Chapter 1: Introduction

Bangladesh is one of the most densely populated agricultural countries in the world, although per capita cultivable land is not sufficient (Taylor and Roese, 2006, Sadika *et al.,* 2012). Livestock plays a pivotal role for providing essential protein sources for the population, alleviating unemployment problem and participate in earning foreign exchange (Taylor and Roese, 2006). Cattle, buffalo and goat are the most common livestock reared under commercial, semi-intensive or household rearing system. However relatively smaller population of sheep, pig and most recently camel and dumba are being reared in some part of the country (Islam *et al.* 2016). Dongnala of Kaptai Upazilla under Rangamati district isa remote hilly area and a well-known pig rearing locality where pig farming is mostly popularamong indigenous people (Hossain *et al.* 2011). Indigenous pigs, foreign breeds like Hampshire as well as cross bred pigs (indigenous and Hampshire cross) are reared byboth traditional and household rearing methods (Hossain *et al.* 2011).

Most often the pig farms are affected with infectious and non-infectious diseases that render significant economic threat to the poor farmers. Among them bacterial diseases like hemorrhagic septicemia (HS), anthrax and brucellosis, protozoal diseases like coccidiosis, viral diseases like foot and mouth disease (FMD) and systemic affections with undiagnosed etiology like diarrhea, pneumonia are mostly reported. (Hossain *et al.*, 2011).Scabies, which is also known as the seven-year itch is an important parasiticskin infestation of swine caused by different species of mites, either by *Sarcoptes scabiei* or *Demodex phylloides* (Hicks and Elston, 2009). The symptoms include severe itchiness and pimple-like rash across the body surface. Sarcoptic Scabies refers to itchiness of skin caused by *Sarcoptes scabiei*.These mites penetrates animal skin by secreting enzymes that dissolve into the epidermal layer of the skin followed by eating tissue material by continuous inward burrowing inside the animal skin. Once inside, a female mite starts burrowing further andlay eggs untilcompletion of the lifecycle at 6 weeks. Newly hatched mites continue the process of eating skin tissue and continue lifecycle. The scabies mite causes allergic reactions and facilitates secondary bacterial infections (Beckham *et al.,* 2009). The

injured site caused from burrowing may become infected with *Streptococcus spp*.and may result in serious consequences such as rheumatic fever (Simone *et al*., 2009).

Upazilla veterinary hospital (UVH) in Kaptai is the only veterinary health service provider to the pig farms of this locality where records of different disease and disease conditions are recorded. Among different infectious and non-infectious diseases of swine, sarcoptic scabies is one of the important contagious diseases and very likely to be prevalent in a dense pig rearing community like Dongnala. But unfortunately, there is no published report of scabies infestation in pig farms of this area. Therefore, this report describes the clinical cases of sarcoptic scabies in pig farms of Dongnala particularly emphasizing on the clinical alterations observed in affected swines.

Chapter 2: Materials and Methods

2.1. Study Area

This study was conducted at Dongnala, Kaptai Upazilla under Rangamati District of Bangladeshwhich lies at $22^{0}24'35"$ North Latitude and $92^{0}7'12"$ East Longitude. The approximateland area of the locality is 150 acreswith an estimated pig population of 70.For the current study, the sampling was conducted opportunistically based on owners'complaintsto the veterinary surgeon regarding skin affections and itchiness of their farm reared pigs. A herd basis sampling approach was conducted where the entire suspected herd was investigated for specific clinical symptoms. The oldest animals were of the primary concern followed by investigation on younger animals of the same herd. Under the above descriptors a total of twenty five (N=25) pigs were examined for scabies.

Figure 1: Location of study area in Kaptai Upazilla Map

2.2. Diagnostic procedure

Diagnosis of the disease was conducted by general physical examination of the suspected pigs, clinical symptoms and laboratory procedures.

2.2. A. Physical Examination

Data recorded for each animal included animal demography (Age, Sex, Body Weight and Breed), rectal temperature. The date of case occurrence, clinical symptoms, feeding history of the affected swines were also recorded. Physical examination was conducted under the close supervision of upazilla veterinary surgeon where each swine patientswere examined for any pruritus and presence of papules. Different areasof the bodywere observed through palpation and were examined to detect any pain.

