

Article

Prevalence of *Salmonella* in dressed and cooked broiler meat of different grocery shops, hotels and restaurants in Gazipur and Dhaka city of Bangladesh

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Abstract: The study was conducted to find out the prevalence of *Salmonella* in dressed and cooked broiler meat in different shops and restaurants in Gazipur and Dhaka city including the sanitary quality. A total of 80 samples of dressed boiler, 88 cooked samples from road side fast food shops and small hotels, and 104 cooked samples from recognized fast food shops and restaurants were subjected to bacteriological isolation and identification. Highest number of *Salmonella* spp. were 42.5% in road side shops and 16.25% found in super market for dressed meat. Thigh muscle was more prevalent to breast muscle in both market types for dressed muscle. A total of 31 thigh muscles were positive for road side shop and 23 for super market where 26 and 19 breast muscle were positive for road side shop and super market respectively. Among the cooked meat or fried chicken incidence of *Salmonella* spp. were 23.86% in road side shops and 11.54% found in recognized shops. In case of both market source thigh muscle was highly prevalent in comparison to breast muscle. For cooked meat, a total of 19 thigh muscles were positive for road side fast food shops and small hotels, and 12 for recognized fast food shops and restaurants where 15 and 8 breast muscle were positive for road side fast food shops and recognized fast food shops respectively. Our results highlighted the need of implementing strict hygiene and sanitation standards to reduce the incidence of *Salmonella*. The prevalence of *Salmonella* in poultry products can be reduced effectively by identifying and eliminating the sources and contamination sites during slaughter and processing of poultry.

Keywords: broiler; *Salmonella*; meat; food safety

1. Introduction

Now a day's salmonellosis is a common and serious problem in the poultry industry of the world especially in the developing country including Bangladesh. Poultry industry is a rising profitable sector in Bangladesh. There has been tremendous development of this sector over the recent years in this country (Islam *et al.*, 2018). However, the advancement of poultry industry is seriously hampered due to the outbreak of various infectious and non-infectious diseases. Among the bacterial diseases, salmonellosis caused by the genus *Salmonella* is of major problems in the poultry industry in Bangladesh (Sarker *et al.*, 2015). It causes a variety of acute and chronic diseases of poultry in Bangladesh. The disease may occur in chicken, duck, pigeon, quail, insects and rodent and other animals and birds. More than 2,300 serotypes of all the isolated *Salmonella*, 10% of these have been isolated from poultry (Hyeon *et al.*, 2011).

Salmonella is one of the most important pathogens responsible for human food poisoning in the developed & also in the developing countries and chicken products are widely acknowledged to be significant reservoir for

salmonella. They have frequently been incriminated as a source of salmonella contamination and consequently thought to be major sources of the pathogen in humans (Hasan *et al.*, 2018). Furthermore, one of the most common causes of *Salmonella* infection reported in humans has been through the handling of raw poultry carcasses and products, together with the consumption of undercooked poultry meat & poultry products.

It is one of the most frequently reported food-borne diseases worldwide as well as in Bangladesh. The US Centers for Disease Control and Prevention (CDC) estimate 1.4 million cases, 16430 hospitalizations, and 582 deaths in the United States of America annually (Mead *et al.*, 1999).

Salmonella spp. is potentially responsible for various pathogenic processes in man and animal including poultry. It can cause diarrhea, vomition, fever, abdominal cramps in human. Sometimes severe diarrhea requires medical interventions such as intravenous fluid therapy. In cases, where bacteria enter into the bloodstream, symptoms include high fever, malaise, pain in the thorax and abdomen, chills and anorexia (Bell, 2002). Antibiotics are extensively used in poultry industry either as a growth promoter or to control infectious diseases (Sarker *et al.*, 2018). Concern about antibiotic resistance and its transmission to human is important because these resistant bacteria may colonize in human gastrointestinal tract and may contribute resistance genes to human through R-factor, conjugative plasmids or chromosomal elements as reviewed by (Kabir *et al.*, 2010). Therefore, the disease causing microbes that have become resistant to antibiotic drug therapy are increasing public health importance. Undoubtedly the poultry slaughtered and dressed under Bangladesh conditions carry extremely high initial contamination loading from the point of slaughtering process to the point at which the consumers are offered the product.

Therefore the present study was undertaken in dressed broiler and cooked meat sold in different grocery shops, restaurants and fast food shops in Gazipur and Dhaka city to know the load of harmful *Salmonella*.

2. Materials and Methods

2.1. Collection and transportation of samples

A total of 80 dressed broilers and 104 cooked broiler meat samples were collected from different types of retail shops, road side restaurants and fast-food shops of Gazipur and Dhaka city of Bangladesh. After collection, immediately brought to Bacteriology Laboratory of the Department of Microbiology and Hygiene, Bangladesh Agricultural University, Mymensingh through maintaining cool chain using ice box.

2.2. Bacterial culture media

Solid and liquid culture media were used to isolate the bacteria. Blood agar, MSRV media, MacConkey agar (MC), Salmonella-Shigella agar (SS), Eosin Methylene Blue agar (EMB), BGA, Xylose-Lysine Deoxycholate agar (XLD), Tetrathionate and Mueller Hinton agar were used as solid culture media for this study. The liquid media used in the study were nutrient broth (NB), peptone broth, methyl-red and voges-proskauer broth (MR-VP), indole, catalase, TSI, SPA and sugar media, 1% hippurate solution, 3.5% ninhydrin solution, oxidase solution and sugar media.

