Good hygiene practices among meat handlers in small and medium enterprise slaughterhouses in Kenya

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ABSTRACT

Implementation of hygiene practices in small and medium enterprises (SMEs) poses a serious problem, which can increase food safety risks. In SME slaughterhouses, the risk posed is even higher given that meat and meat products are important in regards to foodborne illnesses. Therefore, this study determined the good hygiene practices among meat handlers (MH) in SME slaughterhouses. A cross sectional survey was carried out among 207 MH in five SME beef slaughterhouses in Nairobi County, Kenya and its environs. Five categories of hygiene practices were assessed namely hand washing, protective clothing, prohibited practices, medical examination and equipment handling. The training needs among the MH were determined by categorizing the overall hygiene practices into either poor ($<70\%$), average ($70-89\%$) or good ($>=90\%$) out of a possible high score of 100%. Use of soap and disposable towels during hand washing, use of gloves, cleaning equipment between carcasses and handling the equipment when not in use were poorly practiced. MH's overall hygiene practices significantly differed with education, experience, training, and age ($p < 0.05$). In terms of training needs, about 82% of the MH should be considered for training. In conclusion, hand washing and equipment handling practices in studied SME slaughterhouses were not adequate. Overall, their level of hygiene practices may be influenced by education, experience, training, and age .

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1. Introduction

Good hygiene practices in food establishments are essential for consumer protection and the control of public health risks. This is because, the hygiene of food workers can contribute significantly to outbreak and transmission of foodborne illnesses (Assefa, Tasew, Wondafrash, & Beker, 2015). According to several authors, poor personal hygiene of food workers can contribute to as much as 97% of foodborne illness outbreaks (Assefa et al., 2015; Green et al., 2007; Kahraman, Cetin, Dumen, & Buyukunal, 2010). All workers in a food handling area are therefore expected to maintain a high degree of cleanliness of their body and clothing, and wear suitable, clean and, where necessary, protective clothing in order to ensure food safety and public health (Nee & Sani, 2011).

Food handlers are asymptomatic carriers of foodborne pathogens (Opiyo, Wangoh, & Njage, 2013). Disregard of hygienic measures enables these pathogens to come into contact with food and,

in some cases, to survive and multiply in sufficient numbers to cause illness in consumers (Assefa et al., 2015). Frequent outbreaks of foodborne illnesses are caused by *Staphylococcus aureus* and gram negative bacilli such as *Salmonella* spp., *Shigella* spp., *Campylobacter jejuni*; enterotoxigenic *Escherichia coli* as well as viral agents, such as hepatitis A and Norovirus associated with food handlers (Shojaei, Shooshtaripoor, & Amiri, 2006). Most of these foodborne pathogens can survive on hands, mouth, skin, bruises, hair, sponges, clothes, and other surfaces for hours or days after the initial contact (Pérez-rodríguez, Garcia-gimeno, & Zurera-cosano, 2013).

Food safety programs in food establishments should be set up and implemented to ensure that personal hygiene practices are maintained and to some extent, foodborne illnesses are reduced. In large food establishments, economies of scale allow ease of installation and implementation of the programs. A population that is supplied with food from such establishments can be regarded to face fewer food safety risks. However, the case may not be said to be true for small and medium enterprises (SMEs). In SMEs setting up and implementing such programs pose serious practical problems

(Marais, Conradie, & Labadarios, 2008). Some of these problems include; lack of experienced and technically qualified personnel, time, training, motivation, commitment, funding, and in-house knowledge to identify foodborne microbial hazards (Bertolini, Rizzi, & Bevilacqua, 2007; Panisello & Quantick, 2001; Taylor, 2001). Due to these factors, hygiene practices are generally low. In a country or region where majority of the consumers source their food from such SMEs, this can have a profound impact on public health and the country's or region's economy due to increased disease burden.

While most of the factors that contribute to poor implementation of hygiene practices in SMEs have been identified, missing data on the actual levels of these practices makes it less possible to estimate the actual level of food safety risk posed. This also limits efforts to improve hygiene practices though training, because the actual practices that are poorly performed are unknown. To provide opportunities to improve food safety performance in SMEs that are significantly important to consumers in terms of food supply, a case study was carried out in Kenya to assess good hygiene practices of meat handlers (MH) in SME slaughterhouses. The MH in Kenya were targeted because a big percentage of meat consumed in Kenya is supplied by SMEs (Farmer & Mbwika, 2012). Furthermore, among the most widely consumed foods, meat and meat products are of particular importance regarding foodborne illnesses (Ansari-Lari, Soodbakhsh, & Lakzadeh, 2010). A thorough understanding of the current level of good hygienic practices in SMEs and the personal determinants of these practices will help identify the training needs and opportunities to overcome particular demographic barriers that may hinder adequate implementation of good hygiene practices in SMEs.

