Original Article

Livestock associated epidemiological information profiling in New Sandwip Island (Jahajerchar) of the Meghna estuary, Noakhali using participatory disease searching tool

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ABSTRACT

Objective: The present study was conducted in New Sandwip island (Jahajerchar) of the Meghna estuary, Noakhali to explore animal species are being reared, their disease status, and also to finding out the constraints and opportunities for keeping livestock in the island.

Materials: Considering local knowledge as an epidemiological intelligence, the livestock species and their disease profile as well as livestock keeping problems were assessed through two focus group discussion with informants' interview using Participatory Disease Searching (PDS) tools. The interview was conducted predominantly using semi-structured questionnaire (SSI) and other participatory epidemiology(PE) tools such as simple ranking (SR), pair-wise ranking (PWR), proportional pilling (PP) and transect work (visualization) were applied with flexibility to collect information.

Results: PDS tools identified sheep (69%) is the main livestock species followed by cattle (16%) and buffalo (15%) in the island. The Peste des Petits Ruminant (PPR) in sheep (90%), anthrax in cattle (52%) and Haemorrgic Septicemia (HS) in buffalo (59%) were confirmed as top important species-wise diseases via the study. This place is prospect for sheep and buffalo raising rather than cattle. Lack of of shelter (Khella) for keeping livestock during adverse climatic condition, no access of portable water along with inadequate veterinary health care facilities were recognized as constraints for livestock raising in this island.

Conclusion: This place is potential for sheep and buffalo raising rather than cattle. The study has validated the significance of accepting participatory disease searching tool in order to capture voluntarily submitted epidemiological data towards establishing a cost effective, unique national disease surveillance system in Bangladesh.

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KEYWORDS

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INTRODUCTION

Livestock is one of the main element of agriculture makes manifold offerings to the growth and development in the agricultural sector of Bangladesh. Livestock production is the second highest among all other sub-sectors of agriculture in Bangladesh (BER, 2012). The livestock resources of Bangladesh are mainly based on cattle, goat, sheep, buffalo, and poultry, and contribute in family income generation as well as a source of protein in rural Bangladesh. As growing of population and urbanization, the agricultural land is gradually declined and remaining maximum land is being allocated for crop production rather than animal grazing pasture land. The country has 23.63 million cattle, 25.60 million goat, 3.27 million sheep, 1.46 million buffalo, 261.77 million poultry and 50.52 million duck (DLS, 2015). Variability in geographical features and climatic condition causes unevenness in animal population throughout the country, for example, buffalo is suitable in coastal areas since the swampy environment is conducive for buffalo raising.

Livestock disease surveillance is critical for protecting public health, sensible control of diseases, and access to international trade markets in addition to improving animal health welfare. At present, participatory disease searching (PDS) technique has been evolved as a system to assess livestock disease status along with to gather epidemiological data. Due to the 'bottom-top' nature, participatory epidemiology (PE) became more popular and the central body to the development initiatives of international aid programme (Mariner et al., 2011; Hussain et al., 2001; Jost et al., 2007). Participatory Epidemiology (PE) commenced with interactive philosophies that upgraded the usefulness of animal disease surveillance in pastoralist livestock. At the same time, PE has been implemented in animal and human diseases surveillance in various settings (pastoral, rural, urban and peri-urban) throughout the world (Jost et al., 2007; Mariner et al., 2011). PE approach has been applied to control endemic and sporadic animal diseases in Africa and Asia as well (Jost et al., 2007). PDS tools have added value to already existing surveillance systems by increasing their sensitivity and rightness, and especially encouraging the insertion of marginalized rural peoples (Grace, 2003; Jost et al., 2007; Mariner et al., 2011).

In view of above, PDS approach has been adopted in profiling livestock associated status such as animal situation , animal disease status, and as well as to quantify the problem and prospects of livestock keeping in New Sandwip Island (Jahajerchar) of the Meghna estuary of Noakhali. The present study was conducted in New Sandwip island (Jahajerchar) to explore animal species are

being reared, and also to finding out the constraints and opportunity for animal keeping in the island. The study was rational as little information is known by the Department of Livestock Services on livestock rearing in this island that helps for the strategic planning in the light of disease control initiatives in the coastal areas.

