

Pig illnesses and epidemics: a qualitative study on perceptions and practices of pig raisers in Bangladesh

Nazmun Nahar⁽¹⁾, Main Uddin⁽¹⁾, Emily S. Gurley⁽¹⁾, M. Salah Uddin Khan⁽¹⁾, M. Jahangir Hossain⁽¹⁾, Rebeca Sultana⁽¹⁾ & Stephen P. Luby^(1,2)

Summary

Zoonoses in swine are increasingly becoming a global public health concern. Understanding how livestock farmers perceive animal illnesses will help to develop locally acceptable and effective public health intervention strategies to control and manage zoonoses. The authors describe Bangladeshi pig raisers' perception of pig illnesses and their behaviour towards sick pigs. We collected qualitative data from August 2007 to September 2008. Included in our study are backyard pig raisers from three districts, namely: Faridpur, Chapainobabgonj and Tangail and nomadic herders from six districts, namely: Mymensingh, Tangail, Sherpur, Sirajgonj, Bogra and Pabna. We conducted in-depth interviews ($n=34$) and made observations of human interactions with pigs ($n=18$). Pig raisers reported several illnesses that caused their pigs to suffer and die. They had close contact with sick pigs whilst caring for them. They slaughtered sick pigs and consumed and sold the pork if they thought that the pig might die. They believed that pig illness could be transmitted among pigs but not between pigs and humans. The perception of pig raisers on pig illnesses and their behaviour towards sick pigs places them in close contact with potentially infectious pig secretions and excretions. Such exposure could favour zoonotic transmission of infectious diseases. A better surveillance system for pig diseases would provide an opportunity to identify the transmission of diseases, determine whether they pose a risk to humans,

or whether they contribute to the emergence of diseases.

Keywords

Bangladesh, Disease, Farmer, One Health, Perception, Pig, Qualitative research, Swine, Zoonosis.

Malattie ed epidemie nei suini: studio qualitativo sulle percezioni e sulle pratiche degli allevatori di suini in Bangladesh

Riassunto

Le zoonosi nei suini rappresentano diventando in misura crescente un problema di salute pubblica di rilevanza globale. Comprendere in che modo gli allevatori percepiscono le malattie dei loro animali aiuterà a mettere a punto strategie di intervento localmente accettabili ed efficaci per il controllo e la gestione delle zoonosi. In questo contributo gli autori descrivono la percezione delle malattie dei suini e il comportamento degli allevatori verso i capi malati con riferimento al Bangladesh. Questo studio di ricerca qualitativa si è svolto nel periodo da agosto 2007 a settembre 2008 e ha coinvolto gli allevatori stanziali di tre distretti (Faridpur, Chapainobabgonj e Tangail) e gli allevatori nomadi di sei distretti (Mymensingh, Tangail, Sherpur, Sirajgonj, Bogra e Pabna). I dati sono stati raccolti mediante interviste approfondite ($n=34$) e osservazioni delle interazioni uomo-animale ($n=18$). Gli allevatori hanno riferito diverse malattie con esito fatale che hanno colpito i loro capi. Sono stati

(1) International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), GPO Box 128, Mohakhali, Dhaka 1212, Bangladesh
nahar.nazmun@yahoo.com

(2) Centers for Disease Control and Prevention (CDC), 1600 Clifton Rd, Atlanta, GA 30333, United States of America

a stretto contatto con gli animali malati prendendosene cura e quando temevano che un capo malato potesse morire, l'hanno macellato consumandone e vendendone la carne. Pensavano che la malattia potesse trasmettersi agli altri capi, ma non all'uomo. La percezione di questi allevatori e il loro comportamento nei confronti dei suini malati li ha esposti a secrezioni ed escrezioni potenzialmente infettive. Tale esposizione potrebbe favorire una trasmissione zoonotica di malattie infettive. Un miglior sistema di sorveglianza per le malattie dei suini permetterebbe di rilevare l'eventuale trasmissione delle malattie e accertare se comportino dei rischi per l'uomo o contribuiscano all'insorgenza di malattie.

