

Assessment of hygiene practices of pork retail outlets in Kampala district, Uganda

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Abstract

This study was conducted to map the distribution of pork retail outlets as well as assess their role in food borne disease transmission. Using a structured questionnaire, practices associated with hygiene related to infrastructure, workers, and equipment were assessed. Sources of pork were assessed to determine whether pork had undergone inspection, as were socio economic determinants of hygiene outcomes and risk factors for foodborne disease. There were 158 pork outlets in the five divisions of Kampala. Overall, 68% of the pork was from places where slaughtering was not authorized (ungazetted) and meat inspection not carried out. Worker hygiene score was highest (average 71%), followed by infrastructure (68.2%) and equipment (47.3%). There was a significant relation between good hygiene and the presence of a public health certificate. However only 42% of the outlets had a public health certificate. Holding a public health certificate is an important predictor of good practices.

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Keywords

Pork

Contamination

Hygiene practices

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Introduction

Pork has in recent years become an important meat in Uganda, second only to beef in the amount consumed. With a population of over three million, the country's pig industry has experienced tremendous growth in recent decades (The Republic of Uganda Ministry of Agriculture Animal Industry and Fisheries, 2011). Although consumption per capita is still only 3.4kg/person/year, pork is a popular source of protein for both rural and urban population (FAOSTAT, 2015). Kampala, the capital of Uganda is the main marketing hub for pork from the leading pig producing communities in the country (Ouma *et al.*, 2014). A considerable proportion of pigs slaughtered in the district are kept in the peri-urban areas (The Republic of Uganda Ministry of Agriculture Animal Industry and Fisheries, 2011).

Most of the pork produced in the country is distributed and sold through informal market channels where food safety practices such as inspection of the pork and the hygiene of sale premises are perceived to be uncommon (Ouma *et al.*, 2014). There is only one gazetted slaughter place for pigs in Kampala called "Wambizzi Cooperative Society Ltd."; but most pigs that reach Kampala are slaughtered in backyards or vacant land near pork outlets (Wandera,

2015). Studies done in other developing countries indicate that slaughter of pigs in ungazetted places makes meat inspection difficult to implement, thereby increasing risks of pork-borne infections such as *T. solium cysticercosis*, *Echnococosis* and *Trichinellosis* (Joshi *et al.*, 2003; Maridadi *et al.*, 2011; Krecek *et al.*, 2012).

Pork becomes unsafe for human consumption when the pig slaughtered was infected with zoonotic pathogens or if the meat is contaminated with pathogens during the handling process (Haileselassie *et al.*, 2012). Handlers of pork are at risk from pork-borne disease as are consumers (Aiello and Larson, 2002; Eshitera *et al.*, 2012; Mwanjali *et al.*, 2013). In developing countries, conditions such as salmonellosis, *Escherichia coli* gastroenteritis, taeniosis, amoebiosis, shigellosis, cholera, toxoplasmosis, rotavirus infection and typhoid are associated with contaminated food and can cause severe effects (Bogere and Baluka, 2014; Ifeadike *et al.*, 2014). Contamination has been associated with ungazetted slaughter areas but licensed slaughter houses may also be problematic (Jumaa, 2005). Food handlers can be a source of contamination (Nyarango *et al.*, 2008).

The objective of this work was to map the location of pork outlets in Kampala and to assess hygienic

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practices, their socio-economic determinants and risk factors for pork borne disease.

Materials and Methods

Study area

Kampala district is the capital city of Uganda. According to the Uganda Bureau of Statistics the population of people in Kampala was estimated to be 1,659,600 in 2011. The district is located in the central region of the country, making it a market hub for pigs reared in the rural communities of the different parts of the country. Although on a small scale, pig rearing is done in backyards in some peri-urban areas with an estimated population of 38,306 (The Republic of Uganda Ministry of Agriculture Animal Industry and Fisheries, 2011). Kampala has five divisions: Kawempe, Rubaga, Makindye, Nakawa and Kampala central administrative division. All divisions were part of the study.

Study design

A survey was carried out in Kampala district from May to June 2012, to map the pork retail outlets and assess hygiene practices along the market chain from the pig slaughter places to the pork retail outlets. Pork retail outlets in this study constituted two categories: pork eateries where only cooked pork was sold and butcheries/eateries where both raw and cooked pork was sold.

