Prevalence of mange infestation in smallholder pig farms in selected areas of Mpwapwa town, Tanzania

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SUMMARY

A cross sectional study was conducted between October 2015 and February 2016 to establish the prevalence of sarcoptic mange infestation and identify risk factors associated with the infestation in pigs kept by smallholder farmers in Mpwapwa town. A total of 22 households participated in the study. Questionnaires were administered to gather information on pig management and potential risk factors for mange mite infestation. This was complemented by researcher's examination of animals and environmental observation. A total number of 127 pigs were clinically examined and skin scrapping samples were collected for laboratory examination of sarcoptic mange mites. The majority of respondents were females (81.8%), had primary education (72.8%) and the household pigs herd size was 10 ± 14 (ranged between 1 and 60 pigs) which were crosses of either Landrace or Large White breed. Pigs were fed on non compounded feed that constituted maize bran, green leaves, pumpkins, potatoes and kitchen wastes. All the 33 (100%) grower pigs were stunted. The housing of pig and general management was poor. All the farms had pigs which were clinically positive for sarcoptic mange mite infestation however, laboratory results showed that 30 (23.6%) of the samples had *Sarcoptes scabiei* var. *suis*. Despite the fact that majority of the farmers (99.2%) reported controlling of mange using ivermection, 69.3% of them reported recurrence of the disease. It is conclude that sarcoptic mange mite infestation is a problem in pigs kept by smallholder pig farmers in Mpwapwa district. Therefore, education to farmers on better pig management and feeding coupled with good mange control measures may help to overcome the problem of mange infestation in Mpwapwa district.

Key words: sarcoptic mange, pig management, diseases, smallholder farmers

INTRODUCTION

Pig production forms an integral part of farmer's economy in many parts of the world. Pig keeping is increasingly becoming an important economic activity in most resource poor communities of sub-Saharan Africa. This trend is likely to continue due to minimal investment capital required, quick return and diminishing grazing land for ruminants (Speedy, 2003). As evidenced by the fact that pork consumption exceeds all other livestock meat products throughout the world, it is apparent that pigs and pork play a vital role in providing high quality protein to human (Speedy, 2003). In Tanzania, the pig industry is still at its infancy stage as the country population sums to 2.7 million of which more than 90% are kept by smallholder farmers who practice indoor and outdoor production system (URT 2016). However, of recent the industry is becoming popular in many parts of the country and provides significant contribution to meat supply (Mkupasi, 2014). The performance of pigs in Tanzania is low due to poor husbandry

practices, inbreeding, inadequate support services, diseases and lack of slaughter and marketing infrastructure (URT, 2006; Wilson and Swai, 2014).

Pig industry is constrained by health problems which range from infectious to non infectious diseases. Malnutrition is among the big problems in pigs in most of the pig farmers. The poor grower-pig performance in the smallholder herds in the tropics which is attributed to among others inadequate and poor-quality feeds (de Fredrick and Osborne, 1977; More *et al*., 1999). Infectious diseases like African swine fever, Foot and Mouth disease and bacterial diseases substantially limit the pig production in Tanzania (Wilson and Swai, 2013). Internal and external parasites are common as a result of climatic and management factors (Kambarage *et al.*, 1990; Esrony *et al.*, 1997; Wilson and Swai, 2013; Nonga and Paulo, 2015). The parasitic diseases have been among the leading causes of economic losses like mortality, decreased litter size, poor growth rate, reduced weight gain and poor reproduction performance (Wilson and Swai, 2013 & 2014).

Sarcoptic mange infestation in pigs has been reported to be among the important parasitic disease in Tanzania and East Africa (Kambarage *et al.*, 1990; Wabacha *et al.*, 2004). Nevertheless, there are limited studies that have been conducted to ascertain the magnitude of mange problem in pigs, its distribution and the possible risk factors for the infestation particularly in the central zone of Tanzania. The current study was undertaken to determine the prevalence of sarcoptic mange infestation and identify risk factors in pigs kept by smallholder farmers in Mpwapwa town, Dodoma Tanzania. The importance of this study is based on the fact that the knowledge of the spectra of the disease and its epidemiology is important in the formulation of effective control measures aimed at improving the pig industry in the country.

