Role of Livestock Governance in Public Health: Dangerously Neglected in Bangladesh

Abstract

The objective of this study is to examine the strength of livestock governance in public health in Bangladesh. Bangladesh is a densely populated country. This country also has one of the highest cattle densities: 145 large ruminant/km^2 compared to 90 for India, 30 for Ethiopia and 20 for Brazil[2]. Recent studies show that 75% of emerging human infections are zoonosis related. In India the 1994 plague epidemic cause's loss of totaling $1.7billion.The Veterinary Public Health wing at Department of Livestock Services (DLS) not outfitted in terms of personnel, technology and logistics. Department of Livestock Services (DLS) and Directorate General of Health Services (DGHS) combined effort are minimum in zoonosis control. People live in close proximity with animal and birds in Bangladesh. So any zoonotic epidemic in this region will have a high cost on human health and also on economy. Antimicrobials use in livestock is not properly regulated, so there is a concern of developing cross-antimicrobial resistance. This paper tries to analyses the background information on zoonosis and antimicrobials use in animals. Also try to synthesis framework for prudent antimicrobials use in animals and zoonoses control for a better public health in Bangladesh.

Key words: Zoonosis, Governance, Livestock, Public Health, Antimicrobials, Epidemic

Introduction

Public health services are conceptually distinct from medical services. They have as a key goal reducing a population's exposure to disease-for example through assuring food safety and other health regulations; vector control; monitoring waste disposal and water systems; and health education to improve personal health behaviours and build citizen demand for better public health outcomes. Thus they involve such disparate activities as improving slaughterhouse hygiene and cattle-keeping practices, cleaning irrigation canals to discourage vector breeding,and applying public health regulations (Gupta,2005). Livestock sector play an important role in soci-economic development in Bangladesh. The contribution of livestock sector in national GDP is 1.66%.Now the total livestock population in Bangladesh is 54.36 million (cattle, Buffalo, sheep, goat) and total poultry population is 320.63 million (Dr.Hossain, 2016).The population density is 1106/km^2 and the land area is only 147610 km^2 (Wikipedia, The free encyclopedia, 2017). Dwelling place of human, animal and poultry are very adjacent to each other. The weather of Bangladesh is very humid and all the condition creates favorable condition for pathogens. So people suffer different types of infectious and contagious disease here. Some of the diseases are zoonotic. In the era of globalization diseases also getting global nature due extensive movement of animal and animal products throughout the world. In the Mosaic Law and in Exodus 9:8-10 there are rather clear indication of recognition of relationship between certain animal and human diseases. Jenner in the 18^{th} century recognized the relationship between cowpox and small pox. However, it was not until late in the 19^{th} century that it was fully realized that tuberculosis in cattle and in human being is one disease and that the same in case of anthrax and rabies in man and animals. These momentous discoveries led to the realization that research on animal disease might help to solve problems related to human disease and that prevention of animal disease would also afford protection to human being against disease of animals communicable to man. (Stafseth, 1955). Zoonoses are diseases and infections that are naturally transmissible between vertebrate animals and man. Nearly one billion of livestock are kept by more than 600 million small farmers in rural areas around the world.About 95% farmers lives in extreme poverty in Bangladesh (Uddin, Huylenbroeck, Hagedorn, Sultana, & peters,2010). Health threats at the human-animal-ecosystems interface have increased over the past few decades. These health threats are caused by multiple drivers, many of which are associated with human behavior, including the effects of modified landscapes and changes in agricultural practices. Indiscriminate antimicrobials use in animal also creates a hazardous situation in public health. The recent efforts to control highly pathogenic avian influenza (HPAI) reflect the need for reducing risks associated with zoonotic pathogens and other diseases of animal origin. Reducing these risks cannot be done by one sector alone, therefore international organizations and their member states are increasingly converging towards a One Health approach that incorporates a collaborative, cross-sectoral, multidisciplinary mode of addressing threats and reducing health risks at the human-animal-ecosystems interface. It is often assumed that disease prevention is more cost-effective than response; however it is difficult to quantify the benefits of prevention. This leads to difficulty in attracting the required investment to implement activities that address disease emergence, maintenance or spread.