Parole chiave

Allevatore, Bangladesh, Maiale, Malattia, One Health, Percezione, Ricerca qualitativa, Suino, Zoonosi.

Introduction

Zoonoses affect both animal and human health and are increasingly recognised as being a global public health threat (2, 5). About two-thirds of infectious organisms that are pathogenic to humans are of zoonotic origin (31). In addition to the direct effects on human and animal health, zoonoses have a considerable economic impact. The death of an animal due to disease or culling of livestock for disease control can result in a crippling financial loss, especially in rural or marginalised communities that rely on livestock breeding (1, 15).

Pigs are a potential reservoir host for several zoonotic diseases that cause high mortality and morbidity among humans worldwide (4, 23, 26, 28, 29). The close interactions among pigs, humans and other livestock might increase the risk of cross-species spill-over transmission, especially densely populated settings, such as Bangladesh. Applying a One Health approach that integrates the health of humans and animals from a healthy environmental context that allows farmers to raise healthy crops and farm animals and provides clean water and air can reduce the risk of such transmission (13, 19). This approach is highly relevant for public health in

Bangladesh because of the high density of the human population and their close interaction with animals that has often caused disease outbreaks (13). People's perceptions about illnesses shape their behaviour (16, 20, 21, 27). Thus, understanding pig raisers' perception of the illness that their pigs suffered from is important to frame practical and acceptable prevention strategies using an integrated One Health approach. This manuscript describes Bangladeshi pig raisers' perceptions of pig illnesses and their behaviour towards sick pigs.

Materials and methods

As a topic, pigs in Bangladesh has had little prior investigation, therefore, we conducted this exploratory qualitative study that can generate hypotheses so that we can proceed with further epidemiological investigations in the future (17, 24). In addition, qualitative studies focus on understanding the views of the local population which is valuable in the development of community level health interventions (14).

Given the lack of literature on pigs in Bangladesh, to develop the study design, we sought information from the sweepers of Dhaka, the capital city, who are known to raise pigs. The information they provided enabled us to further identify a range of communities that raised pigs in their backyard and in nomadic herds. We selected both backyard pig raisers and nomadic pig herders as our informants. We conducted this study in three backyard pig raising sites, namely:

- the urban municipality sweeper colony in Faridpur District town
- sub-urban sweepers of the Kanshat sub-district in the Chapainobabgonj District
- the rural indigenous Mandi community in the village of Gachabari in the Tangail District.

For nomadic herders, we collected data from six pig herds in six neighbouring districts. These were: Mymensingh, Tangail, Sherpur and Sirajgonj, Bogra and Pabna Districts.

We collected data from August 2007 to September 2008. In-depth interviews ($n = 34$)

were conducted with backyard pig raisers ($n = 17$) and herders ($n = 17$) who directly cared for the pigs. We selected households with more pigs because we assumed that when there were more pigs, the opportunities to observe interaction between pigs and humans would be more frequent. The nomadic herders are mobile and difficult to locate. We asked those herders whom we already knew from our preliminary exploration or those we had already interviewed to introduce us to new herders. Both in backyard communities and herds, we continued interviews of pig raisers until we reached data saturation that defined the required number of informants for a qualitative study (18, 25). Thereafter, we conducted 18 observation sessions, 12 from backyard owners and six from herders to identify the interactions of pigs with humans and others animals. On average, the observations lasted 7 h.

We conducted the interviews in Bengali, the language in which pig raisers are fluent. We recorded the interviews with audio tape recorders. We transcribed the interviews that we had recorded verbatim and expanded observation notes into detailed descriptions. We reviewed our dataset and developed a code list based on the emerging themes and the study objectives. Then we manually coded our data, looked for patterns and relationship

between each code and summarised our findings.

Ethical considerations

We took informed consent before conducting the interviews and observations. The Ethical Review Committee of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) reviewed and approved the protocol.