MATERIALS AND METHODS

The study was conducted in New Sandwip Island (Jahajerchar) of Noakhali district is a silted island has been developed before a decade on the estuary of the mighty river Magna shown in **Figure 1**. The island is 29 km in length and 17 km in wide with an area of approximately 500 km² and is considered to be under Subornochar, Companiganj upazila of Noakhali district and Hatia upazila of Chittagong district. There are many creeks go throughout the island that are connected to each other and channelized to the Magna river.

Figure 1: New Sandip island (Jahajerchar) in the Maghna estuary, Noakhali

The interview was conducted using participatory epidemiology tool such as semi-structured questionnaire (SSI), simple ranking (SR), pair-wise ranking (PWR), proportional pilling (PP) and transect work (visualization) were applied with flexibility to collect information as described by Catley (2005). Two focus group discussion were conducted and informants were used as livestock owners, keepers, and veterinarians and paraveterinarians of Noakhali district. The informants decided place suitable for the interview. Interviews were conducted in local language so that all informants understand and participate effortlessly. An average of 10-12 persons was participated in each focus group discussion.

Semi-structured questionnaire (SSI): The data was recorded using semi structured questionnaire (SSI) directed by step-wise approachs including introduction,

animal husbandry (species, rearing, feeding, diseases, treatment, and vaccination), limitations to livestock rearing , if any, intended for profiling livestock status and disease situation of this island.

Simple ranking and Pair-wise ranking: In simple ranking (SR), a list of livestock species was prepared by questioning the informants to label livestock that are being raised in the island. These were then print on card and informants instructed to arrange or rank the cards in order of livestock population. This procedure was repeated to list and rank the livestock species by economic importance. Following the same procedure, simultaneously, listed and ranked the breeds of each livestock species, diseases in each livestock species, and also problem met during livestock raising.

Pair-wise ranking (PWR) is somewhat different than simple ranking where each listed items of simple ranking were compared exclusively with all the other listed items (as apple-to-apple comparison) and rank items by considering the relative importance and/or benefit of individual listed items. PWR is immensely beneficial where informants failed to reach consensus using simple ranking or where two listed items had the identical importance and scores. PWR provide way forward to solve the disagreement among informants during the simple ranking.

Proportional pilling: Proportional piling (PP) was performed to list and rank livestock species raised in the island by numbers and their economic importance. Squares were drawn on papers with each square signifying livestock species kept within the island. A total of 100 beans were given to participants. Informants then distributed 100 beans (*i.e.*, counters) to each square per relative number of each livestock species with the highest piles of according to the relative numbers of each species with the maximum beans signifying the most common livestock species in the island. The same procedure was repeated to rank the livestock species by economic importance. Relative occurrences of the livestock diseases, breeds of each livestock species, and problem encountered during livestock raising were assessed simultaneously following the identical procedure.

Transect work (visualization): Transect walk (*i.e.*, walk through the island) was conducted with informants to validate the information provided during interview. It offered the chances of spotting the itemized natural resources.

Data Management and Analysis: A database was created for statistical analysis using Microsoft Excel® tools.

Ethical approval: Not applicable

RESULTS

Two focus group discussions (FGD) were conducted in this study. Each group consists of 10-12 livestock keepers/owners, Veterinarians and paraveterinarians, with age range between 21 to 45 years, from the main land (Subornachar) upazila of Noakhali district. Semi Structured Interview(SSI) format Focus group discussion (FGD) revealed that livestock being raised as free range system in 'Bathan' with very limited veterinary services and no extra feed and mineral supplementations allowed for livestock. '*Bathan*' is a place where animal are grazed freely. The island has a total of 14 *bathan* where approximately 70,000 number of 3 species livestock being raised. Of 70,000 livestock, 48,300 were sheep, 11,200 were cattle and 10,500 were buffaloes. The main land livestock keepers shifted their livestock in this island particularly during May-June to November-December of each year because of scarcity of fodder and green grass in the main land as the land is used for paddy cultivation. Informants also added that some parts of the island submerge under water (about 5 feet) during tidal surge.
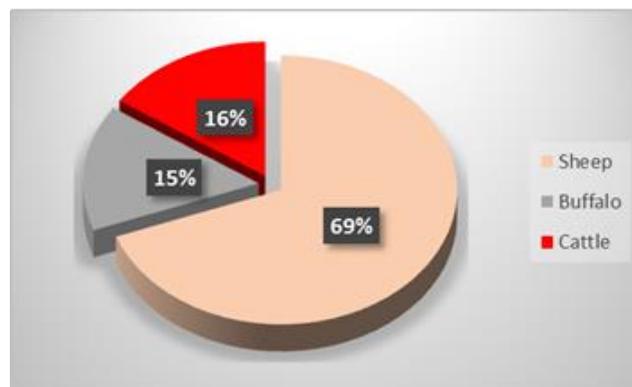

