and varieties of dishes all around the world. Consumers eat these readily available foods for their good composition and taste but it becomes a target to most of the microbial contamination. This study based on the safety of the chicken and for its support. We have studied the factors like Status of poultry and poultry products in Pakistan, Microbial quality of poultry meat, Factors affecting the microbial quality of poultry meat, Antibiotic resistance of *Escherichia coli* in poultry meat, Microbial quality and antibiotic resistance in poultry meat in Pakistan perspective, Evaluation of microbial contamination of faeces according to Pakistan’s perspective. The conclusion of the study is that chicken of other countries is more resistant to *E. coli*. It is due to because the sanitary system of Pakistan is not developed as other countries. In Pakistan, the environment provided to indigenous chicken is not clear that’s why *E. coli* can easily find its way to enter in chicken.

1. Status of poultry and poultry products in Pakistan

Poultry includes chicken products such as chicken meat, eggs etc. It contains proteins and other carbohydrates in large amount. There are many types of chicken but here we will discuss only one type which is indigenous chicken, it’s raising and composition as well.

In Pakistan, in bringing the difference between demand and supply of protein the poultry chicken (indigenous) is playing a key role. Farming done for commercial and financial benefit in Pakistan has been started in the 1960s and after decades it has shown rapid growth. The promotional policies from the Government and the persistence of the poultry sector (indigenous) community were the result of its rapid growth. The Government concluded production of the poultry chain to be the most important part of the food processing industry and has given special attention to this community. Hence, due to its importance poultry community was considered to be free of income tax and free of sales tax (Sadiq & Brothers, 2004). As a result of it, the growth rate of chicken from the early 1970s to 1980s was increased to 10-15%. The most important cause for their rapid growth was increasing their domestic market due to this reason their consumption was increased by more than 4% per year (Sadiq & Brothers, 2004).

In Pakistan, one of the most well developed and dynamic community is poultry production concluding 26.8%,1.26%, and 5.76% respectively to the total production of the chicken, overall GDP and agricultural community. In the past few years, most growth has been shown by poultry community and has come out as a good source of employment of more than 1.5 million people of the total unemployed population of the world (Mahmood et al., 2014).

Before 1960, in Pakistan indigenous chicken was used as a side or part-time poultry (Abedullah & Bukhsh, 2007). The indigenous Chicken community is one of the most vibrant and organized sectors of the agriculture industry in Pakistan. It consists 5.67%
productivity of the total production in the agriculture industry, total poultry consists of productivity of 10.4% and in GDP cost factor which is constant is 1.2% (Jatoi et al., 2013). Moreover, there is still a great difference between the demand and supply of animal protein in Pakistan. It indicates that this difference can increase if the required steps will not be taken to enhance the productivity of chicken. Part-time poultry (indigenous or desi chicken) can be an important and possible way of decreasing the pressure on the productivity of the animal protein in the food industry. In many developing countries, indigenous chickens produce about 80 to 99% of the total poultry production raise in villages (Sonaiya & Swan, 2007). This backyard or side poultry is an important source of income in about 80% of rural families in Pakistan (Mariante, McManus, & Mendonça, 2002). In villages, this poultry farming is generally not doing production to which it deserves. The main reason for it is a shortage of experts in techniques (Bhatti, Qureshi, & Ahmad, 1991). It concludes that 80% of the total families in Pakistan raise chickens to about 10 to 12 adults, but they raise them with improper knowledge and coverage of health (Burio, Mughal, Wagan, Abbassi, & Bhutto, 1985).