2.3. Isolation and identification of bacteria

Pure culture of *Salmonella* spp. was obtained as per the methods described by Krieg *et al.* (1994). Briefly, 10 gm of samples were homogenized with 90 ml of 0.1% peptone water and 50 µl of homogenized sample was poured on to selective agar media and spread with glass spreader and incubated at 37°C for 24 hours. The colonies of primary cultures were repeatedly sub-cultured by streak plate method (Cheesbrough, 1985) until the pure cultures with homogenous colonies were appeared.

3. Results and Discussion

Dressed broiler from different categories shop and cooked meat from hotel and restaurant are used as a regular food by the majority of the Gazipur & Dhaka city. Among the dressed broiler incidence of *Salmonella* spp. were 42.5% (34 sample showed positive among 80 samples) in road side shops and 16.25% (13 samples showed positive among 80 samples) found in super markets (Table 1). In case of dressed broiler meat prevalence of *Salmonella* are shown in Table 2.

Table 1. *Salmonella* isolation from dressed broiler collected from different shops (N=80).

Shop location	No. of positive sample	Percentage (%)
Road side shops	34	42.5
Super markets	13	16.25

Table 2. Prevalence of *Salmonella* in dressed broiler meat (N=80).

Source	Number (%) of positive sample	
	Breast muscle	Thigh muscle
Road side shops	26 (32.5)	31 (38.75)
Super markets	19 (23.75)	23 (28.75)

Among the cooked meat or fried chicken incidence of *Salmonella* spp. were 23.86% (21 sample showed positive among 88 samples) in road side shops and 11.54% (12 samples showed positive among 104 samples) found in super markets (Table 3).

Table 3. *Salmonella* isolation from cooked meat collected from different shops.

Shop location	No. of positive sample	Percentage (%)
Road side fast food shops and small hotels (N=88)	21	23.86
Recognized fast food shops and restaurants (N=104)	12	11.54

In case of thigh muscle highest number of positive sample was found for road side fast food shops and small hotels followed by breast muscle. Details are shown in Table 4.

Table 4. Prevalence of *Salmonella* in cooked broiler meat.

Source	Number (%) of positive sample	
	Breast muscle	Thigh muscle
Road side fast food shops and small hotels (N=88)	15 (17.05)	19 (21.60)
Recognized fast food shops and restaurants (N=104)	8 (7.70)	12 (11.54)

Normally broilers are kept in cage in road side shop and dressed broilers are kept in deep fridge in the recognized super market. Some people buy from road side shop and some buy from super market and then taken to home for eat. On the other hand in hotel and restaurant or different recognized fast food shopping mall sold cooked meat or fried chicken as a regular food to peoples.

The prevalence of cooked meat was highest (23.86%) in road side fast food shops and small hotels than recognized restaurants (11.54%). So this type of dressed broiler or cooked meat has a great public health importance. It was clear that, these type shops have failed to protect against typhoid or gastrointestinal disorder, despite regular use of different types of modern machine.

Recent studies have demonstrated that peoples who are habituate in fast food are increasingly vulnerable to *Salmonella* contamination. Such problems arise even in developed countries. Poultry have a major role as vehicles of transmission in human cases of salmonellosis. An assessment of factors affecting the prevalence and growth of *Salmonella* on broiler chicken carcasses would be useful to risk managers in identifying the intervention strategies that would have the greatest impact on reducing human infections. Broiler chicken is the main type of chicken consumed as poultry in many countries. A large percentage of poultry is colonized by *Salmonella* during grow-out, and the skin and meat of carcasses are frequently contaminated by the pathogen during slaughter and processing (Li *et al.*, 2013). The people of studied area are more habituate in fast food. So, foodborne diseases are arises increasingly in this area due to *Salmonella* contamination in the fast food. The high degree of contamination of cooked meat in households poses a health hazard to consumers (Ahmed *et al.*, 2009).

Broiler dressing procedure, waste products disposal, disinfection of different materials which is used for dressing purposes or cooked purposes with different scientific method, pasteurization of food, and by a general enhancement of hygiene, that foodborne pathogenic *Salmonella* and their diseases finally controlled to an acceptable level in most countries (Bae *et al.*, 2013). Foodborne diseases should not be seen as an independent part of the infectious disease cycle, but as a vehicle for their transmission (Anderson and Ziprin, 2001).

In this research project present study *Salmonella* were found in the poultry meat, which was supported by Islam *et al.* (2018), Hossain *et al.* (2015), Malmuthuge *et al.* (2012), Sudershan *et al.* (2012), Torok *et al.* (2011), Ahmed *et al.* (2009) and Zhao *et al.* (2001). Several selective culture media were used simultaneously in this study to culture the organism. The media used in this study were selected considering the experience of the past

researchers worked in various fields relevant to the present study by Kabir *et al.* (2014). The colony morphology of *Salmonella* spp. was similar to that of Sarker *et al.* (2009).

However, the results of this study show clearly that dressed broiler and cooked broiler meat sold in different shops or restaurants or fast food shops of Gazipur & Dhaka city that were examined contained high counts of *Salmonella* and contains a great public health importance.

4. Conclusions

It may be concluded that all samples of dressed broiler and cooked meat sold in different shops, restaurants and fast food shops in Gazipur and Dhaka city that were examined contained load of harmful bacteria *Salmonella*. More sanitization and good cooking procedure should be adopted to avoid the risk of spreading foodborne *Salmonella* through these types of products sold in different shops, restaurants and fast food shops.

Conflict of interest

None to declare.

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