Results

Pig illnesses as defined by the pig raisers

The descriptions by pig raisers of pig illnesses indicated several known diseases and clinical signs from which their pigs suffered (Table I). They considered pneumonia, asthma, anthrax and sores spoiling internal organs to be very serious illnesses because they killed pigs shortly after onset. However, piglets could die from less severe illnesses, such as foot and mouth disease, diarrhoea or pox. Piglet mortality increased during the rainy season. Respondents believed that exposure to rain water made piglets cold and that reduced their chances of survival. As a consequence, a sick piglet often could not compete with siblings for breast milk or sometimes stopped eating due to illness and died.

Table I

A summary of terms used to describe pig illness among backyard pig raisers and pig herders living in Faridpur, Chapainobabgonj, Mymensingh, Tangail, Sherpur and Sirajgonj, Bogra and Pabna Districts, Bangladesh, 2007-2008

Common disease (occurrence almost each year)	Less common diseases (occurrence once in two to three years)	Rare diseases (reported symptoms)
Foot and mouth disease (<i>badla</i>)*	Anthrax (<i>torka</i>)	Shivering all of a sudden and death
Diarrhoea (<i>haga</i>)	Pox (<i>boshonto</i>)	Moving around like an insect and death
Cough and cold (<i>thanda</i>)	Jaundice	
Fever (<i>jo</i>)	Tumours in any part of the body	
Pneumonia		
Asthma (<i>hapani</i>)		
Helminthic infections (<i>krimi</i>)		
Sore (<i>gha</i>)		
Loss of appetite		

* local terms in brackets

Experience with epidemics

Pig raisers reported episodes of unknown illnesses that affected several pigs at the same time and caused death. These outbreaks occurred suddenly, unpredictably, affected a large pig population and did not occur every year. Herders often mentioned devastating outbreaks that killed thousands of pigs between 2000 and 2002. During this study, herders reported similar disease outbreaks in 2008 and later in 2009. They offered a range of differing descriptions of epidemic illnesses that they had personally witnessed (Table II).

Care-seeking behaviour of pig raisers for their sick pigs

To treat pig illnesses, pig raisers used both traditional and biomedical treatments. They sought biomedical treatment from veterinary practitioners (*poshu daktar*) that includes certified veterinarians and veterinary field assistants employed by government livestock hospitals and/or untrained shopkeepers who sell veterinary drugs. They often did not distinguish between a veterinarian, a veterinary assistant or an untrained practitioner. The informants from all study sites solely used a traditional remedy whereby sick pigs are kept in mud or sand and wounds are washed to treat foot and mouth disease. Backyard pig raisers from the rural study site reported that they treated all illnesses, except foot and mouth disease, by feeding sick pigs a mashed local fruit called *Chalta* (*Dillenia indica*). They

believed that the sour taste of this fruit helped sick pigs recover quickly.

Pig raisers reported using several biomedical drugs, including acetaminophen, paracetamol, promethazine, oxytetracycline and penicillin to treat sick pigs. Herders said that they learned about biomedical treatment during their visits to veterinary practitioners where they described the clinical signs of the sick pigs and received suggestions for treatment. If pigs got sick subsequently with similar clinical signs, they applied the treatment without consultation. However, they mentioned that the majority of Muslim veterinary practitioners were reluctant to physically touch pigs during examination and treatment since pigs are considered the most 'unclean' animal in the Muslim religion. Thus, in addition to feeding medicine, herders often administered the injections to their sick pigs, resulting in dissatisfaction and mistrust when pigs died even after receiving the prescribed treatment. A herder expressed his frustration as follows:

A few years back, suddenly some of my pigs got sick and then, after 3 or 4 days, died (Table II, penultimate entry). One day two died, next day three died, every day they were dying. What didn't I do to treat my pigs? I went to Netrokona, Athorobari, Kishorjonj, Mymensingh, everywhere, to seek treatment. In the Mymensingh livestock hospital, they told me to use a Renamisine (oxytetracycline) injection. I administered the injection by myself and gave oral saline but the pig didn't survive. Then I went to another doctor. The

Table II
Description of the epidemic diseases by pig raisers during 2007-2008 from Faridpur, Chapainobabgonj, Mymensingh, Tangail, Sherpur and Sirajgonj, Bogra and Pabna Districts, Bangladesh