2. Microbial quality of poultry meat
Chicken meat is mostly used in the whole world because it has a most excellent quality of protein and all the necessary amino acid required by humans. Although, chicken is at the high danger of getting infectious and it can become the cause of spreading foodborne diseases. During the different steps of processing, all the tissues which are potentially edible are at high risk of contamination from different types of sources inside and outside of the chicken (Borch & Arinder, 2002; Kozačinski, Hadžiosmanović, & Zdolec, 2006) and it can also get from operators, environment, and types of equipment(G. Mead, 1995). Microorganisms of more than 30 genera including seven pathogens (Salmonella, Clostridium perfringens, E. coli, Campylobacter, Listeria monocytogenes, Staphylococcus aureus, Yersinia enterocolitica) are identified for causing the contamination of poultry meat (Klinger & Lapidot, 1992; P. S. Mead et al., 1999). In the United States of America, the Centre for Diseases has reported that 3.9 million foodborne infections are caused by these seven pathogens and ultimately cause 1600 deaths per year (P. S. Mead et al., 1999). As a result of the difference in the technology of processing or experimentation, many differences were observed in the indigenous chicken meat on its microbial activity (Abraham, Wellington, & Victoria, 2012). The microbiological quality and safety of chicken meat of the processed products have the same importance for retailers, consumers and producers and they both are equally involved in contamination of microbiology. The microorganisms found in chicken are psychotropic; they are even capable to reproduce in cold or chill environment i.e. in refrigerators. Spoilage of chicken meat is mainly detected by its smell, and the life of the chicken meat is usually determined by the history of its temperature since production and the total concentration of spoilage organisms which were initially present (Pooni & Mead, 1984). If chicken meat stored in chill climate is giving unpleasant smell or odor then it is confirmed that the microbial metabolism has started. Contaminated poultry meat with foodborne pathogens, can cause illness if there is mishandling during experiments, storing or cooking of the spoiled chicken. In a developed country, illness caused by the foodborne pathogens causes suffering in humans, productivity loss and it can also decrease the price of chicken meat and their products. Data of the European Union in 2001 showed that there were total 157822 cases of illness caused by the foodborne pathogens(Cavitte, 2003).

Modern conditions of intensive rearing play a role in increasing problem of this illness, where many of the indigenous chickens are kept together in cages and undergo high processing rate, meanwhile, their genes are not affected throughout this process. These conditions are in the favor of reproduction of foodborne pathogens. Although in the production of indigenous chicken the use of antimicrobials (whether it is for performance purposes, therapeutic or prophylactic) takes part in the development of foodborne pathogens resistance, which have a serious effect on human. About 40% of the human population in European countries in 2000 were resistant to infection caused by one antimicrobial pathogen means over 18% populations were multi-resistance (Threlfall et al., 2003). Serotypes observed in humans who were infected with multi-resistance include those pathogens which were also observed in poultry (Van Pelt et al., 2003). E. coli exists as a foodborne pathogen in
chicken meat and it is observed recently (Corry & Atabay, 2001).

Many efforts have been done from many years for the improvement of hygiene in the experiments and processing on the chicken meat. Despite these efforts, the chicken meat continued to get more and more infectious with many types of microorganisms (Organization, 1989). One of the efforts was the use of chemical but it proved very less successful (Frels, Samuelson, Froning, & Rupnow, 1984; Sheldon & Brown, 1986).

In accordance to the World Health Organization (WHO), the reduction of microbial pathogens in chicken meat depends mostly on the right usage of experimental techniques just like freezing, irradiation, pickling, pasteurization, and cooking at the retails, domestic and industrial scale. Irradiation is used for the reduction and stopping of foodborne pathogens in food (Farkas, 2006; Murano & Cross, 1999). Moreover, to use irradiation as a technology for the processing of food, it is important to first study the sensitivity of radiation. It gives us the basics of the estimation done accurately of inactivation doses (Adu-Gyamfi, Nketsia-Tabiri, & Boatin, 2009; Thayer, 2000).

3. Factors affecting the microbial quality of poultry meat

Quality of meat can be assumed by the study of overall characteristics of chicken meat which are consists of its morphological, sensory, chemical, hygienic, biochemical, physical, microbial, culinary, technological and nutritional properties (Ingr, 1989).

In this study, the factors affecting the microbial quality of chicken meat have been discussed.

a) Gender

The gender is a most important factor of microbial quality of meat (Holcman, Vadjnal, Zlender, & Stibilj, 2003; Le Bihan-Duval et al., 2008). At the post-mortem of about 24hours, the microbial property of chicken meat between both the genders was investigated by (López, Schilling, & Corzo, 2011). During the study of microbial quality and gender effects on it resulted that female chicken meat has low microbial quality than that of male chicken meat. This difference in the microbial quality of both genes can be due to the concentration of glycogen in their meat. (Gigaud et al., 2007) investigated the effect of gender on the concentration of glycogen. The rate of glycogen is considered to be more important in females with low microbial quality.

