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# Prevalence of *Salmonella* in chicken meat and its slaughtering place from local markets in Orathanadu, Thanjavur district, Tamil Nadu

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**Abstract**
The surveillance of non-typhoidal *Salmonella* serovars was done to evaluate the hygienic quality of chicken meat and slaughtering places in local markets of Orathanadu, Tamil Nadu during February 2017. A total of five chicken slaughtering places/meat shops are present in the study area, from which 15 chicken meat samples and five water samples (used for washing of chicken, knife, wooden table and hands) from slaughtering places were collected and processed for isolation of *Salmonella*. A prevalence of 33.3% (5/15) and 60% (3/5) *Salmonella* was observed from chicken meat and water samples, respectively. This study indicates the prevalence of *Salmonella* in raw chicken meat and water used for processing of carcass, instruments and hands due to poor hygienic practices followed during slaughtering and cleaning process. Eventhough Indian cooking system kills pathogenic and/or zoonotic microorganisms, adoption of hygienic practices need to be stressed to the persons involved in slaughtering of poultry to produce clean meat and educating the public to demand for clean and safe foods of animal origin from the commercial markets.

**Keywords:** *Salmonella*, prevalence, chicken meat, slaughtering place – hygienic practices

## 1. Introduction
Foodborne diseases are a serious concern as public health issue in the food industry [1]. Contaminated foods are unsafe, which may contain harmful pathogens bacteria, viruses and parasites. Unsafe foods are responsible for many foodborne and waterborne diarrhoeal illnesses which kills an estimated 2.2 million people every year globally, most of them are children [2]. Most foodborne infections are due to unhygienic handling or contamination when prepared. Sanitary food handling, refrigeration and proper cooking can prevent foodborne illnesses in humans. However, care must be taken when raw chicken meat is handled to prevent cross-contamination with intestinal contents of the birds, cutting board to chop without washing the board on multiple processing [2, 3].
Poultry are one of the most important reservoirs of *Salmonellae* that can be transmitted to humans through the food-chain [4, 5] and make the food-chain unsafe from farm to the table [1]. Salmonella organisms are most frequently isolated bacterial agents of foodborne disease outbreaks [1]. Non typhoidal Salmonella (NTS) serotypes from chicken meat act as a source of human infection [4, 6] and they are most important zoonotic bacterial foodborne pathogens of humans that cause diarrhoea, bacteraemia and focal suppurative infections [7]. They can also cause either acute or chronic salmonella infection or even death [4]. Particularly *Salmonella enterica* var Typhimurium is the most frequently isolated serovar from chicken meat [4-6, 8, 9]. However the epidemiology of NTS in poultry in India has not been fully understood [5].
The cross-contamination between meats and personnel and equipment used during a day in processing of meats due to improper and ineffective cleaning and disinfection particularly with chopping boards, knives and tables were the risk factors for *Salmonella* contamination [9]. Microbial load of raw meat can be attributed to unhygienic conditions in slaughter houses and transportation [10, 11]. The level of prevalence can be reduced by adopting hygienic practices during poultry slaughter [1, 6, 7, 9, 12] to ensure food safety. Training should be given to meat handlers and butchers regarding food safety practices and proper inspection procedures should be strictly adhered to minimise the contamination of raw meat and meat products sold in market places [13]. Control strategy of *Salmonella* must be taken into consideration in the food chain through meat handlers, trade associations, academics and government to minimize

*Salmonella* prevalence in retail shops [9]. However the incidences of *Salmonella* in chicken meat has been reported by several workers in different regions of India, region-based investigation needs to be stressed to create awareness among village people efficiently. Hence, the present study was aimed to study the prevalence of Salmonella in chicken meat and water samples (used for washing of chicken, knife, wooden table and hands) from slaughtering places in local markets in Orathanadu upgraded town panchayat, Thanjavur dist., Tamil Nadu, India.