After identifying the first pork outlet and obtaining data, directions to the location of the next outlets were obtained from the respondent. Global Positioning System (GPS) points of the pork outlets were taken during the survey and used to generate a map using Esri's ArcGis software (version 10.1). An observation checklist was used to assess the practices of the gazetted Wambizzi abattoir in Rugaba division and an ungazetted slaughter place in Church zone, Kamwokya in Nakawa division. The latter was selected for convenience and because typical of the ungazetted slaughter places. A structured questionnaire was used to assess hygiene practices of the pork retail outlets. Prior to conducting the study, the tools were pretested in two pork outlets in Namasuba-Kikajjo zone, Wakiso district. The questionnaire was administered to the respondents by two veterinary officers fluent in Luganda, the commonly used local language, and English. Direct observations were also carried out by interviewers using a structured checklist.

Statistical analysis

Hygienic practices were divided into three

categories: infrastructure (n=9 variables); equipment presence and condition (n=8 variables); and, worker hygiene (n=5 variables). Hygienic responses were summed into an overall hygiene score, which was also standardized to a percentage score. Robust linear regression, accounting for clustering of data within divisions was used to assess the relation between the hygiene score and predictors (gender of owner, years in operation, type of establishment, and presence of a medical certificate). Data were analyzed with Stata 11.

Ethical considerations

The study was approved by the Research and Ethics Committee of the College of Veterinary Medicine and Biosciences of Makerere University (Reference No: VAB/REC/13/104). Prior to questionnaire administration, verbal consent was obtained from the respondent after clear explanation of the purpose of the study.

Results

Location of pork retail outlets



Figure 1. Distribution of pork eateries/retail outlets in Kampala district at the time of study

In all, 179 retail outlets were identified in Kampala district during the study. Twenty-one of these were not mapped because they were closed (n=18) or owners did not consent to the study (n=3). Of the 158 outlets mapped, Makindye division had the highest number of outlets (42) and Kampala Central had the least (6). The locations were displayed in the map illustrated in Figure 1.

Of the 158 outlets identified, only 17 (10.7%) were pork eateries and the rest were butcheries/eateries. All the pork eateries were managed by men while 12 of the 141 butcheries/eateries (8.5%) were managed by females (Table 1). All outlets except

one (99.3%) sold alcohol and 82% of outlets sold salads as accompaniments to the cooked pork.

Respondent gender	Kampala Central, n(%)	Kawempe, n(%)	Makindye, n(%)	Nakawa, n(%)	Rubaga, n(%)	Total, n
Male	5 (3.4)	36(24.6)	39(26.7)	29(19.9)	37(25.3)	146
Female	1 (8.3)	3 (25.0)	2 (16.7)	3 (25.0)	3 (25.0)	12
Total	6	39	41	32	40	158

Hygiene practices associated with pig slaughter places and pork marketing

Practices that affect slaughter hygiene were assessed in an un-gazetted slaughter place (Church zone Lufula, Kamwokya) and a gazetted slaughter place (Wambizi abattoir). Table 2 depicts the two scenarios.

Table 1. A summary of respondents by gender in pork outlets in five divisions of Kampala district

Variable	Church zone Lufula	Wambizzi abattoir
Location	On the outskirts of Kamokya town centre; in swampy ground with a dirty surrounding and open drainage channels.	In an industrial setting with a fairly clean surrounding.
Structures present	Holding pens and open ground. Pigs slaughtered and carcass scalded and cleaned on grass/soil.	Holding pens, stunning area, area for scalding and cleaning carcasses, hanging areas for inspection, weighing and sale area. Offices for inspectors and management.
Number of pigs slaughtered per day	5-10 pigs.	50-70 pigs.
When are pigs slaughtered	Usually done before 7.00am. However more can be slaughtered in the day based on need.	Done early before 7.00am.
Clients served	Most pork outlets in the locality.	Whole Kampala area and formal processors.
Marketing and transportation	Usually done by hand lifting to nearby outlets, packed in sacks and ridden on bicycles or motorcycles.	Can be sold locally, transported to distant destinations using pick-up cars and motor cycles.
Meat inspection	Not done.	Ante-mortem and postmortem checks done by a full-time meat inspector.

Hygienic practices at pork outlets

The average overall hygiene score was 61.3% with a range of 13.6-100%. Worker hygiene score was highest (average 71%), followed by infrastructure (68.2%) and equipment (47.3%). There were differences between divisions with butchers in Kampala Central, Nakawa and Kawempe scoring 78%, 78% and 72% respectively, Makindye scoring 57% and Rubaga just 38%. The level of compliance with different aspects of good hygienic practices is given in Table 3.

