Nontyphoid *Salmonella* in farm animals and food products in the Middle East and North Africa: a systematic review

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Aim: This study aimed to document the prevalence, serotype distribution and antibiotic resistance of nontyphoidal *Salmonella* in animal food products from Middle East/North Africa (MENA) countries. **Methods:** Peer-reviewed articles published from 1 January 2011 to 7 March 2023 were included and the data were narratively synthesized and statistically analyzed to estimate and compare the overall prevalence. **Results:** The authors found a high prevalence of *Salmonella* in MENA countries (12.80%), with the highest prevalence in Lebanon (41.10%). Poultry had a higher prevalence of *Salmonella* (14.49%) than livestock (9.62%). *Salmonella enteritidis* was the most commonly identified serotype (21.99%), and sulfamethoxazole had the highest resistance rate (78.81%). **Conclusion:** The authors emphasize the importance of implementing control measures in MENA countries to limit the spread of the *Salmonella* pathogen.

Foodborne infections are a significant global public health concern, and *Salmonella* is one of the primary pathogens responsible for these infections in humans. According to estimates, *Salmonella* causes around 155,000 deaths annually due to diarrheal diseases [1]. *Salmonella* is a major cause of foodborne infections and a serious public health issue worldwide. It is responsible for an estimated 2.8 billion cases of diarrhea annually [2]. In the EU, meat and related products are major sources of contamination and are involved in 17.9% of foodborne outbreaks, with *Salmonella* spp. being the most frequently detected pathogen. *Salmonella enteritidis* is responsible for a third of these outbreaks, and combinations of *Salmonella* with eggs or meat products are the most common hazard/food pairs [3]. In the USA, nontyphoidal *Salmonella* (NTS) infections have been estimated to cause approximately 1.2 million illnesses, 23,000 hospitalizations and 450 deaths each year, making it the second most common cause of foodborne illness after norovirus [4].

WHO recognized that the African region has the highest proportion of foodborne diseases, with an estimated 91 million people affected and 137,000 deaths each year. NTS is responsible for killing 32,000 people annually. Regarding gastroenteric diseases by population, the eastern Mediterranean region is ranked third. In 2010, it was estimated that at least 100 million people in this region contracted foodborne diseases each year, and 37,000 deaths occurred annually [5]. A World Bank report stated that the total loss of productivity associated with foodborne illness was estimated at $95.2 billion per year, while the cost of treatment was estimated at $15 billion [6]. Thus, salmonellosis can lead to significant social and economic losses [7].

For many low- and middle-income countries, several factors, including rapid demographic and dietary changes, contribute to the risk of population exposure to foodborne hazards, which impact current food security risk management capacities [8]. According to a WHO estimate, more than 100 million people living in the Middle East/North Africa (MENA) region become ill with a foodborne disease every year, and 32 million of those affected are children under 5 years old [9].

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