Experiments on the microbial quality of meat showed that the concentration of lipids was more in female chickens meat than that of male chicken meat (Peters, Idowu, Agaviezor, Egbede, & Fafiolu, 2010). Gender also affects the concentration of lipids content and crude proteins. Similarly in another study scientist noted that at the same age both of the genders, male chicken meat also has a higher concentration of proteins than that of female chicken meat (Bogosavljevic-Boskovic, Mitrovic, Djokovic, Doskovic, & Djermanovic, 2010).

b) Temperature

Chicken meat is important for its short and limited shelf life when it is stored at a low temperature. Freezing and cooling of the chicken meat are usually for the safety of chicken meat and its meat products (Soyer, Özlıp, Dalmış, & Bilgin, 2010). Cooling or low temperature can reduce the reproduction of microorganisms in chicken meat which decrease the quality of meat but improve the safety of meat. Freezing temperature can reduce or even stop the microbial reproduction and the biochemical reactions occurring in the chicken meat just like lipids oxidation in the chicken meat. Chicken meat is consists of a higher concentration of iron and myoglobin which is usually known as a catalyst for oxidation reaction in chicken meat (Asghar, Gray, Buckley, Pearson, & Booren, 1988). Oxidation of lipids in chicken meat can have an effect on chicken's meat texture, meat color, meat flavor and its nutritional value (Asghar et al., 1988). Seasons such as winter and summer affect the microbial quality of meat. The microbial quality of meat can also be affected by the changes occurring in climate especially during their exposure to the hot climate.

c) Weather

Production of chickens at high scale system, the number of chickens and their stocks in houses of the poultry sector is increasing rapidly. Similarly, under this situation, it is very difficult to manage the sanitary conditions and maximum microclimate of the chicken. The status of health of the indigenous chicken depends upon the microflora of the air. Growth and reproduction of microorganisms in chicken meat also depend upon high temperature and humidity (Karwowska, 2005; Vučemilo et al., 2008).
Analyzed result of some scientist is that the main source of transportation of microbes is air contamination. Microbes enter in chicken through droppings, feed, and litter, and the concentration of microbes in chicken depends upon air dustiness and system of ventilation. The microbial activity of every chicken is different from one another but to a very low extent. The microbial activity of indigenous chicken is high than that of other chicken breeds because they always get their diet from the natural resources and they have enough components and nutrition for a healthy life. They contain less concentration of pathogens and they are not enough responsibility for the transfer of diseases to humans.

The maximum permissible level of microbial contamination of air in indigenous chicken meat sectors is 25000 microbes per $m^3$ to an estimated value(Kolacz & Dobrzański, 2006; SZEJNIUK & KLUCZEK, 1999). According to(Marks, Krzysztofik, Sobol, Baran, & Baran, 1999), the number of airborne microorganisms like fungi and bacteria in poultry meat sectors must not go to more than 100,000 CFU/m$^3$ and 2000 CFU/m$^3$.

d) Packaging system

Indigenous chicken meat is not always freshly available in the market. Some companies also provide a chicken in the stored form. The packaging system of indigenous chicken meat is done in such a way that it will not get contaminate if it is stored for months and even years. In industrial countries, indigenous chickens are not freshly available so they choose the option of the chicken meat available in packets in stored form. The packaging system of indigenous chickens can also affect the microbial quality of chickens (Elsner, Resurreccion, & McWatters, 1997). Moreover, the visual color may get change during the display of the package. The contamination of the indigenous chicken meat is mostly the result of reproduction of aerobic microorganism. Their production can be detected by the unpleasant smell of compounds (G. Mead, 2004). The packaging of indigenous chicken meat is done in permeable fill which contains a high concentration of oxygen usually results in the higher growth of microbial counts. The rate of reproduction of bacteria in packaging which is done in the presence of oxygen is more than that of packaging done in the absence of oxygen.

The freshly cut up indigenous chicken and freshly available ground chicken meat both show a little more shelf life of bacteria. The rate of oxygen transmission (OTR) from>12000 ccs/m$^3$/24 h 230 cc/m$^3$/24 h (Tsou, Han, Dawson, & Acton, 1997). The atmospheric packaging is modified (MAP), in this packaging CO$_2$ is involved to decrease the rate of microbial reproduction. It is mostly used for ground poultry and products without skin. InCO$_2$:packaging shelf life of microorganism was more in comparison to the oxygen packaging (Lawlis & Fuller, 1990). The color of chicken meat from pinkish to pink reddish results from the change of hormones of myoglobin to nitrosylhemochrome. These conversions occur during the indigenous chicken meat curing. It is observed as an indicator of the freshness of chicken meat products (Issanchou, 1996).

