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Isolation and Identification of *Salmonella* Species from Waste Food in Jimma Town, Southwest Ethiopia

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Abstract: *Salmonella* is a genus of rod-shaped bacteria in the family *Enterobacteriaceae*. These bacteria can live in the intestine of humans and other animals. Eating undercooked foods contaminated with animal dung can lead to infection with *Salmonella*. *Salmonella* is a pathogen of food poisoning and is a public health concern. Over 2,600 *Salmonella* serotypes have been identified. It can be transmitted through various foods and environmental sources. This study aimed to isolate and identify *Salmonella spp*. from waste food in Jimma town, Southwest Ethiopia. A total of 20 waste food samples were collected from different households. The selection of study population (households) participants was based on a random sampling technique. A conventional method was applied to isolate and identify *Salmonella spp*. from waste food samples using Salmonella-Shigella Agar (SSA). Of the samples analyzed, half of the remaining food samples were found to be infected with *Salmonella spp*. It was contaminated. Of the samples analyzed, 10 were 20 (50%), while the remaining samples were *Salmonella* negative. Current research shows that food waste is highly exposed to pathogens and plays an important role in food poisoning, which can spread a variety of food poisoning. Proper cooking, food processing, and proper hygiene during consumption are extremely important to prevent food poisoning and the occurrence of food poisoning.

Keywords: Foodborne Disease, Jimma, *Salmonella* Spp, Waste Food

1. Introduction

Salmonella is a genus of rod-shaped bacteria in the family *Enterobacteriaceae*. These bacteria can cause food poisoning. Food poisoning pathogens are the causative agents of food poisoning and are of public health concern. *Salmonella* has more than 2,600 different serotypes. Many have a variety of hosts and can infect a variety of animals, including mammals, birds, reptiles, amphibians, and insects. [1]. Most cases of human salmonellosis are food poisoning and often result indirectly from fecal contamination of animals or humans. Infections can be acquired in a variety of ways, including through direct or indirect contact with animals in the home, at a veterinary clinic, at a zoo, on a farm, or in other public or private settings [1]. There are an estimated 93.8 million cases of salmonellosis each year, with 155,000 deaths. Salmonellosis is most commonly spread through the consumption of food that is contaminated with *Salmonella*. A previous study estimated that there are around 80.3 million foodborne salmonellosis cases each year [2].

This non-typhoid salmonellosis is a zoonotic disease that can be spread from mammals (cattle and pigs) and birds to humans [3]. Livestock that carries such bacteria may develop a symptom that makes them difficult to detect. The infected animals can contaminate fresh products like fruits and vegetables by contacting with their feces. To reduce the survival of pathogens during the process of food handling, preparation, and storage, using a preventive approach like hazard analysis critical control (HACCP) is very crucial. Therefore, to overcome these challenges, identification, and detection in food processing play a great role to protect against food-borne disease outbreaks [4].

Foodborne diseases in humans and Foodborne illnesses from diarrheal as well as *Salmonella enterica* invasion are significantly affecting globally. Particularly in low and middle-income countries where the most burden of disease

and occurrence of mortality are there, controlling *Salmonella* infection is challenging [5]. The problem of microbial contamination of food is a serious one, and cross-border trade raises the risk of outbreaks. The World Health Organization classifies foodborne illnesses as either infectious or toxic, caused by agents in ingested food. The reports from 2005 showed that 1.8 million people died from diseases that caused diarrhea, and a high proportion of these deaths was due to contamination of food and drinking water [6]. Foodborne infections are on the rise, with over a quarter of the population at a high risk of getting sick [7]. *Salmonella* is one of the leading causes of bowel disease worldwide and is also the cause of more serious systemic diseases such as typhoid fever and paratyphoid fever [8]. There are an estimated 696,000-3,840,000 Salmonellosis cases in the USA each year, with 3840 deaths. This causes an estimated cost of between $600 million and $3.5 billion [9]. Nontyphoidal *Salmonella* is the most common cause of bacterial bloodstream infections (BSIs) in adults and children in sub-Saharan Africa, and it is associated with a case fatality rate of 20-25% [10]. Food-borne diseases are a major cause of ill health and death worldwide. The worldwide incidence of nontyphoidal salmonellosis is estimated to be 1.3 billion cases and 3 million deaths annually [11]. The current study was initiated with the objective of isolation and identification of *Salmonella spp* from waste food.