Figure 2. Livestock distribution in the New Sandwip Island (Jahajerchar), using Proportional Pilling tool

In FGDs, simple ranking and proportional pilling tools were used to identify and rank three major challenges that livestock keeper encountered during livestock keeping and raising in the island (**Table 1**). Insufficient forage during the dry season also identified as a problem in livestock raising especially for cattle in this island.

Application of simple ranking and pair-wise ranking indicated that sheep, cattle and buffalo were the common livestock in order of population in New Sandwip Island (Jahajerchar), while buffalo, cattle and sheep were recognized as livestock in order of economic importance. Simple ranking concurrenly documented one sheep breed (Native), three cattle breed (Native, Cross and Red Chittagong) and three buffalo breed (Native swamp type,

Table 1. List and rank problems encountered in livestock keeping and raising using simple ranking and proportional pilling tool

Sl No	Challenges in livestock keeping and raising	Simple Ranking	Proportion (%)
1	Lack of portable water for livestock	2	35
2	Lack of shelter for livestock	1	43
3	Inadequate veterinary health care facilities	3	22

Table 2: Livestock Breed in the New Sandwip Island using simple ranking (SR) and proportional pilling (PP) participatory epidemiology tool

Livestock	Breed	Proportion of Breed (%) (using PP tool)	Ranking of Breed (using SR tool)
Sheep	Native (Deshi)	100	1
Cattle	Red Chittagong	61	1
	Cross breed	22	2
	Native (Deshi)	17	3
Buffalo	Native (Deshi)- Swamp type	75	1
	Crossbred (Deshi X Murrah or Deshi X Swamp)	19	2
	Murrah	6	3

Table 3. Ranking and proportion of diseases among livestock population in the New Sandwip Island using simple ranking (SR) and proportional pilling (PP) of participatory epidemiology tool

Livestock	Name of Diseases	Proportion of diseases (%) (using PP tool)	Ranking of Diseases (using SR tool)
Sheep	Peste Des Petits Ruminants (PPR)	83	1
	Foot and Mouth Disease (FMD)	9	2
	Parasitic infestation (round worm)	5	3
	Anthrax	3	4
Cattle	Anthrax	52	1
	Foot and Mouth Disease (FMD)	19	2
	Liver fluke infestation	18	3
	Haemorragic Septicemia (HS)	11	4
Buffalo	Haemorrhagic Septicemia (HS)	59	1
	Liver Fluke infestation	20	2
	Foot and Mouth Disease (FMD)	16	3
	Anthrax	5	4

Figure 3. Sheep freely roaming in this island.

Figure 4. A buffalo herd freely roaming for searching feed.

Figure 5. Swampy island not be suitable for cattle raising confirmed through transect work.

Figure 6. Remnants of died livestock was found during transect work in the island.

Cross and Murrah) in the island. Informants identified and ranked diseases in each livestock species using SR tool, for example, Peste des Petits Ruminants (PPR), Foot and Mouth Disease (FMD), and Parasitic infestation as the diseases of Sheep; Anthrax**,** FMD, Liver fluke infestation (LFI), and Haemorragic Septicemia (HS) as the diseases of cattle; HS, LFI, FMD, and Anthrax as the diseases of buffalo. Ranking of diseases were performed using simple ranking tool, while proportional pilling tool further provided to breakdown in percentage of livestock population (**Figure 2**), livestock breed (species-wise) and livestock disease (species-wise) (**Table 2 and 3**) of the island.

Transect work documented no human dwelling and crop production in the island, however, presence of small trees and green grass of the island has been attracted mainland livestock keepers for animal grazing. The alluvial island was found to be suitable for sheep rearing as the species is capable to access feed from the swampy coastal areas. Alongside, livestock population (irrespective of species) were roaming freely in island and the cattle were found very weak and lean and even few were found to be infected with FMD during transect work. Compared to cattle, on the other hand, sheep and buffalo were found to be good health (**Figure 3 and 4**). Buffalo

were found to be free roaming at around 5-7 Km radius in the each Bathan of the island.