MATERIALS AND METHODS

Study area and study design

The study was conducted in Mpwapwa as one of the district in Dodoma region which, is located at 120 km from Dodoma municipality. Geographically, Mpwapwa district is positioned between longitude 35°45" and 37°00" East and latitude 6°00" and 7°30" South. The district is located at an elevation of 1007 meters above sea level. The study design was a cross-sectional study which involved four streets namely Hazina, Town area, Ving'hawe and Soko dogo that were purposively selected based on availability of smallholder pig farmers and farmers willingness to participate in the study. Mpwapwa district has a human population of 305,056 (PHCT, 2013) and in 2008, the district had pig population of 37,015 (NSCA, 2008). The study was conducted between October 2015 and February 2016.

Sample selection and sampling

In the study streets, households keeping pigs were identified with the assistance from the livestock extension officer. A total of 22 households accepted to participate in the study. A questionnaire containing information on pig production and management, presence of mange in the farms and mange control measures, and potential risk factors for mange mite infestation was administered to respondents. Direct observation was done to to record the type of pig house and and pig feed and feeding system.

Prior to sample collection, all the pigs in the farm were clinically examined with

particular emphasis on mange mite infestation. The general body condition was assessed and for the growers, the body size was corraleted with the age. This was followed by thorough clinical examination for mange on the skin. The key clinical lesions that were looked for were presence of small red papules and general erythema of the skin. Presence of itching was observed through a constant scratching of a pig against objects and biting. Emphasis was on presence of lesions like alopecia, thick brown scabs, thickening and wrinkling of the surrounding skin (hyperkeratosis) especially around the ears, head, neck, shoulder and legs. Finding of any of the listed clinical lesions, the farm and the individual pig was putatively grouped as mange positive.

For sampling purposes all the pigs that had lesions suggestive of mange were categorized into grower pigs with the age between four and six months and adult pigs (above six months). The sample size of 127 pigs was selected to allow a detection level of 5% with 99% certainty (Canon and Roe, 1986). These included 33 growers and 94 adults and 95 were female pigs and 32 were males.

Sample collection, handling and laboratory identification of mange

The selected pigs with lesions were physically restrained by using a pig snare and sampling was undertaken. Sampling of skin scrapping for mange identification was done as described by Davis and Moon (1990). Briefly, by using a clean surgical blade which was prior dipped in mineral oil, the skin area of about 2.5 cm^2 with lesions was scrapped until blood was seen to ooze out. For each study pig, at least two samples were collected from different areas of the skin with lesions. After sample collection, the scrapped area was disinfected using povidone iodine and sprayed with oxytetracycline antibiotic before the pig was released. The skin scraping samples were transferred to the clean plastic containers, well labelled and stored at room temperature until analysis for mange in the laboratory. Laboratory analysis was done at LITA Mpwapwa parasitology laboratory.

In the laboratory, the samples were transfered from the plastic containers into glass petri dish, crasshed and added with 10 ml of potassioun hydroxide (KOH) 10 % solution and allowed to stay for 24 hours so as to allow digestion of crusts. Non crusted samples were put in a petri dish and then a drop of mineral oil was added on the scrapings. Then the mixture was allowed to mix thoroughly and the petri dish was put under a light microscope and the sample observed under ×10 and ×40 objectives. Identification of mange mites of pig was done according to the standard identification key described by Sousby (1982). The positive samples were the ones which contained adult mange mites.

Data analysis

The collected data was entered in Microsoft Excel spread-sheet and were analysed using Epi Info™ Version 7 (Centre for Disease Control, Atlanta, USA). Using Statcalc, proportions of categorical variables were computed and further compared using the chi-square test at a critical probability of $P < 0.05$. The strength of associations between dependent and independent variables were determined using 2 x 2 contingency tables.