2. Materials and Methods

2.1. Sample Collection

Samples of waste food were taken from different households in Jimma town. The selection of study population (households) participants was based on a random sampling technique. A total of 20 waste food samples were collected and aseptically taken and kept in sterile polyethylene bags and transported to Research and Postgraduate Laboratory, Department of Biology, College of Natural Science Jimma university for microbiological analysis.

2.2. Isolation of Salmonella Spp

Salmonella Shigella agar media has been prepared by measuring 60g for 1000ml of sterilized distilled water and was allowed to heat boil. Twenty ml of sterilized medium was poured onto sterilized Petri plates and allowed to cool to solidify for 30 minutes. After the media has solidified, three Petri plates containing media. Twenty-five grams of waste food was weighed and diluted in 225ml peptone water and incubated at 37°C for 18 h for pre-enrichment. Then 0.1 ml of presumptive sample was transferred to Salmonella-Shigella Agar media containing Petri plates. Finally, the culture media was placed in an incubator at 37°C for 48 hrs. Salmonella growth produces transparent colonies with blackish color in the middle due to H_2S gas formation. Samples were identified as Salmonella based on macroscopic colony morphology.

3. Results and Discussion

From a total of 20 waste food sampled from different households, half of the samples 10/20 (50%) were positive for *Salmonella spp*. and the rest 10/20 (50%) were found negative for *Salmonella* spp. *Salmonella* infections are increasing worldwide, but little is known about *Salmonella* surveillance in African countries and other developing countries [12]. This is because the food waste is suspected of being contaminated with *Salmonella* and other pathogenic microbes. Unless hygienic practices are followed carefully, developing countries are at high risk of food-borne pathogens. Foodborne illness can be caused by bacteria that can be found in contaminated foods.

Foodborne outbreaks have been associated with a wide range of foods, including poultry, eggs, beef, fish, dairy products, and chocolate [13]. There was another scholar who shared the same interest in the same subject reported that the retail raw meat and poultry samples from markets and supermarkets in Ho Chi Minh City, Vietnam, were heavily contaminated with *Salmonella* spp. (60.8%) [14]. In addition to this, contamination of *Salmonella* in retail meats and shrimps in the Mekong Delta, Vietnam was 48.6% for beef samples and 21.0% for chicken meat [15]. MDR non-typhoid *Salmonellae* are more common causes of bacteremia, especially in children under 5 years, in most African countries [16].

According previously conducted research, out of the 14,695 patients who were involved in the *Salmonella*-caused outbreaks, 1,534 (10.4%) were hospitalized and 4 (0.03%) died [17]. Invasive *Salmonella* infections result in an enormous number of illnesses each year, with over three and a half million cases and over 600,000 deaths. These infections are especially common in resource-limited settings [18]. In 2006, *Salmonella* was the leading food-borne bacterial pathogen in the United States, killing more than any other food-borne pathogen [19]. The severity of *Salmonella* infections is determined by the strain of *Salmonella* bacteria responsible for the infection and the health of the host. Children below the age of 5, the elderly, and people with weakened immune systems are at greater risk of getting salmonellosis. [20]. In 2018, *Salmonella* accounted for more than half of the reported food poisoning outbreaks in the EU [21]. *Salmonella* has been consistently reported to be one of the leading international causes of food poisoning in humans. The incidence of human *Salmonella* infections confirmed in the United States in 2010 (17.6 per 100,000 population) was higher than any other food-borne pathogen. [22].

4. Conclusions

In summary, *Salmonella spp*. Isolated from food waste collected from various households. Current studies have found that some samples are positive for *Salmonella*. This study showed that food waste is highly polluted, so consumption by poor and homeless people can cause the development of salmonellosis. This food waste can also be

contaminated with *Salmonella*, so it is highly recommended to practice hygiene with ready-to-eat foods. This shows that food waste plays an important role in the spread of food poisoning. Therefore, great care should be taken when using foods.

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