Research Framework and Approach

The study conducted by reviewing different literature related to this topic. Zoonosis in Bangladesh, attempts taken by Ministry of Health and Family Welfare, Ministry of Fisheries and Livestock (MoFL) and other public health related organization in Bangladesh in response to zoonosis control and antimicrobials use in animals. Institutional capacity assessment especially the livestock governance in Bangladesh and assessing the importance of livestock governance. Materials were collected intensive literature review emphasis on public health sector. Individual interview of public health personnel in livestock sector, the farmers to triangulate and clarify the fact revealed from the literature. The information was then assembled to narrative summary of the existing loophole in livestock governance that would be useful in public health research and policy formulation in regards to public health.

Global Perspective of Zoonosis and Livestock Disease Dynamics

Animals provide many benefits to people. However, some animals can carry germs (pathogens) that can be shared with people. Zoonotic diseases can be caused by germs including viruses, bacteria, parasites, and fungi. Zoonoses can cause many different types of illnesses in people and animals ranging from mild to serious illness and even death. It is important to know that animals do not always appear sick when carrying a zoonotic disease. Many animals can appear healthy, but still be carrying germs that can make people sick. In the era of Globalization human and animal disease also gets the global importance. Now a day due to free market economy peoples movement throughout the world is extensive. Economic activities also increase the movement of animal and animal product manifold. Now a day if one disease occurs one corner of the world it may transmit to another corner of the world within a few hours. In the current era of globalization we see unprecedented movements of people, product, capital and information has obvious implication on human and animal health. The livestock disease pattern changing day by day. The last decades have seen the dramatic improvements in disease detection, with dozens of new potential pathogens anticipated by 2020 (D. Perry, Grace, & Sones, 2013).Although control and management of many endemic diseases in rich countries have improved, new diseases such as BSE and HPAI have emerged. Emerging disease such as HPAI, BSE, Swine Flu, SARS, MERS, and Ebola makes headline news. The natural ecosystem changes, climate change, deforestation, infrastructure, urban sprawl alter the natural ecosystem and affects the disease dynamics in many directions. The current hot topic is impact of climate change on ecosystem. Climate partially determine the distribution of vector borne disease and fate of free living pathogens and the concerns is the warmer and wetter part of world will be more prone to animal born human diseases. Many diseases are not particularly climate sensitive (e.g., brucellosis and tuberculosis). Even for those that are sensitive, climate change is but one of many disease determinants, some of which may be orders of magnitude greater than climate (D. Perry, Grace, & Sones, 2013).The world's population is growing, although more slowly (2.5 billion in 1950 to 6.9 billion in 2010); it is estimated to reach 9.2 billion by 2050 (United Nations, 2008). Most growth is in the humid tropics, which have higher disease burdens than temperate or drier regions. Growth is accompanied by massive urbanization more than one-half of the world's population now lives in cities and in poorer countries

(United Nations, 2007). Livestock is kept in close proximity to people, often in cramped and unsanitary conditions. Poverty is thought to be one of the risk factors for zoonoses and food-borne diseases in both rural and urban consumers. In addition, natural calamities and disease epidemics are frequent phenomena that particularly affect the poor people (Islam, 2014).In rural area farmer rear livestock is marginal farmer. In some cases one or two cow is the only source of livelihood. According to (Samad, 2011), the poor people in particular may tend to be at risk from zoonotic diseases for a number of reasons: (a) The poor often live in close contact with their livestock and are thus at increased risk of contracting zoonotic diseases, (b) Access to education on the prevention of zoonotic diseases in often unavailable to the poor livestock keepers, (c) Poor consumers may be at greater risk from food- borne diseases, (d) Informal sales of animal products make the maintenance of hygienic conditions and the control of food quality very difficult, (e) In poor and remote areas, hygienic abattoirs and facilities for meat inspection are often limited.