Study site	Description of unknown disease/epidemic
Backyard	Several pigs presented sudden shivering and stiff neck and died very quickly Pigs stopped eating, suddenly started shivering, became lethargic; blood and froth came from the mouth and several pigs died
Herd	High fever, boils in the liver with discoloured meat; several pigs died High fever with boils in the anus; affected almost all the pigs from the herd and several died High fever with impaired hind legs, reduced appetite, most pigs from the herd were affected and several pigs died Fever, loss of appetite, bloody loose stool, salivation and death of pigs Fever, loss of appetite, weakness, salivation and death; the mouth of the dead pigs covered in red saliva

doctor suggested giving Napa (acetaminophen). I was thinking this is a medication for fevers in humans. Why did he give this medicine to my pigs? Again I told myself, 'The doctor prescribed this so he might be right'. When I fed acetaminophen to the pig, the pig died. It might survive for an additional 2 to 8 days but it ultimately died. I wanted to go to police station to make a complaint against the doctor but my uncle said, 'The doctor provided the treatment he thought was best. Don't complain. It is not in your luck.' And then, I never talked to that doctor again.

Separation of sick pigs and perception of contagiousness

Pig raisers reported that if one pig became ill, it could often spread illness to the other pigs. Sometimes they separated the sick pigs from the healthy ones to limit the spread of illness, although this separation was never strict. In a nomadic herd, pigs roamed around freely and healthy pigs could easily come into contact with sick pigs that had been separated from the rest of the herd. When deaths occurred in a herd due to serious illness, herders from unaffected herds often moved their pigs to a distant place. They believed that a deadly illness could spread through the air and therefore avoided places where air could pass from the location of the affected herd. Many remarked that a few years ago (probably in 2002), an epidemic illness came from a neighbouring country and killed a number of pigs, gradually spreading among all pig raising sites in Bangladesh. A herder expressed his perception about contagiousness as follows:

Pox, foot and mouth and anthrax can go from one pig to another but we haven't seen pneumonia go from one to another. Doctors said that these diseases are from virus that could move with air. If any pig is infected, then another pig with good health can also be infected. So we are very careful about this. When we visit a herd with any illness we wash our clothes before we return to our own herd as the illness can come with our body and clothes from the air. The virus will not leave me until I bathe and wash my clothes. If the air touches my body and clothes and then touches the pigs, then pigs can get the illness.

Pig raisers also separated pigs for practical reasons. If pigs were not separated, the sick pigs might be unable to compete with healthy pigs for necessary food intake. Backyard pig raisers explained that because of limited space they kept the sick pigs separately in the kitchen, in front of their house or in the cattle shed. This procedure was meant keeping the sick pigs closer to humans so they could monitor their medical condition and provide care. Herders separated sick pigs for another practical reason: sick pigs often could not walk as fast as the other pigs. One herder usually stayed behind to take care of the sick pigs until the pigs recovered and could walk normally.

No informants believed that illness could spread from pigs to humans or from humans to pigs. They added that they had never heard of this before. While we were conducting the study, an epidemic was ongoing and we observed close interactions between herders and their sick pigs (Table II, final description). Herders separated the seriously ill pigs by the roadside along with dead pigs that they partially covered with local vegetation. Local people did not allow them to bury pigs in their land. Herders frequently came into contact with the saliva and froth from the mouth and faeces of sick and dead pigs. The following quotation is from the observation report of the outbreak situation.

Herders held the sick pigs tightly and fed them oral saline. First they opened the mouth of a pig with their hands (herders). While feeding the oral saline, three of the pigs jerked their mouths and the water, along with saliva, spread and smeared the hands, faces and bodies of herders. At that moment, we noticed a few herders spitting frequently to remove the pig's saliva mixed with water from their own mouths and lips. After spitting, they also wiped their mouths with the edge of their clothing.

Prevention practices

Pig raisers used both spiritual and biomedical prevention methods. Often they sacrificed healthy pigs directly or sold piglets in order to donate the money to a temple as an offering to a deity. They believed that it would cure a sick pig when treatment did not work or prevent the illness from spreading to other pigs. One

herder reported vaccinating pigs to avoid deadly illness though he could specify neither the name of the illness nor the vaccine.