2.2. B. Presumptive Clinical Diagnosis

The tentative diagnosis was arrived from owner's complaint(s), clinical history and specific clinical signs for Scabies.In short, the head region of the suspected pigs, more specifically, the ears followed the body, tail and legs were examined for pruritic lesions. Increased scratching, dirty ears and hyperkeratosis may indicate the presence of mites (Averbeck *et al.*, 1993).

2.2. C. Laboratory Diagnosis

Sample collection

Skin scrapings were sampled form suspected areas of the animal body particularly focusing on crusts and pruritic lesions. Scrapings were first taken from the crusted ears and faces followed by other areas of the body. Deep skin scraping technique was followed where scraping was done by using a clean scalpel. In brief, periphery of the skin lesion was targeted while holding the blade at a right angle to the lesion; the skin was scraped in the same direction until blood appeared from the sampling site. The samples with crust were digested in 10% potassium hydroxide (10 volumes of 10% KOH to 1 volume of crust). As a result, mite exoskeleton was left unharmed while breaking down the most crust components. Then the collected materials were transferred on a microscope slide with a drop of immersion oil and finally covered with a cover slip. This was followed by observation of mite under light microscope

with low power (×10) objective. Higher magnifications (40X and 100X) were used for identification of mite genus/species.

Identification of Organism

The mites were identified by the identification keys described by Averbeck and Stromberg (1993). *Sarcoptes scabiei*is very small white mites. The male mite size ranges from 213-285µm in length and 162-240 µm inwidth. While the female mite can be 300-504 µm long and 230-420 µm wide. The mites are almost round to ovoid in shape when viewed from the back while it is ventrally flattened and dorsally rounded in side view. *Sarcoptes scabiei* possess a total of eight stumpy legs (parasitesinhumans.org).

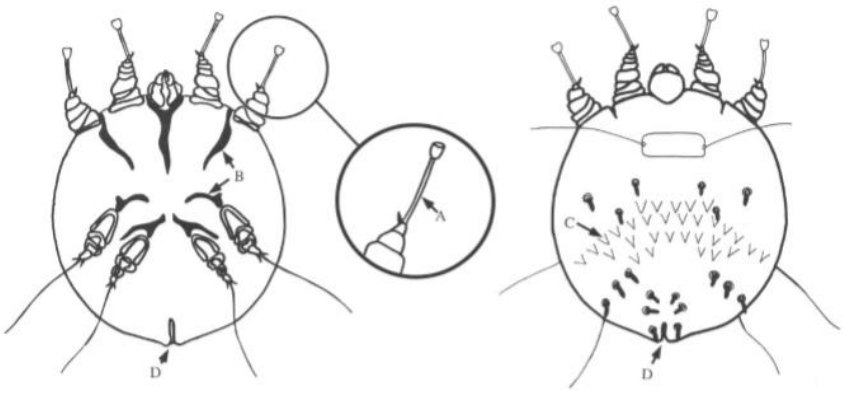

Figure 2: Ventral (Left) and dorsal (Right) view of an adult *Sarcoptes scabiei.* (A) Empodium. (B) Apodemes. (C) V-shaped spines. (D) Anus.

Figure 3: Dorsal (Left) and Ventral (Right) view of *Sarcoptes scabiei* under microscope

Chapter 3: Results

3.1. Distribution of Cases

In total, ten (10) cases of scabies were confirmed by physical and microscopic examination from 25 examined pigs at Dongnala in March 2018, therefore the case frequency was 40%.However, the highest percentage of scabies was found in cross-bred pigs (50%, 5 confirmed cases out of 10) followed by 25% (2 out of 8) is indigenous breed and 42% (3 out of 7) in Hampshire breed. On the other hand, frequency of scabies was found higher in mature pigs (50%, 6 positive cases out of 12) compared to that in piglets (37%, 3 out of 8) or in farrow (20%, 1 out of 5).

Table 1: Percentage of Scabies in Swine at Dongnala, Kaptai, Rangamati according to breed (N=25)

Breeds	**Population**	**Scabies Positive**	**Percentage**
Indigenous	8	2	25%
Indigenous × Hampshire	10	5	50%
Hampshire	7	3	42%
Total	25	10	40%

Table 2: Percentage of Scabies in Swine at Dongnala, Kaptai, Rangamati according to age (N=25)

Groupings	**Population**	**Scabies Positive**	**Percentage**
Boar/Sow	12	6	50%
Piglet	8	3	37%
Farrow	5	1	20%
Total	25	10	40%