Antimicrobials used in Animal and Human Health Hazards

Now a day's antimicrobials are widely used in around the globe in food animal such as in cattle, poultry and pigs. We don't have accurate information on antibiotic use in developing countries but agricultural use probably exceeds medical use; most use is probably in intensive production systems; and, use is probably increasing rapidly (Grace, 2015). Bacterial disease is a major concern in efficient production of animal derived food and cause of ill health in both food producing and companion animal. In some production system spread of bacterial disease may be accelerated by proximity of animals. In Bangladesh this possibility is very high. Peoples housing is very close the animals housing. Bacterial disease may be controlled in some situations by eradication, maintenance of animals of specified health status, vaccination, and good hygiene. Nevertheless, antimicrobial chemotherapy remains vitally important for treating and in some cases preventing bacterial disease. Many bacterial diseases of animals are potentially fatal; others cause pain and distress. Appropriate use of antimicrobials will cure some sick animals and speed the recovery of others, and may improve the welfare of treated animals and reduce the spread of infection to other animals or, in the case of zoonotic disease, to humans. The challenge is to use antimicrobials wisely, minimizing the risk of resistance. The short generation time and ability to exchange genetic material has inevitably resulted in the development of resistance to antimicrobials by many animal bacteria. The development of resistance to animal antimicrobials may present a hazard to humans when the resistant bacteria can cause disease in humans and can be transmitted via contaminated food. We observed multi drug resistance Tuberculosis in Bangladesh. As tuberculosis is a zoonotic disease and the disease is common in cattle of Bangladesh. Multi-drug resistance grow by indiscriminate use of antimicrobials in cattle. Bacteria from animals which do not cause human disease may still present a hazard when transferred via food if they then transfer their genetic material coding for resistance to pathogenic human bacteria. Clearly a risk to humans exists when the antimicrobial used in animals is also used in humans. In Bangladesh antibiotics like penicillin, Ciprofloxacin, levofloxacin, streptomycin, gentamicin , ceftrixone widely use both in human and animal for treating bacterial infection. Not only in bacterial infection but also limiting secondary bacterial infection in viral disease

the mentioned antibiotics is also used. The risk of transfer of antimicrobial resistance from animals to humans could be much reduced if transfer of bacteria could be minimized. One way is more stringent hygiene in markets, abattoirs, and food processing plants. But hygienic knowledge of most of our small farmer is very little and abattoirs hygienic condition in Bangladesh is dilapidated. Clearly antimicrobial resistance would not develop if antimicrobials were not used in animals. But a draconian decision to prohibit their use in animals would devastate the livestock industry, increase bacterial including zoonotic disease, and have a catastrophic effect on animal welfare. Nevertheless, particular practices should be scrutinized to ensure that the benefit to animals and to society outweighs the risk. Antibiotics fed at low, generally sub therapeutic known to improve feed conversion efficiency and thus performance in food producing animals. The improvement may reflect a reduction in subclinical disease, although this is probably not the whole reason (Q.A.Mckellar, 1998).In Bangladesh oxytetracycline use is very common as growth promoter in feed especially in poultry feed. Prophylactic use of antimicrobials is more common in veterinary practice than in human medicine and reflects husbandry systems where animals are contained in close proximity within the same patch of air or water. Group medication in these circumstances may involve therapeutic treatment of affected animals and prophylactic medication of unaffected contacts. The antimicrobials are administered at therapeutic dosages, which clearly differentiate this strategy from that used to enhance production. Prophylactic use of antimicrobials should be used only when disease spread cannot be contained by vaccination, changes in management, or better hygiene and when the development of disease in animals in contact with an infected case is virtually inevitable without antimicrobial intervention. Targeted therapeutic use of an antimicrobial to treat a specific disease in a clinically affected animal presents a rational and justifiable use. The antimicrobial should be selected on the basis of the sensitivity of the infecting organism and the pharmacokinetics of the drug, ensuring attainment of appropriate concentrations at the site of infection. Narrow spectrum agents which affect the fewest commensal bacteria should be used and the drug administered in the most effective dosage. Since exposure of bacteria to subtherapeutic concentrations of antimicrobials is thought to increase the speed of selection of resistance, this should be avoided (Q.A.Mckellar, 1998).The availability of antibiotic causing health hazard in countries like Bangladesh; here the farmers are mostly unaware of misuse of antimicrobials. In livestock sector many paraprofessional, feed seller, quack are suggesting the farmer to use antimicrobials in poultry and dairy animals without knowing the drugs residual period and severe public health consequence. The Department of Livestock Services have no specific regulation for antimicrobials use in livestock and qualified veterinary doctor's number is very small in terms of livestock population in Bangladesh. Poultry sector in this country is growing day by day here the main concern is most of the farmer use antimicrobials by themselves or by the suggestion of feed traders. The feed traders suggest unnecessary antimicrobials for their business benefit or personal gain only. The monitoring of antimicrobials use in livestock is minimum as there is no separate drug directorate for livestock department. This year (2017) World organization for Animal Health set the theme for World Veterinary Day (29^{th} April) as 'Antimicrobial resistance-from awareness to action'. Veterinary services have a key role to play to fight against anti-microbial resistance through their role in regulating and supervising the use of antimicrobials, offering

professional advice to farmers and animal owners and collaborating with the human health sector.

