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# Prevalence of Salmonella in Poultry Farmers in Owerri, Imo State, Nigeria

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**ABSTRACT**

There had been several reports on the high prevalence of salmonella infection among poultry farmers in Nigeria. This study is aimed at investigating the prevalence of salmonella infection among poultry farmers in Owerri, Imo State. A total of ninety poultry farmers were recruited for the study. The subjects consisted of forty-five males and forty-five female poultry farmers. Stool sample was collected in a plain sterile container. The presence of salmonella infection was detected using standard microbiological procedures. Data generated was expressed in percentage and presented in tables. A total of forty-three (43) poultry farmers were recruited for the study of which a total of 25(58.14%) poultry farmers has salmonella infection. There was a significant difference between the numbers of poultry farmers that showed the presence of salmonella infection when compared to the number of poultry farmer without salmonella infection. On the assessment of the safety practice method adopted by poultry farmers, 69.77% reported that they do not wear gloves when handling chickens, 72.09% reported that they do not wear face masks and apron, 97.64% reported that they do not wear hair restraint while 27.91% reported that they do not cut their finger nails. The prevalence of salmonella infection among poultry farmers in Owerri, Imo State is high when compared with reports from other studies. The age group >43 years has the highest prevalence of salmonella infection, while the prevalence of salmonella infection is high among females, married and poultry farmers with poor education. This study confirms that poultry farmers in Owerri have poor knowledge and practice but moderate attitude on salmonella infection prevention.

**Keywords**: prevalence, salmonella, poultry, farmers

## INTRODUCTION

*Salmonella spp.* is a Gram-negative rod-shaped bacterial which is one of the most common infectious agents in the tropics, especially in areas with poor hygiene [1-4]. The source of infection with *Salmonella spp.* comes from human

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or animal feces or urine which contaminates drinking water and food so that it becomes a source of infection, besides fish, flies and dust can also act as intermediaries for salmonellosis [5]. The bacteria of the genus Salmonella are responsible for illnesses in human beings and animals. The genus is divided into two species: *Salmonella enterica* and *Salmonella bongori* [6-8]. *S. enterica* is divided into six subspecies (enterica, salamae, arizonae, diarizonae, houtenae and indica) and each one of them has several serovars or serotypes. Nowadays, more than 2500 serotypes are known and almost 1500 of them belong to the subspecies enterica [9].



Most pathogenic isolates from humans and other mammals belong to *S. enterica* subspecies enterica. Other *S. enterica* subspecies and *S. bongori* are more common in cold-blooded animals and the environment, with lower pathogenicity to humans and livestock [10]. A few serotypes are host specific; i.e., *S. typhi* is implicated in typhoid fever in human beings, while Salmonella pullorum and gallinarum are responsible for bacillary white diarrhoea and fowl typhoid in poultry, respectively (Zhang *et al.*, 2015). *Salmonella choleraesuis* is host restricted to pigs, *Salmonella ser. abortusovis* is involved in sheep abortions and *Salmonella dublin* infects bovines [11]. There are a number of non-host-specific serotypes that may infect several animal species, including humans, and these are generally responsible for foodborne diseases with foods of animal origin being the main source. From the early years, the most common agent of human foodborne disease was Salmonella typhimurium, but in the last few decades the frequency of Salmonella enteritidis has dramatically increased [12]. Poultry farming is the form of animal husbandry which raises domesticated birds such as chickens, ducks, turkeys and geese to produce meat or eggs for food. It has originated from the agricultural era. Poultry – mostly chickens – are farmed in great numbers. More than 60 billion chickens are killed for consumption annually [13]. Chickens raised for eggs are known as layers, while chickens raised for meat are called broilers.

## MATERIALS AND METHODS

### Study Area

The study was conducted among farmers in Owerri, Imo state.

### Study Population

The study subjects consisted of apparently healthy male and female poultry farmers in Owerri, Imo State. A total of forty-three (43) poultry farmers were recruited for the study. The subjects consisted of forty-five males and forty-five female poultry farmers.