DISCUSSION

Sheep was found dominating among all livestock species as the native sheep species natural resistant to infectious diseases reasoned for sheep rearing in coastal region of Bangladesh (Haque et al. 1988). Since, the species has the ability to acclimatize with harsh coastal region climate, profitability with poor husbandry management and feeding supplementation, rural farmers of Bangladesh always prefer to kept sheep for their livelihood (Sultana et al., 2011). In addition, sheep are kept as a family tradition of livestock rearing particularly in coastal areas of Bangladesh. For example, sheep are raising popularly than goat and cattle in coastal area Noakhali district of Bangladesh (Rahman et al., 2014).

PPR has been acknowledged as an acute and highly transmissible economically important endemic viral disease of small ruminants in Bangladesh. The disease was reported with high morbidity and mortality rate in small ruminants of Bangladesh (Rahman et al, 2016). The documentation of earlier study was in aligned with this study where PPR was found as main disease of sheep. As this island is located in the remotest area of the country, ensuring technical and operational support such as annual immunization along with raising community awareness from main land to this island through limited government veterinary field workers and to ensure veterinary health facilities have always been challenging. Islam et al. (2015) stated that control of PPR may be achieved through annual vaccination along with adoption of perch housing for small ruminants in Bangladesh.

HS has been captured as a top most imporant disease of Buffaloes followed by LFI, FMD and Anthrax. This result is supported by the findings of other researcher in Bangladesh (Mondal and Yamage, 2014). Bangladesh is considered to be endemic with LFI and the costal areas are viewed as hotpots of this disease since the buffaloes being raised in this areas (Sardar et al., 2006; Rahman et al., 2017).

A very few reports of LFI in buffaloes in Bangladesh may be due to underreporting, because this species is generally raised in swampy rural and coastal areas, and normally faraway from urban areas where Upazila Livestock offices are located. The intermediate host of *Fasciola gigantica* (liver fluke) is much more aquatic than that of *F. hepatica* (Spithill et al., 1999) and only *F. gigantica* is prevalent in Bangladesh (Rahman et al., 2017). As buffaloes inhabit swampy areas the prevalence of

fascioliasis is expected to be higher than other ruminant species ([Khan et al., 2009](), [2011](); [Yadav et al., 2015]()). Because of the livestock keepers moved their FMD infected livestock from the main land to this island, the animal movement is responsible for the prevalence of the disease in all rurinant species in the island ([Rweyemamu et al., 2008]()).

During tidal surge, the island is inundated with saline water contaminated the water sources (ponds). Since a reasonable portion of the island is marshy disfavors of suitable fodder growing in the island (**Figure 5**). May be due to the above reasons, cattle were found lean and weak in the island, and for why, the island could not be considered for cattle keeping. On the other hand, buffaloes were healthier than cattle because of their ability to feed both in dry land and wet land (including submerged water). Anthrax, HS and FMD were endemic diseases of Bangladesh. The livestock disease proportion of disease status of this study was compliance with the findings of other researcher in Bangladesh ([Mondal and Yamage, 2014]()).

Many livestock died during adverse climatic condition was found as remnants of died livestock (**Figure 6**) since the island has no shelter. Many cattle and sheep were washed away by the tidal surge in the most recent cyclone 'Nada' as confirmed by the livestock keepers during conducting SSI. As a result, permanent shelter for livestock is to be erected concerning livestock production in this island.

CONCLUSION

The island is suitable for sheep and buffalo rearing rather than cattle. Proper initiatives should be taken by the authority for building livestock shelter (Khella) to be warranted in adverse climatic condition. However, portable water to be available for livestock through re-excavating the existing ponds with proper embankments. Primary veterinary health care facilities will be optimized in this island for prevention and control of common livestock diseases. In this regards, the livestock keepers to be trained and empowered to ensure veterinary health care services in consultation with local livestock office is also necessitated.

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CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHORS' CONTRIBUTION

The study designed and conducted through active participation by SKSI, NHS, SC, NI and draft preparation and critically revised the manuscript: SKSI, SC, AHMTA, and NI. All authors read and approved the final manuscript unanimously.

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