2. Materials and methods

2.1. Study area

A cross-sectional survey was carried out in five SME slaughterhouses located in Nairobi County, Kenya and its environs. Each slaughterhouse had less than 100 employees. About 334,068 cattle are slaughtered annually in these slaughterhouses (Muthee, 2006), which accounts for the highest proportion of cattle slaughtered in Kenya. Majority of these slaughterhouses serve Nairobi and its environs, which is the largest market for beef in Kenya (Farmer & Mbwika, 2012).

2.2. Target population and sampling technique

A stratified sampling technique was used. The population was first classified into five strata according to their area of work (sticking/bleeding, flaying, evisceration, splitting/quartering and green offal section). All the MH in each strata were exhaustively sampled. The participants who agreed to be interviewed included 21 bleeders, 28 flayers, 37 eviscerators, 53 splitters, and 68 offal section workers.

2.3. Data collection

A structured questionnaire modified from Jianu & Goleţ (2014) and Nel, Lues, Buys, & Venter (2004) was administered through direct interviews with respondents. The questionnaire had been pretested and corrected earlier in an SME slaughterhouse in Isiolo County, which is located 200 km North of Nairobi City. The interview was carried out in English but where not possible, the questions were translated into Swahili, which is the second national language. The questions assessed the socio-demographic characteristics and hygienic practices of the MH. The practices were assessed using a five-point ordinal scale (0 = never, 1 = rarely, 2 = sometimes, 3 = often to 4 = always). The option 'sometimes' was included to ensure the respondents did not pick the correct answer by chance.

2.4. Data analysis

Data were analyzed using IBM SPSS (Version 23.0, Armonk, NY: IBM Corp). As an initial measurement, univariate statistics were performed for all variables to understand their individual performance and detect outliers. Descriptive statistics (frequencies) were obtained to describe each of the assessed variables. To determine the percentage score of each MH's practices, the number of correctly answered practices were divided by 20 (the sum number of assessed practices) then multiplied by 100. Given that the data collected in the practices sections were ordinal, non-parametric measurements were preferred for further analysis (McCrum-Gardner, 2008; Miranda-de la Lama, Sepulveda, Villarroel, & Maria, 2013; Mundry & Fischer, 1998). Therefore, Mann Whitney *U* test ($p = 0.05$) was used to determine if the scores significantly differed with training and gender of the MH while Kruskal–Wallis one-way ANOVA ($p = 0.05$) was used to determine if the scores significantly differed with the age, education level and experience of the MH. The stepwise-step down procedure was used to separate statistically significant categories (Kruskal-Wallis, $p < 0.05$). Where the data set was unbalanced, as was the case with age, the exact significance, based on Monte Carlo simulation (10,000 samples), was considered (Jianu & Goleţ, 2014). In order to categorize practices into various levels and determine the level of training requirements in the SME slaughterhouses, recommended thresholds for knowledge, attitude and practices studies (Macias & Glasauer, 2014) were used for this purpose. If the percentage score of MH was ≤70, their level of hygiene was low, and training is urgently required. If their score frequency was 71–89%, the hygiene level was moderate, and training might be considered. Finally, if the score was ≥90%, the hygiene level is high, and training is difficult to justify.

3. Results

3.1. Demographic characteristics

The MH comprised of more males (86%) than females (14%). Majority of the MH were middle aged (31–40 years) representing 41% of the MH, with 25% being younger (20–30 years) representing 25% of the MH. The other proportion was above 40 years. Majority of the MH had primary level education (48%) followed by secondary (40%), while 8% lacked formal education. On the other hand, 4% of the MH had tertiary level education. Experience varied from 1 to 5 (38%) years or >10 (35%) years while the rest of the MH had less than one of experience. MH trained in hygienic meat handling were fewer (40%) than the untrained MH (60%).

3.2. Meat handlers' hygiene practices

Table 1 gives the frequency percentages of each of the MH's hand washing practices.

3.2.1. Hand washing practices

Majority of the MH (86%) reported that they wash their hands before handling meat. On the other hand, MH who often wash their hands between carcasses were more (53%) than those who always wash their hands (43%). After visiting the toilet, majority of the MH (84%) always wash their hands. During hand washing, more than half of the MH (58%) do not use soap, whereas only 15% of the MH always use soap. After hand washing, majority of the MH (49%)