Another type of packaging is also done to the products of indigenous chicken meat. This is known as vacuum packaging. It is performed on the cured indigenous chicken meat products to remove oxygen and it is noted that this packaging maintains the quality of the product and increase its shelf life. Nitrosylhemochrome, it is the pigment of the cured chicken meat and in the presence of oxygen, it behaves sensitive to the light. In vacuum packaging, it is recommended for the use of barrier films which have an OTR of 15-17 cc/m$^2$/24 h(LIN, SEBRANEK, GALLOWAY, & LIND, 1980).

Applications of MAP for the cured indigenous chicken meat may consist of a scavenger of oxygen into the barrier package in addition to the different mixture of nitrogen and CO$_2$ present in an atmosphere that are used as filler. Radiations coming from the sun, ultraviolet light (UV) are observed to affect the indigenous chicken meat pigment. The effect of these radiations results in the discoloration of the cured and fresh indigenous chicken meat (Kartika, Dawson, & Acton, 1998) recently experimented that ultraviolet lighting which is non-filtered from the lighting of fluorescent has no effect on cured color stability of packaged slices done by the vacuum packaging system.

e) Antibiotic resistance of *Escherichia coli* in poultry meat

*Escherichia coli* are a gram-negative bacterium. It comes from the family of Enterobacteriaceae. They are distributed worldwide. The cause of their vast spread is...
that they are present in surface water, in animals, humans and in the soil as well. The most important place for the survival of *E. coli* in humans and chickens as a pathogen in their intestinal tract (Bélanger et al., 2011). *E. coli* can also be found on the chicken’s feathers and skin. These bacteria can cause various diseases in chickens such as asbaciilosis further types of this disease are cellulitis, peritonitis, septicitis, salpingitis, coligranuloma, synovitis, and omphalitis. These diseases have a major effect on the economy of the production of chicken in the whole world. It can cause economic loss to a whole country as well. Mostly economic loss is due to loss and mortality of the production of contaminated chickens (Otaki, 1995).

In the intestinal tracts of human, they live as natural inhabitants. Contaminated chicken and red meat always are the most common source for infection in humans. *E. coli* is usually mostly reported pathogens of foodborne diseases(Hughes, Gillespie, & O’Brien, 2007). They are harmless to the system of the human body. Some of the strains of *E. coli* play a major role in causing various health issues to the humans. Among all the health problems which are caused by *E. coli* food poisoning is taking more and more attention. This has now become a global concern.

The most frequent way of transmission of *E. coli* that is through the intake of water and food. It can also be transmitted from human to human which cause the rapid spread of disease. The unintentional consumption of food can cause diarrhea. *E. coli* is the most prominent and visible species in the cases reported of food poisoning usually caused by the intake of contaminated chicken meat (Bhandare, Sherikar, Paturkar, Waskar, & Zende, 2007). Taking personal hygiene for granted can also cause various infections which are often caused by the pathogenic *E. coli*. Resistance to antibiotics is now a worldwide threat. New types of antibiotic resistance can spread to the whole world. Many types of it are spreading with the unusual speed. Leaders of world health organization have described the microorganisms which are resistant to antibiotics as nightmare bacteria that cause a catastrophic threat to all the population in every country of the world. Antibiotics get into humans by the intake of contaminated food. It is the main health problem in many of the countries due to the continual circulation of the bacterial strains which are resistant in the environment. Agents which are antimicrobial mostly use in the poultry community for the prevention of diseases and to promote the growth of chicken as well (Barber, Miller, & McNamara, 2003). The widespread use of antibiotic resistant, foodborne pathogens has frightened the treatment of infectious diseases. The presence of pathogens which are multidrug resistance (MDR) in chicken meat has warranted concern. In some poultry sectors, some companies carry out the misuse of antibiotic resistant. This misuse of antibiotic-resistant has led to enhancement of antibacterial resistant in the isolation of multiple bacteria (Ghose, SHARDA, Chhabra, & Sharma, 2003).

The food which is contaminated with the microorganisms resistant to antibiotics has the most possibility of encoding of the genes in determinants of antibiotic resistance which are usually carried on the genetics of mobile elements. These may get a transfer to other clinical significance bacteria of humans (van den Bogaard & Stobberingh, 2000). The bacteria which are antibiotic resistant cannot be treated with the help of antibiotics. Hence, the antimicrobial agents stand on an important position for giving the therapeutic measures against the infections caused by the bacteria. Moreover, R-factor frequency and its transmission in the *E. coli* in treating acute infections is a serious problem. Thus, with the great expanding of poultry meat industry, *E. coli* is thought to be an issue in the economy concern in all the steps of chicken industry, from production of the chicken to the buying, to the clinicians due to the enhancement of bacteria which are multi-drug resistive and finally to the veterinarians due to the recovery of infection. Some precautions have been done to recover this health issue; for example, antimicrobials have been ranked according to their importance by World Health Organization in the medicines of chickens (Angulo et al., 2009). In some countries, the use of antibiotics has been banned for many years for the promotion of growth. In developing countries, control on the usage of antibiotics has not being implemented in chicken farming. There is no such information collected yet for the use of antibiotics for that purpose.