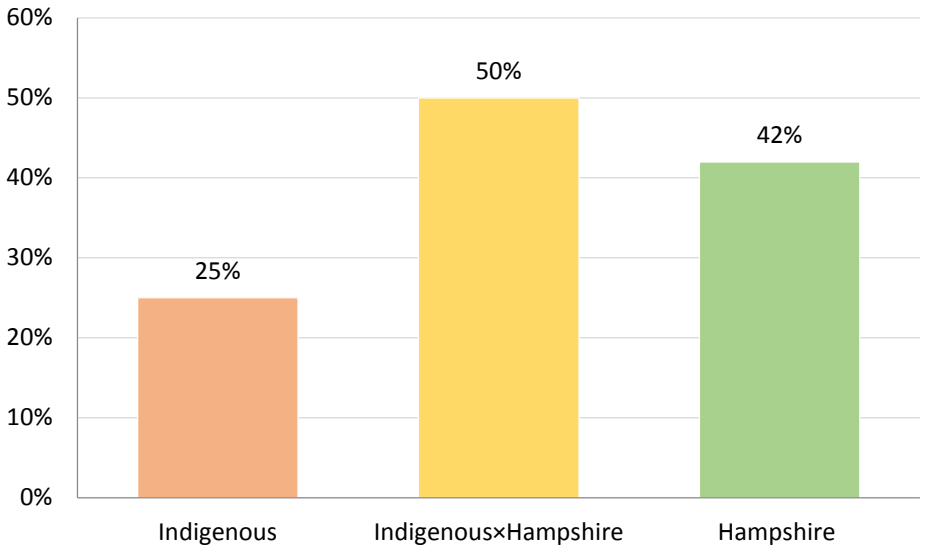

Figure 4: Frequency distribution of Scabies according to breed

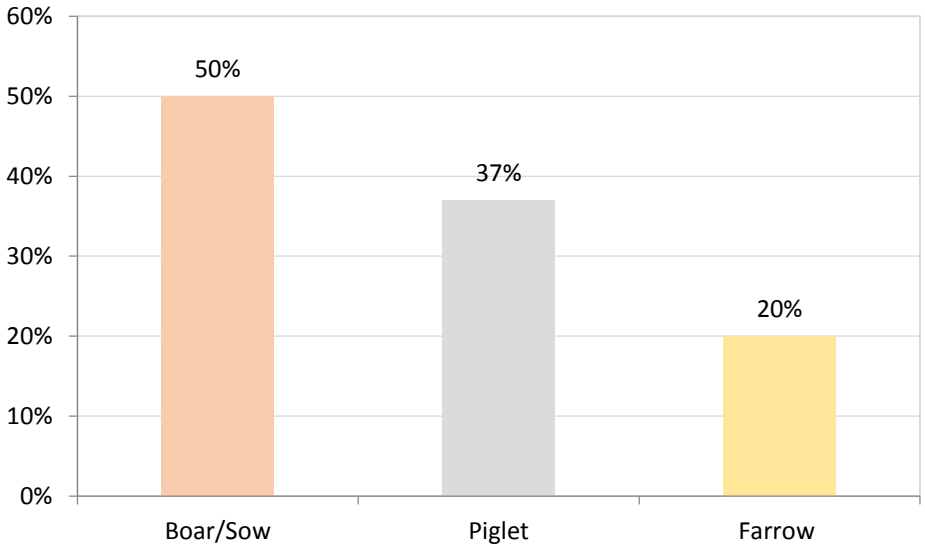

Figure 5: Frequency distribution of Scabies according to age

3.2. Frequency distribution of Clinical manifestation

The pigs affected with sarcoptic scabies presented pruritus, hypersensitivity reaction, alopecia, crust formation, presence of papules. Among these signs, crust formation was predominant in the affected swine (50%), then pruritus (40%) and presence of papules (10%).