## 2. Materials and Methods

### 2.1 Study area and sampling

The surveillance of non-typhoidal *Salmonella* serovars was done to evaluate the hygienic quality of chicken meat and slaughtering places in local markets in Orathanadu upgraded town panchayat, Tamil Nadu during February 2017. A total of five chicken slaughtering places/meat shops were present in the study area, from which 15 chicken samples and five water samples (used for washing of chicken, knife, wooden table and hands) from slaughtering places were collected in sterile containers.

### 2.2 Isolation and identification of *Salmonella*

The chicken meat samples and water samples collected from slaughtering places were processed immediately for isolation and identification of *Salmonella* [14]. Briefly, the collected samples were pre-enriched in buffered peptone water, and then transferred to selenite cysteine broth for selective enrichment. A loopful of inoculum from enrichment broth was streaked onto Xylose-Lysine Deoxycholate (XLD) agar and incubated at 37˚C for 24 hours. The colonies from XLD agar were subjected to Grams staining and biochemical tests (IMViC and growth on TSI agar) for confirmation of *Salmonella* isolates.

## 3. Results and Discussion

A prevalence of 33.3% (5/15) and 60% (3/5) *Salmonella* was observed from chicken meat and water samples used for washing of chicken, knife, wooden table and hands from slaughtering places, respectively based on growth of *Salmonella* with characteristics red colonies with black centre in XLD agar (Fig. 1), identification of Grams negative rod organisms were observed by Grams staining (Fig. 2) and confirmed by biochemical tests such as IMViC (-/+/-/+) and TSI utilization (alkaline slant and acidic butt with $H_2S$ production) pattern of *Salmonella* isolates (Fig. 3).

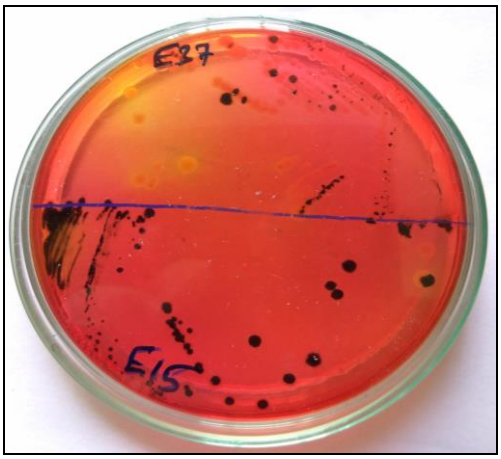


**Fig 1:** Growth of *Salmonella* on XLD agar (characteristics red colonies with black centre)

**Fig 2:** Grams staining of colonies showed Grams negative rod organisms

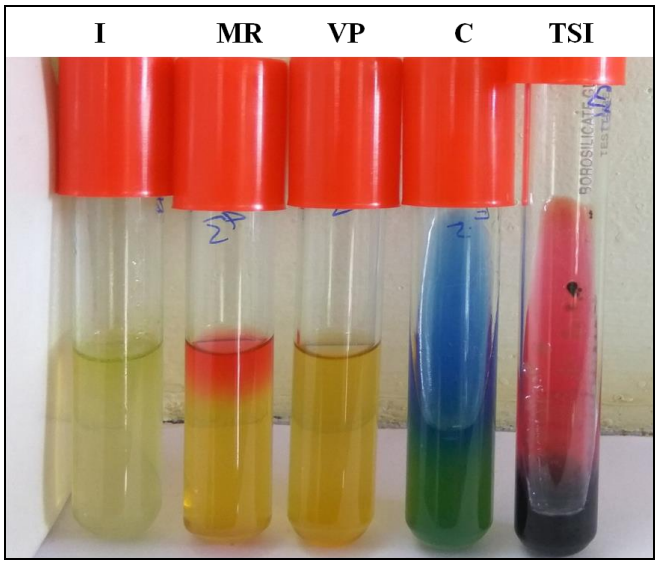


**Fig 3:** IMViC (-/+/-/+) and TSI utilization (alkaline slant and acidic butt with $H_2S$ production) pattern of *Salmonella* isolates