Determinants of hygienic practices

After controlling for the putative socio-economic determinants of hygienic practices, the only significant was the presence of a medical certificate, which had a large, significant and positive effect on the hygiene score (Table 4).

Table 2. A comparison of an un-gazetted pig slaughter place (Church zone Lufula, Kamokya) and a gazetted pig slaughter place (Wambizi abattoir) in Kampala district

Variable	Church zone Lufula	Wambizzi abattoir
Location	On the outskirts of Kamokya town centre; in swampy ground with a dirty surrounding and open drainage channels.	In an industrial setting with a fairly clean surrounding.
Structures present	Holding pens and open ground. Pigs slaughtered and carcass scalded and cleaned on grass/soil.	Holding pens, stunning area, area for scalding and cleaning carcasses, hanging areas for inspection, weighing and sale area. Offices for inspectors and management.
Number of pigs slaughtered per day	5-10 pigs.	50-70 pigs.
When are pigs slaughtered	Usually done before 7.00am. However more can be slaughtered in the day based on need.	Done early before 7.00am.
Clients served	Most pork outlets in the locality.	Whole Kampala area and formal processors.
Marketing and transportation	Usually done by hand lifting to nearby outlets, packed in sacks and ridden on bicycles or motorcycles.	Can be sold locally, transported to distant destinations using pick-up cars and motor cycles.
Meat inspection	Not done.	Ante-mortem and postmortem checks done by a full-time meat inspector.

Table 3. Compliance with good hygienic practices in pork retail outlets in Kampala district

Infrastructure	Comply ing (%)	Worker hygiene	Comply ing (%)	Equipment	Comply ing (%)
Protected water source	99	Wounds covered	93	Equipment clean	73
Use warm water and soap	79	Nails kept short	91	Equipment dent free	73
Outlet with adequate light	74	No food or drink	59	Equipment in good repair	68
Fridge present	65	Beard & hair trimmed	58	Clean wooden stump	60
Butchery/eatery clean	63	Clean overall	54	Pork always hung	44
Outlet in good state of repair	61			Covered rubbish bin	37
Cleanable walls	61			Equipment not rusty	15
Platform for pork display	57				
Protection from flies	55				

Table 4. Robust linear regression predicting hygiene score of retail outlets in Kampala district

Variable	Coefficient	P
Years in business	-0.03	0.495
Male owner	-0.7	0.779
Public health certificate	4.19	0.018
Source from Wambizzi	-2.11	0.175
Butchery	-1.41	0.195

Discussion

Although the study was intended to exhaustively map all outlets, it is probable that some were missed since the exercise was conducted along roads and in trading centers, which were identified using the district administrative map. This study confirms increasing demand of pork with a considerable number of outlets established in all Kampala districts. The demand could be driven by the improving incomes, growing social clusters and less interference of religious sentiments

that made pork less popular in the past (Ouma *et al.*, 2014; FAOSTAT, 2015). Demand is also thought to be influenced by alcohol consumption and a strong association between alcohol sale and pork was found in this study. Ownership of pork outlets was dominated by men. This was also noted in a value chain assessment in Masaka, Mukono and Kamuli district whereby except at the production level, women's involvement in the pig value chain was minimal (Ouma *et al.*, 2014). There was a tendency for women operated outlets to have better hygiene but this result was not significant possibly due to the small number of women.

The gazetted abattoir tended to have better practices and hygiene than the ungazetted slaughter place. This may be because the abattoir had better infrastructure, more trained staff and a higher level of inspection. In addition, the abattoir had benefited from support from a series of development projects. The study demonstrated that most pork consumed in Kampala was un-inspected and could pose a risk of meat borne infections to consumers. Similar studies in Dar es Salaam city in Tanzania, and East Cape Province South Africa also disclosed that poor hygiene of most slaughter places and lack of inspection posed a serious public health challenge (Ngowi *et al.*, 2004; Krecek *et al.*, 2012). The role of meat inspection in eliminating infections such as *T. solium* cysticercosis and echinococcosis has been described in various studies (Sakai *et al.*, 2001; Joshi *et al.*, 2003; Boa *et al.*, 2006). Just like in other developing countries where such a challenge occurs, lack of meat inspection has been due to failure to implement the Public Health (PH) legislations that enhance meat safety (Joshi *et al.*, 2003).