RESULTS

Demographic characteristics of respondents and pig management system in Mpwapwa town

A total of 22 households were visited and the majority of respondents were females (81.8%) and had primary education (72.8%). On average, each of the study household had a pig herd size of 10 ± 14 (ranged between 1 and 60 pigs per household). The summary of demography of respondents and management of pig in Mpwapwa town is summarized in Table 1. Pigs were reported to be fed mainly on non compounded feed which included maize bran, green leaves, pumpkins, potatoes and cassava wastes. Sometimes, they were being given kitchen leftovers like beans, rice, vegetables and stiff porridge "*ugali*". Some of the respondents (19.7%) were providing compounded feed (commercial feed) to their pigs as supplementary feeds. All of the grower pigs examined 33 (100%) seemed stunted with poor body condition.

Table 1. Respondents demographic characteristics and pig management system in Mpwapwa town

Parameter assessed	Category	Number (%)
Respondents demography (n=22)		
Sex	Female	18 (81.8)
	Male	4 (18.2)
Education level	Primary school	16 (72.8)
	Secondary school	4 (18.1)
	Above secondary school	2 (9.1)
Street of residence	Ving'hawe	8 (36.4)
	Soko dogo	7 (31.8)
	Town center	4 (18.2)
	Hazina	3 (13.6)
Pig management system (n=127)		
Street of pig sampling	Hazina	40 (31.5)
	Soko dogo	17 (13.4)
	Town center	18 (14.2)
	Ving'hawe	52 (40.9)
Age	Adult	94 (74)
	Growers	33 (26)
Sampled pig sex	Female	95 (74.8)
	Male	32 (25.2)
Breed	Landrace cross	76 (59.8)
	Large White cross	51 (40.2)
Type of management	Indoor	127 (100)
Housing floor type	Concrete	97 (76.4)
	Earthened	30 (23.6)
House cleanliness	Clean	79 (62.2)
	Dirty	48 (37.8)
Feed type	Compounded	25 (19.7)
	Not compounded	102 (80.3)
Feeding frequency per day	Once	51 (40.2)
	Twice	76 (59.8)
Source of breeding boars	Other farms	72 (56.7)
	Own boars & other farms	55 (43.3)
Status of growth in grower pig (n=33)	Stunted	33 (100)
	Normal growth	0 (0)

Prevalence of mange infestation in pig

A total of 127 pigs were sampled from 22 households that were selected in four streets of Mpwapwa town. The results of mange infestation and the control measures are shown in Table 2. All the farms were observed to have pigs that showed clinical manifestations that were suggestive of mange infestations (Figure 1). The observed clinical signs and lesions were irritation, scratching against walls, hyperkerotosis, alopecia, dull grey or brown in skin appearance. The lesions were commonly found on the ears, head, neck, shoulder or legs. Some of the grower pigs had dermatitis and raised red papules. Skin scrapping laboratory examinations revealed that 30 (23.6%) of the samples had mange which was identified as *Sarcoptes scabiei* var. *suis*. Majority of the farmers (99.2%) were controlling mange by routine use of ivermectin injection still most of them (69.3%) reported recurrence of the lesions and they concluded that the control measures were not effective.

Factors for mange infestations

During data collection and analysis, a number of factors were examined and relationship with mange infestation in pigs was worked out (Table 3). The factors that were considered include age of pig, sex, breed, breeding boar, feed type and feeding frequency, housing type and cleanliness. The results indicated that all the factors had no direct link with mange infestations.

Table 2. Sarcoptic mange infestation and control in pigs reared at Mpwapwa town

Parameter assessed	Category	Number (%)
Clinical mange	All farms	127 (100)
Mange infestation confirmed in laboratory	Positive	30 (23.6)
Mange infestation in pigs per street	Hazina	11 (8.7)
	Soko dogo	5 (3.9)
	Town center	5 (3.9)
	Ving'hawe	9 (7.1)
Mange control measures	Ivermectin	126 (99.2)
	Waste oil	1 (0.8)
Effectiveness of mange control measures	Not effective	88 (69.3)
	Effective	39 (30.7)

Figure 1. A photograph of a pig with clinical lesions of sarcoptic mange. Note the hyperemia around the neck, generalized alopecia, hyperkerotosis of the skin, dull grey with black patches on the skin appearance.