It is an environmental source not only in a way of deactivation of microorganisms that are antibiotic resistive among chickens and human population but in fact, they are the source for the introduction of
resistive genes into the natural ecosystem of bacteria. (Kümmерер, 2009) in their review of antibiotics in the aquatic environment, gives the information that during medical treatment by the use of antibiotics the bacteria can become resistant to them. The resistances that can be found in effluents of the hospital, treatment of sewage plants and municipal sewage these bacteria are their important source.

4. Microbial quality and antibiotic resistance in poultry meat in Pakistan perspective

In the past years, the consumption and demand for the chicken meat and products derived from it have been increased because of its benefits. It is easily available in the market and moreover, it is easily digestible. Poultry industry of Pakistan is increasing day by day and the production of broiler and indigenous chicken meat have been increased up to an extent of 480 tons from 2006 to 2007 compared to the productivity from 2005 to 2006 which was about 463 tons (Chaudhry, Rashidb, Hussainc, & Rashidd, 2011). Due to increase in its production and demand, the routine checking of the quality of chicken meat is essential for the productivity of product which can be considered safe in accordance to the standards established by the community for its consumption.

It is a major public health issue all over the world (G. Mead, Hudson, & Hinton, 1994). Most of the countries worldwide are trying many attempts to improve the quality of food to overcome the illness caused by foodborne pathogens and are raising the concerns in consumers. The available data of epidemiological about illness caused by foodborne pathogens give a suggestion that their primary cause is the consumption of broiler and indigenous chicken meat (Bonner, Foley, Wall, & FitzGerald, 2001).

Aerobic bacteria such as E. coli is used as an indicator of the poor microbiological quality of chicken meat (Abu-Ruwaida, Sawaya, Dashi, Murad, & Al-Othman, 1994; Capita, Alonso-Callega, Garcia-Arias, Moreno, & Garcia-Fernández, 2002; Nortje et al., 1990). During the cleaning and slaughtering process, elimination of most of these microorganisms takes place. Their subsequent contamination at any step during their production process is possible, from evisceration, de-feathering, and washing to their storage by freezing of chicken meat (Kozaćinski et al., 2006). The complete elimination of these foodborne pathogens from the indigenous and broiler chicken meat is not possible but the risk of the diseases caused by these foodborne pathogens can be decreased by reducing their quantity by doing different attempts i.e. decontamination of chicken meat, implementing an operational and balanced HACCP system and separation of flocks (Goksoy, Kirkan, & Kok, 2004). Microorganisms found in the environment, operator’s hand and equipment, these can also cause the contamination of chicken meat. Although there are many other reasons which can cause many problems in the safety of the indigenous chicken meat during their processing. Some of these problems have been reported (G. Mead, 1995). In Pakistan, it is suggested to buy freshly slaughtered chicken meat.

The surface of the living chicken which is directly connected with the environment, cause the transfer of different microorganisms. The contaminating organisms are obtained directly from the animal shelter and are also raised with organisms that are produced from the feces of chickens. So it is not convenient to say that drug resistance has a direct role in the contamination of chicken meat and its product. The presence of these foodborne microorganisms in chicken meat products plays an important role in the spreading of foodborne pathogens (Farzana, Akhtar, & Jabeen, 2009).

In developing countries such as Pakistan, the leading cause of infections and illness are the foodborne pathogens. Medical care units cost billions of dollars on its treatment (Smith, 2005). The risk of transporting zoonotic infections is also related to the contaminated indigenous chicken meat. International agencies for the management of food, World Health Organization (WHO) especially, organization of agriculture and food and the International Hazard Analysis Critical Control Point (HACCP) Alliance, guidelines have been given to their country members about safe handling procedures like Good Manufacturing Practices (GMP) and HACCP (Bhandare et al., 2007).