The presence of *Salmonella* in chicken meat, slaughtering places and instruments were reported earlier by several authors in India and other countries. Poultry serves as reservoir of *Salmonella* and poultry meat [1, 5, 15]. The *Salmonella* infection status in the native chicken in rural areas and in fresh meat [16, 17] was reported. The earlier studies revealed that, the Indian chicken meat contains pathogenic bacteria like *Salmonella* up to 33.16% [18] and isolated 30% *Salmonella* from raw chicken [19] sold at retail poultry shops. Foodborne outbreaks of salmonellosis have been most frequently associated with *Salmonella* in chicken meat [1, 13, 14, 15, 18, 20] and particularly with NTS in India due to *Salmonella* Enteritidis and *Salmonella* Typhimurium [5].

The unhygienic handling during poultry slaughtering and processing of chicken meat using unclean equipment and contaminated water were the risk factors associated with presence of *Salmonella* with chicken meat due to cross contamination in the present study. This observation is in accordance with the report of several authors earlier with regards to isolation of *Salmonella* in chicken meat from retail outlets. High levels of microbial contamination reflect the poor hygienic quality of poultry meat [20]. Widespread prevalence of Salmonella in chicken meat in retail outlets due to unclean environment, unhygienic food handling practices and use of contaminated water during slaughtering and processing [6, 10, 11, 12], and are suggestive evidence of *Salmonella* post preparation contamination of foods of animal

origin [14]. A study revealed that poultry litter at farm and post defeathering and post evisceration stages at retail chicken processing, are critical sources of cross contamination of invasive *Salmonella* [21]. Detection of eight *Salmonella* serovars reflect the possibility of cross-contamination from various sources in slaughterhouses and poor hygiene during the process of cutting meat, contamination during handling and storage as well as retail level [22].

The presence of multiple drug resistant *Salmonella* in chicken meat and indicated high prevalence of *Salmonella* in raw chicken meat [6] and make the food chain unsafe from farm to the table [1] which considered as a major global threat to public health. It requires continuous surveillance of situation including the antimicrobial resistance pattern [15], because it is a serious public health problem in the world, with an increasing concern for the emergence and spread of antimicrobial-resistant strains [14].

Contamination of poultry and poultry products should be prevented during handling, slaughter and processing to protect the public from infections and diseases [18]. Food safety is an issue of growing public health concern [2], especially foodborne diseases associated with the consumption of poultry meat and its processed products [18] contaminated with *Salmonella* [22]. Health education intervention on food safety and hygiene should be strengthened to ensure food safety during food preparation and storage in food service establishment [23]. Urgent necessity to minimize the contamination of meat sold in market places is by proper sanitation and inspection practices [13]. The adoption of improved technology and strict hygiene measures can often reduce the risk of contamination [21].

## 4. Conclusion

A prevalence of *Salmonella* was observed from chicken meat (33.3%) and water samples (60%) and) used for washing of chicken, knife, wooden table and hands from slaughtering places in local chicken shops in Orathanadu upgraded town panchayat, Tamil Nadu. The *Salmonella* contamination in the chicken meat poses greatest risk of developing salmonellosis in humans. The number of chicken meat outlet is only few in the study area and henceforth demanding for hygienic preparation was also less among the consumers. It needs to be inspected and monitored by the local authorities to process and sell hygienic meat to the consumers. Unhygienic handling of birds during slaughter process results in contamination with *Salmonella* from bird's intestinal contents. Hygienic practices at the shops during slaughtering of birds, frequent changes of water used for washing the meat, knife and slaughtering places can reduce the *Salmonella* contamination, and awareness among consumers for demanding clean chicken meat can prevent the outbreaks of salmonellosis in humans.

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