Role of Veterinarian in Public Health

The idea of a veterinarian as a member of the public health team is not a new concept. One of the earliest references to the need of veterinarians in public health was made in 1884 by Frank S. Billings, a Boston physician, in his book "The Relation of Animal Diseases to the Public Health, and Their Prevention." This view was reiterated in 1941 by Haven Emerson in his report "The Health Needs of the Nation." Like its human counterpart, veterinary medicine made rapid advances following the opening of the field of bacteriology in the late nineteenth century. Early in the twentieth century the close inter-relationship of human and bovine tuberculosis was recognized. It was agreed that the control of the disease in cattle was essential to the eradication of the bovine type of disease in man. On the basis of these observations, the first milk sanitation programs were inaugurated under the supervision of veterinarians. The program emphasized two points: the tuberculin testing of cattle, and later the heat treatment of milk (pasteurization). The successful control program that followed, and of which we are justly proud, has been one of veterinary medicine's greatest contributions to public health (Scrug, 1952). It can be said in summary that veterinary medicine is playing an important role in preventive medicine.

Veterinary activities in the Public Health Service have been principally in the following fields of activities.

1. Communicable disease control, with primary emphasis on the control of those animal diseases transmissible to man.
2. Public health research.
3. Quarantine regulations that relate to animals.
4. Sanitation, especially as it pertains to food products of animal.
5. Prudent use of antimicrobials in animals and birds.

Emerging and re-emerging diseases including food borne illnesses are now significant public health concern. The veterinary professionals contribute to improvement of human health by advancing biomedical and comparative medical research, preventing and addressing zoonotic diseases and enhancing environmental and ecosystem health as well. Veterinarians, because of their knowledge on animal diseases and food production have become leaders in developing and implementing new methods of promoting sustainable public health. Due to the ability to link the health of the animal and human populations, Veterinarians are in an ideal position to address the concerns of public health. The involvement of veterinary expertise at the policy level is necessary to ensure adequate planning, design, implementation and supervision of veterinary public health programs and to ensure appropriate integration and collaboration with human health programs. Now a day’s veterinarian are playing an important role as policy makers and directing different public health organization in

government and private sector. Veterinarian also employed in different Public health institutes including international agencies such as the World Health Organization (WHO), the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (OIE).Veterinary medicine has a definite role in the composition of a public health team. The veterinarian, like the physician, the dentist, the nurse, and the engineer, can make a worthwhile contribution to the preventive medical program. As more and more veterinarians are integrated into public health teams, the tempo of our fight against those diseases which have animal reservoirs will be increased.