### Selection Criteria

#### a. Inclusion criteria

a) Subjects who gave consent to participate in the study.
b) Subjects who were aged 18 years and above.

#### b. Exclusion criteria

a) Subjects who did give consent to participate in the study.
b) Subjects who were aged below 18 years and above 50 years.

### Sample Collection

Stool sample was collected in a plain sterile container.

### Microbiological Method

The presence of salmonella infection was detected using the culture method.

### Procedure

The stool sample was inoculated onto selenite broth, SSA and KIA incubated at 37 °C for 48 h. It was subjected to Gram-stained suspected Salmonella colonies. The different Salmonella species was identified using a combination of colonial appearance, serology (agglutination with specific antisera) and biochemical testing.

### Statistical Analysis

Data generated was expressed in percentage and presented in tables.

## RESULTS

A total of forty-three (43) poultry farmers were recruited for the study of which a total of 25(58.14%) poultry farmers has Salmonella enterica. There was a significant difference between the numbers of poultry farmers that showed the presence of salmonella infection when compared to the number of poultry farmer without salmonella infection.

**Table 1: Prevalence of Salmonella Infection among Poultry Farmers**

| No of Screened | No of Poultry Farmers With Salmonella Infection | Percentage (%) | $X^2$ | P-value |
|---|---|---|---|---|
| 43 | 25 | 58.14% | 12.01 | 0.017 |

The age distribution of salmonella infection among poultry farmers showed that the age group >43 has the highest prevalence of salmonella infection 10(23.26%) while the age group 31-43 has the least prevalence of salmonella infection 7(16.28%).The sex prevalence of salmonella infection showed that females have the highest prevalence of salmonella infection 16(37.21%), while the males have the least prevalence of salmonella infection 9(20.93%).

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Marital status distribution showed that married poultry farmers have the highest prevalence of salmonella infection 15(34.88%) when compared to that of single individuals 10(23.26%). On the level of education, poultry farmers with primary education have the highest prevalence of salmonella infection 13(30.23%) while poultry farmers with tertiary education have the least prevalence of salmonella infection 4(9.30%).

**Table 2: Demographic Characteristics Relative to the Prevalence of Salmonella Infection among Poultry Farmers**



| Variable | Category | No of Poultry Farmers Screened | No of Poultry Farmers With Salmonella Infection | Percentage (%) |
|---|---|---|---|---|
| **Age (years)** | 18-30 | 12 | 8 | 18.60% |
| | 31-43 | 13 | 7 | 16.28% |
| | >43 | 18 | 10 | 23.26% |
| Total | | 43 | 25 | 58.14% |
| **Sex** | Male | 23 | 9 | 20.93% |
| | Female | 20 | 16 | 37.21% |
| **Total** | | 43 | 25 | 58.14% |
| **Marital Status** | Single | 20 | 10 | 23.26% |
| | Married | 23 | 15 | 34.88% |
| **Total** | | 43 | 25 | 58.14% |
| **Level of Education** | Primary | 16 | 13 | 30.23% |
| | Secondary | 14 | 8 | 18.60% |
| | Tertiary | 13 | 4 | 9.30% |
| **Total** | | 43 | 25 | 58.14% |

Based on the assessment on the knowledge of the risk factors associated with the transmission of salmonella infection, 30.23% of the poultry farmers reported contaminated food and water, 23.26% reported exposure to infected animals, 27.91% reported not washing hands while 18.60% reported cross-contamination as the risk factors associated with salmonella infection transmission.

