



The detection and antimicrobial susceptibility profile of *Shigella* isolates from meat and swab samples at butchers' shops in Gondar town, Northwest Ethiopia



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Received 15 May 2015; received in revised form 20 October 2015; accepted 23 October 2015

KEYWORDS

Shigella;
Prevalence;
Antimicrobial
resistance;
Butcher shops;
Gondar town;
Ethiopia

Summary Food borne pathogens are major causes of deaths, illnesses and billions of dollars of expenses. The burden of food borne illness is worsened by the ever increasing rate of antimicrobial resistance microbes. *Shigella*, a bacterial pathogen associated with food, is reported to account for higher prevalence rates of food borne illness in different settings. A cross-sectional study was conducted from February 10 to June 30, 2013, at the butcher houses of Gondar town in the Northwest of Ethiopia to assess the prevalence and antimicrobial susceptibility pattern of *Shigella*. Cattle raw meat and swab samples from selected critical control points, including knives, chopping boards, and the hands and noses of butchers, were collected and analyzed. The identification of *Shigella* was carried out using colony characteristics, the Gram reaction, and biochemical tests. Antimicrobial susceptibility testing was performed using the Kirby–Bauer disc diffusion method. The overall hygienic status of the butcher shops was also assessed using a checklist. An observational analysis revealed that the sanitary condition of the butcher shops and their premises was poor. Of 306 samples screened, 10.5% were positive for *Shigella*.

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Approximately 7.4% of meat samples and 10.2% of swab samples were contaminated with *Shigella*. Out of the total *Shigella* isolates, 90.6%, 46.9%, 18.8% and 9.4% were resistant to ampicillin, amoxicillin, ceftriaxone and tetracycline, respectively. A multidrug resistance pattern was recorded in 27.8% of the isolates. In conclusion, the safety of meat sold at Gondar butchers houses was poor. The identified *Shigella* isolates showed high levels of drug resistance and multidrug resistance patterns for commonly used antimicrobials in veterinary and human medicine. Practicing wise use of antimicrobials and strict sanitary interventions at different critical control points is strongly recommended, in addition to further in-depth studies to prevent unprecedented consequences from shigellosis.

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Introduction

Food-borne pathogens are among the leading cause of death and illness in developing countries and cost billions of dollars in medical care and social costs [1]. Changes in eating habits, mass catering, complex and lengthy food supply procedures with increased international movement and poor hygienic practices are major contributing factors [2]. Contaminated raw meat is one of the main sources of food-borne illnesses and is a risk factor for the transmission of zoonotic infections [3–5]. Food safety and quality is becoming a matter of increasing concern and a serious threat to public health in many countries. Biological contaminants, largely bacteria, constitute the major cause of food borne diseases [6].

The World Health Organization (WHO) estimated that in developed countries, up to 30% of the populations suffer from food borne diseases, and resulting in up to 2 million deaths in developing countries per year [7]. Bacteria contaminate meat while it is being processed, packed, transported and consumed. The contamination could be due to the ill health of the animal or due to slaughtering and subsequent processes [8]. *Shigella* is a bacterial contaminant of food from different sources and can result in illness with a low infective dose [9]. Food borne outbreaks of *Shigella* are also common, especially with foods that are subjected to hand processing, such as meat in butcher shops; exposed to a limited heat treatment; or served raw to the consumer [10]. Raw food materials of doubtful quality; storing food at a temperature that would permit microbial growth; the use of water of questionable hygienic quality; using packaging materials that are not of food-grade quality; lack of facilities for proper waste disposal at vending sites; and the use of unclean utensils are possible

reasons for bacterial contamination of meat in butcher shops [11,12].

Previous reports from different parts of Ethiopia indicated that *Shigella* is circulating in the Ethiopian population with increasing antimicrobial resistance over time [13–20]. Selling and consuming raw meat at butcher shops are practiced widely in different towns of Ethiopia. Gondar town is one of these towns where raw meat is sold at butcher houses. However, there is scarce information on the microbial quality and safety of raw meat that is sold at butcher houses, particularly in relation to *Shigella* contamination. To the best of the authors' knowledge, to date, there has only been one study carried out on meat from an abattoir regarding *Shigella* isolates and their antimicrobial resistance pattern in Ethiopia [21]. Hence, the aim of this study was to determine the prevalence and antimicrobial susceptibility profile of *Shigella* from raw meat and selected critical control points from butcher houses in Gondar town.

Materials and methods

Study design, period and area

A cross sectional study was conducted from February 10 to June 30, 2013, at Gondar town, Northwest Ethiopia. The town is located at an altitude of 1500–2200 m above sea level. The maximum and minimum temperatures of the area were 30.7°C and 12.3°C, respectively. The area receives a bimodal rainfall pattern with an annual precipitation rate of 1000 mm. According to the 2007 Ethiopian central statistics agency summary report, the total human population of the town was estimated to be 206,987 [22]. During the study period, there were 90 operational butcher houses.

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