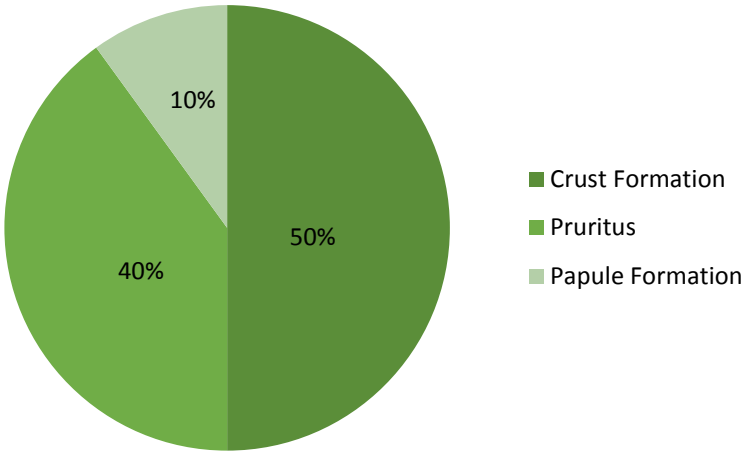

Figure 6: Frequency distribution of clinical manifestation in scabies

Chapter 4: Discussion

The *Sarcoptes scabiei* is a parasite that lives in the epidermal layer of skin. This mite feeds on the constituents of stratum corneum which is also known as cornified envelop (CE). The cornified envelope is the physical barrier against outer environment and it constitutes with the flattened dead-cell of different proteins. A complex series of insoluble lipids help to produce a complete barrier. Stratum corneum excludes foreign substances as well as harmful organisms andprevents the loss of vital fluids. This system is continuously regenerated by differentiating keratinocytes in a highly organized process.When the female scabies mite burrows into the superficial skin layers, it moves by mechanically disrupting the CE. Proteases would be required to digest the ingested skin proteins and perhaps also might play a role in degrading skin proteins outside of the mite (Beckham *et al.*, 2009).

Eggs are laid in small numbers as the mite burrows and as these hatche, six-legged larvae climb out on to the skin and search for hair follicles. The action of moving mites within the skin and produces an intense itch that may resemble a hypersensitivity reaction in appearance. Eggs producea massive allergic response followed by producingmore itching. Mite uses its mouth parts and special cutting surfaces on the front legs. The affected pigs show the lesions which start on itching can be intense and associated with a hypersensitivity reaction to the mites. As the hypersensitivity subsides, typically after several months, the thickened, rough, dry skin is covered with grayish crusts. Pigs with non-crusted lesions have the highest density of mites on the face while pigs with crusted lesions have the highest density of mites in the ear. Infestations are negatively correlated with daily weight gains and feed conversion in swines (Averbeck *et al.*, 1993).

This study reveals the overall case frequency of scabies in suspected pigs of Dongnala which is 40%. This frequency is quite high considering the previous reports of scabies in Gazipur, Bangladesh was 12.5% in goat (Rony *et al.*, 2010) and 10.71% in swine population of 196 in Meghalaya, India (Laha *et al.*, 2014). Several factors may have caused this high frequency of scabies case such as poor farm hygiene, lack of use of anthelmintic, inappropriate husbandry practices, lack of

veterinary health care support and high density of pig population (Hossain *et al.*, 2011).

These animals were from different herds of different ages. Most of the swines had the history of feeding rice polish, boiled rice and some unconventional feeds like cauliflowers, arum and hilly grass. The infestation has been found predominant in crossed breeds (50%) followed by literally resistant in indigenous breeds (25%) of swine breeds. This study also has found that free roaming adult swines (50%) are exposed to scabies while younger ones (20%) seems to be protective. This may be due to the fact that certain environmental conditions like overcrowding, poor herd hygiene and ignorance which is conductive to the spread of scabies. Previous reports have shown an association between significant overcrowding (Up to 30 people per household) and a prevalence of scabies approaching 50% (Currie *et al.*, 1994)

Conclusion

Sarcoptic scabies was seen more commonly in male compared to female. Common clinical findings were pruritus, crust formation, alopecia, papule formation, hypersensitivity reaction. Ignorance and poor hygienic management was common in the case history. Improving the housing condition, consultancy with veterinary surgeon and treatment protocol should be maintained.

Limitations

The number of clinical Sarcoptic Scabies cases in this study was small (25 cases). The diagnosis of Sarcoptic Scabies was only based on clinical and microscopic findings. The pathological examinations and other important laboratory examinations were not done. Distribution of the diseases throughout the population was not possible to show.

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The author
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Biography

I am Mong Sing Nu Marma, son of Mr. Mui Ching Mong Marma and Mrs. Maching Prue Marma. I passed Secondary School Certificate (SSC) in 2010 (GPA-5.00) followed by Higher Secondary Certificate (HSC) Examination in 2012. Now I am an intern veterinarian under the Faculty of Veterinary Medicine in Chittagong Veterinary and Animal Sciences University. In the future, I would like to work as a veterinary practitioner and do research on clinical animal diseases in Bangladesh.