Table 3. Risk factors of sarcoptic mange infestation in pigs

Factor	Category	Number (%) infested	RR	95% CI	P value
Age	Adult (n= 94)	26 (27.7)	0.82	0.69 - 0.98	0.1165
	Growers (n= 33)	4 (12.1)			
Sex	Female (n= 95)	22 (23.2)	1.03	0.82 - 1.29	0.9773
	Male (n= 32)	8 (25)			
Breed	Landrace cross (n= 76)	19 (25)	0.96	0.79 - 1.16	0.8156
	Large white cross (n= 51)	11 (21.6)			
Breeding boar	Borrow (n= 72)	20 (27.8)	0.88	0.73 - 1.07	0.2934
	Both borrow and use owned boar (n= 55)	10 (18.2)			
Feed type	Compounded (n= 25)	7 (28)	0.93	0.71 - 1.21	0.7548
	Non compounded (n= 102)	23 (22.5)			
Feeding frequency per day	Once (n= 51)	9 (17.6)	1.12	0.94 - 1.37	0.2777
	Twice (n= 76)	21 (27.6)			
Pen floor type	Concrete (n= 97)	23 (23.7)	0.99	0.79 - 1.25	0.8389
	Earthened (n= 30)	7 (23.3)			
Pen cleanliness	Clean (n= 79)	21 (26.6)	0.91	0.74 - 1.09	0.4282
	Dirty (n= 48)	9 (18.8)			

Note: RR - risk factor, CI - confidence interval

DISCUSSION

The study was conducted to establish the prevalence sarcoptic mange infestation in pigs kept by smallholder farmers and establish the possible risk factors for infestations in Mpwapwa town, Dodoma. It was found that the pig management system was poor which probably contributed to the observed high sarcoptic mange infestation in pigs. All the farms visited were found to be infested with mange based on clinical examination giving a general picture that the problem is big and need immediate institution of control measures. Otherwise, farmers will keep on facing losses associated with mange infestations which range from stunted growth, piglet mortality, high treatment costs and reduced production and reproduction efficiency (Kagira *et al*., 2013).

It was found that the majority (81.8%) of the smallholder pig farmers in Mpwapwa town were female and they kept on average of 10 ± 14 pigs per household mainly being Landrace and a few had Large white crosses. This shows that pig production is enterprises which provide sources of income to majority of the people in urban areas especially women who have no formal employment. The increased human population in developing countries has triggered migration of people from rural to urban areas in an increasing trend which have ultimately lead to increased urban poverty. One of the strategies to address poverty in urban areas is to keep livestock like pig so as to increase income, household food supply, social networks, and security in times of hardship, as well as maintaining cultural values (Mlozi, 1996; Mvena, 1999). The findings of the current study is in line with the previous report by Karimuribo *et al.* (2011) in Iringa, Tanzania who also found that women are the most group of the community in urban areas who engage with pig farming. Elsewhere, in Papua New Guinea, it was reported that pig farming is the duty of women (Sillitoe, 2001).

Pig feeding is an important requirement in pig production since pigs need nutritious feed to boost their growth, reproduction and production efficiency. A well fed pig will have strong immunity which helps to overcome disease problems including mange infestations. In Mpwapwa town, most of the pigs were poorly fed on non-compounded feed like maize bran, green leaves, pumpkins and kitchen leftovers. This kind of feeding, establishment of nutritional contents is difficult and therefore what the pig gets per day is difficult to ascertain in terms nutritional contents. Poor feed and feeding practices may expose pigs to limited or unavailability of essential nutrients like lysine and methionine which are essential for growth performance in pigs (Lekule and Kyvsgaard, 2003). It was observed during this study that most of the pigs were stunted and the slaughter weight could be attained at one year and above, something that may not be cost effective to the farmer. This poor nutrition may also be a predisposing factor to diseases including mange. This is in agreement with the observation by Karimuribo *et al.* (2011).