**Table 3: Assessment of the Poultry Farmers Response on the Knowledge of the Risk Factors Associated with the Transmission of Salmonella Infection**

| Variable | Responses | Frequency | Percentage |
|---|---|---|---|
| **Risk Factors** | Contaminated food and water | 13 | 30.23% |
| | Exposure to infected animals | 10 | 23.26% |
| | Not washing hands | 12 | 27.91% |
| | Cross-contamination | 8 | 18.60% |

Base on the assessment of the level of knowledge, 55.81% reported that salmonella is caused by bacteria, 69.77 reported that salmonella can cause severe disease in poultry birds, 58.14% reported that salmonella can cause severe disease in human, 27.91% is of the suggestion that salmonella is only found in poultry and poultry products, while 62.79% reported that salmonella is not only found in poultry and poultry products. 46.51% of the respondent

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reported that eating undercooked raw eggs is a major source of transmission of salmonella, while 20.93% reported that handling of chicken and not washing hands is a source of transmission, 6.98% of the respondents reported contact with eggs as a source of transmission of salmonella infection.

**Table 4: Assessment of Poultry Farmers Responses on their Level of Knowledge on Salmonella Infection**

| Survey Question | Frequency | Percentage |
|---|---|---|
| Salmonella is a | | |
| **Bacteria** | 24 | 55.81% |
| **Virus** | 9 | 20.93% |
| **Don't Know** | 10 | 23.26% |
| Salmonella can cause severe disease in poultry bird | | |
| **Yes** | | |
| **No** | 30 | 69.77% |
| **Don't Know** | 8 | 18.60% |
| | 5 | 11.63% |
| Salmonella can cause severe disease in human | | |
| **Yes** | 25 | 58.14% |
| **No** | 8 | 18.60% |
| **Don't Know** | 10 | 23.26% |
| Salmonella is only food in poultry and poultry products | | |
| **Yes** | | |
| **No** | 12 | 27.91% |
| **Don't Know** | 27 | 62.79% |
| | 4 | 9.30% |
| Salmonella can be transmitted by | | |
| **Eating undercooked raw egg** | | |
| **Handling Chickens** | 20 | 46.51% |
| **Not washing hands** | | |
| **Contact with eggs** | 9 | 20.93% |
| | 11 | 25.58% |
| | 3 | 6.98% |

In the assessment of poultry farmers attitude towards the Preventive measures taken to prevent the transmission of salmonella infection, 79.07% of poultry farmers reported that they always wash their hands, 39.53% reported that they rarely clean the cages at least thrice a week, 65.11% reported that they have never eaten raw egg, 46.52% reported that they wear face mask when cleaning the poultry birds coop while 74.42% reported that they have never snuggle or kiss baby chick.

**Table 5: Assessment of Poultry Farmers Attitude towards the Prevention of Salmonella Infection**

| Preventive Measures | Always | Rarely | Never |
|---|---|---|---|
| Washing of Hands after touching poultry birds | 34(79.07%) | 5 (11.63%) | 4 (9.30%) |
| Cleaning of the cages at least thrice a week | 17 (39.53%) | 20 (46.51%) | 6 (13.95%) |
| Eating of raw undercooked eggs | 8 (18.60%) | 7 (16.28%) | 28 (65.11%) |
| Wearing of face mask when cleaning the poultry birds coop cleaning | 12 (27.91%) | 11 (25.58%) | 20 (46.52%) |
| Snuggle or kiss baby chicks | 7 (16.28%) | 4 (9.30%) | 32 (74.42%) |

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On the assessment of the safety practice method adopted by poultry farmers, 69.77% reported that they do not wear gloves when handling chickens, 72.09% reported that they do not wear face masks, 90.69% reported that they do not wear hair apron, 97.67 reported that they do not wear hair restraint while 72.09% reported that they do not cut their finger nails.

**Table 6: Assessment of the Safety Practice Methods Adopted by the Poultry Farmers**



| Good Safety Practice | Yes | No |
|---|---|---|
| **Wearing of Gloves** | 13 (30.23%) | 30 (69.77%) |
| **Wearing of Face Mask** | 12 (27.91%) | 31 (72.09%) |
| **Wearing of Apron** | 4 (9.30%) | 39 (90.69%) |
| **Wearing of Hair Restraint** | 1 (2.33%) | 42 (97.67%) |
| **Cutting of Finger Nails at all time** | 12 (27.91%) | 31 (72.09%) |