According to the population of Pakistan, Karachi is a large city which has more than 15 million population. Due to overpopulation, infections caused by foodborne pathogens, conditions of sanitary which are inadequate, poor hygienic condition and poverty are increasing in the city (Siddiqui, Haider, & Bhutta, 2008). Chicken meat which is available in the common retail shops without the appropriate control of the
temperature is purchased to an extent of about 23% of households in Karachi (Anjum et al., 2004). Laboratories for the insufficient public health and settings for the inferior clinical diagnostic, a number of observations which are reporting the infectious outbreaks, these are somehow related to the poor hygienic conditions. In many cases, data collected was poorly based on the isolates in the laboratory, which do not reflect the correct ratio of the infections caused by foodborne pathogens; although, a few reports based on community gives the proof of the various outbreaks caused by the foodborne pathogens, *E. coli* in Pakistan (Mohsin et al., 2010).

Antibiotic resistance levels are also elevated among the food-borne pathogens (Farzana et al., 2009; Khan et al., 2009). However, to develop an effective experiment to decrease antimicrobial resistance pressure in the community. These studies will give us useful information.

The chicken meat which is available at the common retail shop has come from a long path of slaughtering and transportation procedure. During the time period of these procedures, each step possesses a risk of microbial contamination. The conditions of abattoirs sanitary and its surroundings have a great effect on the bacterial contamination of poultry chicken meat (Gill, Bryant, & Brereton, 2000). Control of infections caused by foodborne pathogens and microbial load of chicken meat should be checked. Then the conditions for the safety of food should be strictly followed which are provided by the HACCP (Hazards Analysis Critical Control Point). In developing countries such as Pakistan, the abattoir environment, its level of the sanitary system, conditions of storage and transportation, these conditions not only contaminate but also promote the growth of the pathogenic microorganisms such as *E. coli* in chicken meat.

5. **Evaluation of microbial contamination of feces**

The soil is usually contaminated by microbes in the vicinity of high production farms; especially it is contaminated by the feces of infected animals which cause the transfer of pathogens to human beings that cause different infections in them (Trawińska et al., 2006). Many types of hygienic measures are done to avoid the contamination. However, a large number of pathogenic bacteria and viruses can contaminate the soil which can cause a great epidemiological threat on human beings (Amin et al., 2013). The survival of these pathogens and viruses in soil is favored by the moisture of soil and high temperature (Boes et al., 2005; Ngole, Mpuchane, & Totolo, 2006). Manure storage piles of infected animals usually cause the contamination of soil with pathogens like *E. coli*. It is also determined that pathogenic strains of *E. coli* isolated from organic fertilizers can also cause infections in humans (Puño-Sarmiento et al., 2014). The degree of microbial contamination of indoor soil usually increases with the age of chicken and the accumulation of fecal matter. The late rearing period of chicken determines the highest contamination of soil with feces (De Reu et al., 2005; Witkowska & Sowińska, 2017). It is also noted that the poultry houses that have deep litter floor fecal system have approximately nine times more contaminated air with pathogens as compare to the air in the cage system.

More use of antibiotics in veterinary medicine can be a transfer factor for resistant to other pathogens like *E. coli* in human (S. Levy, Marshall, Schluederberg, Rowse, & Davis, 1988; S. B. Levy, 1984). The transfer of these resistant pathogens is noted among different species of animals, between animal to people and vice versa (Shooter, Rousseau, Cooke, & Breaden, 1970).

6. **Conclusions**

On comparing the results with research on indigenous chicken in different countries it is analyzed that chicken in foreign countries shows less presence of *E. coli*. It is due to because their sanitary system is better than that of Pakistan. Environment available to indigenous chicken in Pakistan is not a hygienic country that’s why chicken contains *E. coli*. Other countries have well-developed farms, proper sanitary system, proper food to provide to their chickens while these things lack in Pakistan. That’s why the risk of getting infections is also high in Pakistan. Farmers in other countries don’t have to give antibiotics to their chickens in this way they stay purely indigenous. In Pakistan, awareness about the precautions of slaughtering chickens is not common while slaughters of other countries have proper knowledge about slaughtering a chicken. Due to these reasons, indigenous chicken is also contaminated in Pakistan while broiler gets contaminate due to antibiotics are given to them. These indigenous chickens also spread diseases in their consumers. To reduce the spread of resistant bacteria, hygienic and sanitary conditions should be adopted at the farm, market, industrial and
home-scale level. Government agencies should focus on the usage of antibiotics and restrict their availability on a doctor's prescription.

References