Public Health Organizational Structure in Bangladesh and Their Limitations

In Bangladesh, Institute of Public Health (IPH), National Institute of Preventive and Social Medicine (NIPSOM) are the national level public health institutes supporting in the different health policy formulation of the government and community health programs through research, training and services. On the other hand, Institute of Epidemiology Disease Control and Research (IEDCR) is the nation's focal point for conducting disease surveillance, outbreak investigation, research in the public health issue and training as well. Repeatedly, Bangladesh was stroke with some emerging diseases of animal origin like avian influenza, Anthrax and Nipah. IEDCR investigated all the outbreak cases in collaboration with Department of Livestock Services and International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) (Rahman, 2011)The veterinary public health wing of Department of livestock services have few personnel to combat the zoonoses, anti-microbial resistance, food borne illnesses. On the other hand no veterinarian working in leading public health institutes except few in IEDCR and ICDDR, B. Limited research is undertaken in the field of zoonotic diseases, epidemiology of infectious disease as well as public health issue. (Rahman, 2011) Policy makers only emphasis on clinical issue of disease not on preventive measure because clinical practices is visible. Although preventive measure of disease have great impact on minimizing the health budget. In institutional level there is negligence of adopting research that provides a new insight on zoonosis and epidemiology. No institutional mechanisms have yet been developed to identify constraints to combat the zoonosis. There is no separate Veterinary Public Health (VPH) unit in the national administration in Bangladesh. Veterinarians are employed by the Department of Livestock Services of the Ministry of Fisheries and Livestock, which also deals with the control of zoonoses.Till today in 2017 the organizational structure of Department of Livestock Services is same as in 1981. Zoonotic disease activities are carried out by the Zoonoses Unit established at the Institute of Epidemiology of the National Institute of Preventive and Social Medicine, run by the Ministry of Health. Department of Livestock Services work mainly focusing on extension services. They emphasis the self sufficiency on milk, egg and meat production. Epidemiology of a disease gives the clear picture about the distribution, determinant, host, vector, seasonality of the disease. There is an epidemiology unit at DLS but they don’t conduct surveillance on zoonotic diseases which is most important for prevention, control and eradication of zoonotic diseases. Another concern is illegal cattle trading through border. Bangladesh very prone to illegal trading of wild animal, pet, and fancy birds. Sometimes international smuggler use Bangladesh as transit point. This type of illegal trading may

aggravate the emerging and re-emerging disease scenario of the country. Many zoonotic diseases may enter into Bangladesh through the border area. The Department of Livestock Services have twenty four quarantine station at different seaports, airports, and also at land ports but they are not fully equipped to work properly, the stations are run by a project named "Livestock Disease Prevention and Control project". Poultry and dairy feed ingredients like fishmeal, bone meal, antibiotics, vitamin, and mineral premixes are imported by different feed company in Bangladesh. It is assume that bone meal is the cause of spreading Madcow disease through different country. The feed ingredients may contain different harmful materials that may cause serious public health hazards. Department of Livestock Services has the authority to give license to them but due to personnel and technology shortage their activities monitoring is not possible in a comprehensive manner. Department of Livestock Services (DLS) have no control over the abattoirs' to ensure the quality of meat. One common practice here is slaughtering animal in open field which may create serious health hazards for both human and animal. Sometimes animal died from serious contagious disease like anthrax or Rabies kept in open field for decomposition which is very dangerous for public health.

Communication between Human and Animal Health Professional

In recent years the growths in livestock production increase significantly. The public health concern also increases along with the production. The institutional collaboration between public health and veterinary services seeks to strengthen health services for hard to read populations by making better use of existing resources and to identify appropriate control strategies for zoonotic diseases (Scelling, Wyss, Bechir, Moto, & Zinsstag, 2005). There is no specific structure and guidelines for disease surveillance specially the communicable disease in the Department of Livestock Services. Such combined strategies will foster communication between public health and veterinary specialists, leading to joint ideas, ethical frameworks, and leadership of human and animal health services. Another emerging concept is the ecosystem approach to health, and many public health specialists recommend this as a holistic approach to health. The approach recognizes that sustainable development is possible only with healthy people and ecosystems. Solutions are developed based on an alternative form of ecosystem management rather than on conventional health sector interventions. The approach is complementary to the joint public health and veterinary approach, which emphasizes the interdependence on human and animal health system. (Scelling, Wyss, Bechir, Moto, & Zinsstag, 2005). In Bangladesh the human and animal health sector collaboration is very minimum. The disease surveillance system especially the zoonotic disease is not collaborative. In recent year the scenario started to change, IEDCR with the collaboration with US CDC organize a master's course on applied epidemiology where human and veterinary personnel work together in disease surveillance and outbreak investigation. Any credible and sustainable intersectoral approach must be beneficial to both the sectors. Joint planning, management and coordination are essential. In addition, trans-sectoral assessment and cost sharing schemes are needed, considering both human and animal health economics from a societal perspective. Communication between the public health and veterinary programmes must be fostered to identify further opportunities for collaboration

between public health and veterinary services could increase coverage of essential health interventions for people and livestock in remote rural areas.