Unlike in a study in Kenya where only 40% practiced hand hygiene (Nyarango *et al.*, 2008), almost all outlets used clean water and soap. Keeping nails short which was a common practice could have helped reduce load of micro-organisms that inhabit the hands and makes hand washing more effective as reported elsewhere (Jumaa, 2005). A considerable number of pork handlers worked without protective clothing. This was in agreement with reports in Ethiopia and India (Haileselassie *et al.*, 2012; Ghimire *et al.*, 2013). Poor disposal of waste was a key challenge in the study and it is in agreement with observations elsewhere (Lawan *et al.*, 2013; Ifeadike *et al.*, 2014;). It could be promoting transmission of pathogens from wastes to pork by flies especially in outlets where pork was exposed as also observed in another study (Aiello and Larson, 2002). Many pork sellers admitted not to have been medically examined. It was likely that carriers of parasites

transmitted through faeco-oral route could be among those handling pork at retail outlets (Sciutto *et al.*, 1995; Flisser *et al.*, 2006).

Most of the pork outlets were operated without a PH certificate. According to the PH act, in order to acquire a medical certificate, the premises where the outlet operates has to be assessed by health inspectors and a laboratory report given indicating that the pork sellers (handlers) have undergone a medical checkup and are free of parasitic conditions that can contaminate food (including tapeworms) (The Public Health Act, 1964). Presence of a PH certificate was significantly associated with better hygiene practices; however, it is difficult to establish a causal link as the relation may have been due to a confounding factor (e.g. location). Similar observations were made in Ethiopia, Nigeria and Nepal where poor implementation of PH health regulations on meat hygiene encouraged poor hygiene in outlets (Joshi *et al.*, 2003; Haileselassie *et al.*, 2012; Edia-asuke *et al.*, 2014). The PH act in Uganda sets guidelines for establishment and operation of slaughter places and retail outlets. Likewise, the meat handlers are meant to undergo medical examination to be allowed to handle meat (The Public Health Act, 1964).

Conclusion

Consumption of pork in Kampala is high in the district. The district lacks gazetted abattoirs for pigs meaning there is a lack of meat inspection and monitoring of hygiene practices is difficult. Hygiene practices in retail butcherries/eateries are still wanting, but the fact that a minority of outlets of excellent hygienic practices exist suggests improvements are feasible. Implementation of the PH regulations was useful in promoting practices that led to good hygiene.

There is need for Kampala City Council Authority (KCCA) to set up low cost slaughter facilities in each of the five divisions. Traders in each division could be organized in groups and given training on good meat hygiene practices. The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and KCCA should ensure the PH regulations on meat hygiene are implemented. Studies need to be conducted to assess pathogen contamination in pork sold in the retail outlets.