In most of the pig farms visited, the pigs were totally confined in rudimentary housing of local materials and with little consideration for hygiene or welfare. Some of the pig houses were made of earthened floor reinforced with stones and gravels which was associated with a lot of potholes which made the cleaning work to be difficult. Even the households that had their pig houses with concrete floor, still the floor were poorly made and always had potholes. Poor houses for pigs not only is against animal welfare but also has a lot in terms of hygiene and disease control measures. Studies by Wabacha *et al.*

(2004); Karimuribo *et al.* (2011) and Wilson and Swai (2014) reported that most of the pig farming in Tanzania are associated with poor housing and hygiene system which predispose pigs to parasitic infections like helminthosis, coccidiosis and skin conditions like mange. Therefore, it is important that to attain an improved pig production, farmers should be educated among others the design, construction and maintenance of a pig house which will not be the source of problems to pigs.

It was further found that majority of households keeping pigs shared breeding boars, a practice that can enhance spread of many disease problems including Africa Swine Fever, brucellosis and mange infestations. However, moving boars between multiple farms may pose a problem of pig inbreeding. Many of the pig farms in Tanzania and Africa at large face problems of inbreeding which its major cause is sharing of boars between farms (Kimbi *et al.,* 2015; Montsho and Moreki, 2012; Wilson and Swai, 2014). Similar observations of borrowing breeding boars among farmers have been observed elsewhere (Madzimure *et al.,* 2013; Kimbi *et al.,* 2015). It is therefore important that a better breeding system is established between pig farmers in a place to avoid sharing of breeding boars which otherwise have been observed to have so many side effects.

The study revealed that clinical sarcoptic mange infestation in pig was prevalent in all 22 smallholder pig farms in Mpwapwa district. However, skin scrapping confirmation showed that out of 127 samples from clinically sarcoptic mange infested pigs, 23.6% had *Sarcoptes scabiei* var. *suis.* The current prevalence is in line with the study by Kambarage *et al.* (1990); Permin *et al.* (1999); Wabacha *et al.* (2004); Nsoso *et al.* (2006) and Abdu and Gashaw (2010) but far higher than what was reported by Jufare *et al*. (2015) and Abdu and Gashaw, (2010) in Ethiopia. Kagira *et al.* (2013) reported a prevalence of 63.7% of sarcoptic mange infestation in free-range pigs in Kenya. However, the discrepancy in prevalence may be due to differences in local prevalence of sarcoptic mange in the specific region, seasonality, the type of pig management, sampling techniques and laboratory methodologies employed.

Mange infestation has been reported to be among the parasitic diseases that limit the growth of pig industry in Tanzania (Kambarage *et al.,* 1990; Karimuribo *et al.,* 2011; Wilson and Swai, 2014) and elsewhere in Africa (Wabacha *et al.,* 2004; Kambashi *et al.,* 2014; Jufare *et al.,* 2015). Sarcoptic mange causes a lot of suffering to the pig and its effects are realized based on major economic importance in pig farming as it significantly reduces production efficiency, and costs of acaricides used in its control are enormous and run into billions of dollars worldwide (Davies, 1995). Sarcoptic mange is a serious constraint to production of pigs kept under intensive indoor systems (Kambarage *et al*., 1990; Wabacha *et al*., 2004). The suffering caused by sarcotic mange that include constant itching associated with alopecia, nodules, hyperemia and wrinkling of the skin which makes the pig not to eat properly is an animal welfare issue. During the current study, all age group of either sex or breed were equally predisposed to sarcoptic mange infestations. Farmers reported to use ivermectin injections and waste oils as control measures but still the problem seemed to be persistent and was a constraint to economical pig production in Mpwapwa town. Therefore, it is important that the practical disease control measures should be instituted so as to minimize the problem of mange infestation in pigs kept by smallholder farmers in Mpwapwa town.

It is concluded that sarcoptic mange mites is a problem in pigs kept by smallholder pig farmers in Mpwapwa district. This was thought to be compounded by poor pig management system and poor nutrition. Therefore, education to farmers on better pig management coupled with good mange control measures may help to overcome the problem of mange infestation in Mpwapwa district.

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