**Discussion**

Outbreaks of communicable diseases such as typhoid fever significantly contribute to increased morbidity and mortality during situations of mass population displacement. There had been several reports on the high prevalence of salmonella infection among poultry farmers in Nigeria [14]. In the present study, the prevalence of salmonella infection among poultry farmers is 58.14%. Nevertheless, the high prevalence rate found in this study is in agreement with the primitive level of the infrastructure and bio-security measures observed on some of the farms involved in the study. The result of this study conforms with the study carried out by Andoh *et al.* [15] who reported a prevalence rate of 51.2% in a cross-sectional study on the prevalence of salmonella infection among poultry farmers in Ghana. The prevalence rate recorded in this study is high when compared with the study carried out in Ethiopia, where the prevalence of salmonella infection among poultry farmers is 6.5% [16]. The high prevalence can be attributed to the poor level of knowledge of transmission and safety among poultry farmers, frequent movement of people and lack of enforcement of monitoring programmes which in turn might serve as a source of infection to consumers of poultry products. The poor knowledge of transmission and control and prevention of *Salmonella* infection is in agreement with other studies as the main reason behind the high prevalence of salmonella infection.

In the present study, the age distribution of salmonella infection among poultry farmers showed that the age group >43 has the highest prevalence of salmonella infection 10(23.26%) while the age group 31-43 years has the least prevalence of salmonella infection 7(16.28%). Good knowledge of food safety and hygiene practiced among the age group 31-43years of age might be the reason behind the high prevalence of salmonella infection recorded in this study. Poor knowledge on the safety practice of poultry farming might be attributed to the high prevalence rate recorded among the age group >43 years. Though the study carried out by Mamman *et al.* [17] revealed that younger poultry farmers have the highest prevalence of salmonella infection. Environmental condition, cultural practices, regulations and education could be considered as some of the factors behind the disparity in results.

It was observed from the current study that the sex prevalence of salmonella infection showed that females have the highest prevalence of salmonella infection 16(37.21%), while the males have the least prevalence of salmonella infection 9(20.93%). Gender being a predictor of *Salmonella* infection could be because women usually keep long nails in the name of fashion or manicure, and this could serve as a potential disease reservoir. These observations have been supported by several other studies [18].

From the result it was observed that married poultry farmers have the highest prevalence of salmonella infection, the high prevalence in married farmers as recorded in this study might be as a result of the busy schedule and responsibilities associated with been married which might halt the safety practice measures which is needed to be carried out to prevent the contraction of salmonella. This result agrees with confirmed studies conducted in Bangladesh, Nigeria, Tanzania, Cameroon, South Africa and South Sudan [19].

In the present study, poultry farmers with primary education have the highest prevalence of salmonella infection 13(30.23%) while poultry farmers with tertiary education have the least prevalence of salmonella infection 4(9.30%). The result of this study clearly implies that higher education plays an important role in the prevention of the transmission of salmonella infection. These findings are consistent with a study carried out by Anuradha *et al.* [20] who reported that high level of education influenced the attitudes of towards the prevention of salmonella infection among poultry farmers.

The result of the present study showed that the poultry famers in Owerri have a moderate positive attitude towards the prevention and salmonella infection and a poor safety practice method which must have also contributed to the high prevalence of salmonella infection in Owerri, Imo state, though there is no similar study carried out in Owerri, Imo state to falsify or confirm the result of this factors, cause factors ranging from cultural practices, geographical

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location can affect the result. However, the findings in this study were in contrast with those of similar studies in Ghana and Pakistan, which reported good knowledge, attitudes and practices towards typhoid fever in the surveyed communities [21-24].

## CONCLUSION

The prevalence of salmonella infection among poultry farmers in Owerri, Imo State is high when compared with reports from other studies. The age group >43 years has the highest prevalence of salmonella infection, while the prevalence of salmonella infection is high among females, married and poultry farmers with poor education. This study confirms that poultry farmers in Owerri have poor knowledge and practice but moderate attitude on salmonella infection prevention.



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