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References

- Aiello, A. E. and Larson, E. L. 2002. What is the evidence for a causal link between hygiene and infections? *The Lancet Infectious Diseases* 2: 103–110.
- Boa, M. E., Mahundi, E. A., Kassuku, A. A., Willingham, A. L. and Kyvsgaard, N. C. 2006. Epidemiological survey of swine cysticercosis using ante-mortem and post-mortem examination tests in the southern highlands of Tanzania. *Veterinary Parasitology* 139(1-3): 249–255.
- Bogere, P. and Baluka, S. A. 2014. Microbiological Quality of Meat at the Abattoir and Butchery Levels in Kampala City, Uganda. *Internet Journal of Food Safety* 16: 29–35.
- Edia-asuke, A. U., Inabo, H. I., Umoh, V. J., Whong, C. M. Z., Asuke, S. and Edeh, R. E. 2014. Assessment of sanitary conditions of unregistered pig slaughter slabs and post mortem examination of pigs for *Taenia solium* metacestodes in Kaduna metropolis, Nigeria. *Assessment of sanitary conditions of unregistered pig slaughter slabs and post mortem. Infectious Diseases of Poverty* 3(1): 45-51.
- Eshitera, E. E., Githigia, S. M., Kitala, P., Thomas, L. F., Fèvre, E. M., Harrison, L. J. S. and Maingi, N. 2012. Prevalence of porcine cysticercosis and associated risk factors in Homa Bay District, Kenya. *BMC Veterinary Research* 8(1): 234-240.
- Flisser, A., Rodríguez-Canul, R. and Willingham, A. L. 2006. Control of the taeniosis/cysticercosis complex: future developments. *Veterinary Parasitology* 139(4): 283–292.
- Food and Agriculture Organization Corporate Statistical Database (FAOSTAT). 2015. Food Balance Sheet of the Food Agricultural Organization. Retrieved on December 15, 2015 from FAO website: www.faostat.fao.org
- Ghimire, L., Dhakal, S. and Pandeya, Y. R. 2013. Assessment of pork handlers' knowledge and hygienic status of pig meat shops of Chitwan district focusing campylobacteriosis risk factors. *International Journal of Infectious Microbiology* 2(1): 17–21.
- Haileselassie, M., Taddele, H. and Adhana, K. 2012. Source (s) of contamination of “raw” and “ready-to-eat” foods and their public health risks in Mekelle City. *ISABB Journal of Food and Agriculture* 2: 20–29.
- Ifeadike, C. O., Ironkwe, O. C., Adogu, P. O. U. and Nnebue, C. C. 2014. Assessment of the food hygiene practices of food handlers in the Federal Capital Territory of Nigeria. *Tropical Journal of Medical Research* 17(1):10-15.
- Joshi, D. D., Mahendra, M., Maria, V. J. and Willingham, A. L. 2003. Improving meat inspection and control in resource-poor communities: the Nepal example. *Acta Tropica* 87: 119–127. doi:10.1016/S0001-706X(03)00028-7
- Jumaa, P. A. 2005. Hand hygiene: simple and complex. *International Journal of Infectious Diseases* 9: 3–14.
- Krecek, R. C., Mohammed, H., Michael, L. M., Schantz, P. M., Ntanjana, L., Morey, L., Werre, S.R. and Willingham, A. L. 2012. Risk factors of porcine cysticercosis in the Eastern Cape Province, South Africa. *PloS One* 7(5).e37718.
- Lawan, M. K., Bello, M., Kwaga, J. K. P. and Raji, M. A. 2013. Evaluation of physical facilities and processing operations of major abattoirs in North-western states of Nigeria. *Sokoto Journal of Veterinary Sciences* 11(1): 56–61.
- Maridadi, A. F., Lwelamira, J. and Simime, F. G. 2011. Knowledge and practices related to *T. solium* Cysticercosis-Taeniasis among smallholder farmers in selected villages in Kilolo District in Iringa Region in Southern Highlands of Tanzania. *International Journal of Animal and Veterinary Advances* 3(3): 196–201.
- Mwanjali, G., Kihamia, C., Kakoko, D. V. C., Lekule, F., Ngowi, H., Johansen, M. V. and Willingham, A. L. 2013. Prevalence and risk factors associated with human *Taenia solium* infections in Mbozi District, Mbeya Region,

Tanzania. PLoS Neglected Tropical Diseases 7(3):e2102.

- Ngowi, H. A., Kassuku, A. A., Maeda, G. E. M., Boa, M. E. and Willingham, A. L. 2004. A slaughter slab survey for extra-intestinal porcine helminth infections in northern Tanzania. *Tropical Animal Health and Production* 36(4): 335–340.
- Nyarango, R. M., Aloo, P. A., Kabiru, E. W., and Nyanchongi, B. O. 2008. The risk of pathogenic intestinal parasite infections in Kisii Municipality, Kenya. *BMC Public Health* 6: 1–6.
- Ouma, E., Dione, M., Lule, P., Roesel, K. and Pezo, D. 2014. Characterization of smallholder pig production systems in Uganda: Constraints and opportunities for engaging with market systems. *Livestock Research for Rural Development* 26(3): 110–114.
- Sakai, H., Barbosa, H. V., Silva, E. M., Schlabitz, F. O., Noronha, R. P., Nonaka, N. and Ueno, H. 2001. Short report: Seroprevalence of *Taenia solium* cysticercosis in pigs in Bahia state, northeastern Brazil. *American Journal of Tropical Medicine and Hygiene* 64: 268–269.
- Sciutto, E., Aluja, A., Fragoso, G., Rodarte, L. F., Hernández, M., Villalobos, M. N. and Govezensky, T. 1995. Immunization of pigs against *Taenia solium* cysticercosis: factors related to effective protection. *Veterinary Parasitology* 60(1-2): 53–67.
- The Public Health Act (Meat/Milk rules). The Republic of Uganda 1964
- The Republic of Uganda Ministry of Agriculture Animal Industry and Fisheries. 2011. Statistical Abstract. Report of the Agricultural Planning Department Kampala. Kampala: Ministry of Agriculture Animal Industry and Fisheries
- Wandera, M. 2015. How safe is the meat you are consuming? *Daily Monitor Newspaper*. Kampala: Nation Media Group