Conclusion and policy implication

From the study above mentioned it is identified that there are a lot of problem in livestock governance in Bangladesh. In the meantime policymakers have taken many steps such as implementation of 'Animal Disease Act-2005, Animal Feed Act-2010 and upgradation of Department of Livestock Services Organogram. To ensure a standard livelihood for human and for a sound ecological balance standard livestock governance is essential not only in zoonosis control but also ensure food security and sustainable development. Government should take initiative to ensure strong livestock Institutional Governance, Coordinated surveillance, Inclusive outbreak preparedness, coordinated prevention and control programme, modern equipment and training on ICT.

Some recommendation for a better Veterinary Public Health in Bangladesh are-

- The veterinary service sector should be reorganize for quality and effective national veterinary services specially veterinary public health wing and epidemiology unit of Department of Livestock Services should be given enough logistic support to combat zoonotic disease;
- Intersectoral cooperation should be increased and there should be permanent legally bounded framework among Livestock services, Directorate of health services, IEDCR, IPH and also Drug Administration of Bangladesh;
- Antimicrobials use in livestock should be monitored strictly and proper law and rules should be implemented by regarding authority;
- Advocacy on responsible and prudent antimicrobials use;
- Research Institutes on zoonotic disease should be established;
- The control and eradication of serious zoonoses should be emphasized;
- The investigation and control of zoonotic and food-borne diseases and the protection of environmental health should be emphasized;
- Disease surveillance system should be improved giving special emphasis on zoonotic disease;
- Food animal slaughter must be in abattoirs and Proper guidelines should be ensured for abattoirs management.
- Illegal cattle trading should be stopped by enforcing proper law and regulations.
- Research Institutes on zoonotic disease should be established and planners should identify the need for health systems research to generate new technologies;
- Competent staff should be employed in the planning, organization, management and economics of veterinary services and special projects.

References

1. D. Perry, B., Grace, D., & Sones, K. (2013). Current drivers and future direction of global Livestock disease dynamics. *Proceding of the National Academy of Sciences Of the United States of America* (pp. 20871-20877). National Academy of Sciences.

2. Dr.Hossain, M. (2016). Retrieved April 2017, from www.dls.gov.bd.

3. Grace, D. (2015). *Review of evidence on Antimicrobial Resistance and Animal Agriculture in Developing Countries.* Nirobi: International Livestock Research Institute.

4. Gupta, M. D. (2005, december 3-9). Public Health in India:Dangerious Neglect. *Economical & Political Weekly* , pp. 5159-5165.

5. Islam, M. A. (2014). Zoonoses In Bangladesh:The Role of Veterinarian in Public Health. *Bangl. J. Vet. Mrd.* , 93-98.

6. Q.A.Mckellar. (1998). Antimicrobial Resistance:A Veterinaryperspective: Antimicrobial are Important for Animal Welfarebut Need to be Used Prudently. *British Medical journal* , 610-611.

7. Rahman, M. (2011). Role of veterinarian in Public Health:Bangladesh and global Perspective. *BDvet iNewsletter* , 10.

8. Samad, M. (2011). Public Health Threat Caused by Zoonotic Disease In Bangladesh. *Bangladesh Journal of Veterinary Menicine* , 95-120.

9. Schelling, E., Wyss, K., Bechir, M., Moto, D. D., & Zinsstag, J. (2005). Synergy between Public Health and Veterinary Services To Deliver Human and Animal Health Interventions In Rural Low Income SEtting. *British Medical Journal* , 1264-1267.

10. Scrug, J. H. (1952). The Role of Veterinarian in the United States Public Health Service. *Canadian Journal of Public Health* , 502-504.

11. Stafseth, H. (1955). *Veterinary Education and Public Health.* Sage Publications inc.

12. Uddin, M. M., Huylenbroeck, G. V., Hagedorn, K., Sultana, N., & Peters, K. J. (2010). Institutional and Orgazinational issues in Livestock services delivery in Bangladesh. *quartly journal of International Agriculture* , 111-125.

13. United Nations. (2008). *World Population Perspective:The 2008 Revision.* Geneva: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

14. United Nations. (2007). *World Urbanization Prospects.The 2007 Revision Population Database.*

15. *Wikipedia, The free encyclopedia*. (2017). Retrieved April 2017, from www.wekepidia.com

16. Woolhouse. (2008). Temporal Trends in inthe discovery of human viruses. *Proc Biol Sci* .