Consuming and selling sick pigs

Pig raisers described a common practice of selling or slaughtering a sick pig when they believed that it might die. People would not buy a pig that had died from illness, so their preference was to slaughter the sick pig and attempt to recover some of their investment. Backyard pig raisers reported that the meat of a sick pig was less tasty than that of a healthy pig. Thus, they asked for a cheaper price for meat from sick pigs. After slaughter, they usually kept some meat for the family and sold the rest in the community. A backyard pig raiser explained the context of slaughtering sick pig as follows:

When a pig is sick, we go to the doctor and administer medication. When we see that it is not being cured and will die soon, we slaughter the pig and eat and sell the meat to the neighbours. If it dies before, we don't consume it, we bury it instead. If anyone comes to know that it died and was not slaughtered, nobody will buy it. Even I will not eat it. If I try to deceive others by saying that I slaughtered the pig when it was about to die, people will buy and eat it, as they do not know. If they know (that the pig died), they will never eat it.

Herders reported that they preferred to attempt to sell sick pigs quickly while they were still alive and they attempted to conceal the illness from potential buyers. The sudden death of pigs caused significant economic loss. A deadly outbreak in a herd could destroy the livelihood of the pig owners and herders, as portrayed in the following statement from a herder:

Once, in 1997, I had 35 employees and five pig herds with 1 200 pigs. Among those, three herds were for regular selling and two were for reproduction. When disease came, 500 pigs died at a time. Earlier I borrowed money from others to run those herds. So it was a big loss for me. Because of that outbreak, several herders, like me, became penniless. So we try to sell pigs as soon as they get sick.

Pig raisers said that Hindu cobblers (*muchi*) pick up the carcasses of pigs that have died from an illness to consume the meat since they

cannot afford to pay for meat from slaughtered pigs. Since a dead pig would be buried or discarded anyway, they did not want to pay when the owner demanded money for the carcass.

Discussion

This study identified several issues that are relevant for reducing the risk of zoonoses, including the close interactions between sick pigs and humans, the common practice of slaughtering sick pigs for consumption, the perception that pig illnesses do not affect humans and the high mortality of pigs due to epidemics. Illness among pigs prompted closer interactions with their caregivers, thereby exposing caregivers to the saliva and faeces of sick and/or dead pigs which can pose a high risk for zoonotic transmission of pathogens such as rotavirus (6), influenza (8, 9) or Nipah virus (3, 7, 22).

In the rural areas of Bangladesh, slaughter and consumption of sick animals, including poultry and cattle, is common as the death of domestic animals represents a major economic loss (11, 30). Contact with sick and dead animals during slaughter, handling of raw meat and consumption were associated with recent large anthrax outbreaks among humans in Bangladesh (11, 12). The common practice of selling and slaughtering sick pigs among pig raisers can increase the risk of zoonotic infections to a broader community that may be more likely to purchase meat from a sick pig because it is often sold at a lower price than other pig meat. Very poor people may be at high risk of contracting zoonotic infections through this route because the lower cost of diseased meat represents a rare opportunity to purchase affordable meat. Similar risks were observed in Bangladesh during puffer fish intoxication outbreaks (10). Poor people purchased and consumed the fish because of the lower price compared to other fish. Pig raisers are low income communities, they live with severe resource constraints (Nazmun Nahar, unpublished data). It is unlikely that their practice of slaughtering sick pig and consuming and selling its meat will change

unless their economic situation improves. An integrated public health approach to reduce zoonotic disease risks that provided loans and training to raise healthy pigs might be more effective than simply telling pig producers not to slaughter sick pigs. Easy to understand preventive health messages that do not require extra capital investment, such as the importance of preparing and cooking pork products to eliminate pathogens might be the starting point of a future health intervention for pig raisers and their customers to prevent some of the foodborne zoonoses.

Pig raisers did not believe that diseases could be transmitted from pigs to humans. They recognised the regular transmission of illness between pigs due to similar signs and symptoms of infected pigs but they never noticed pig-to-person transmission. Hence, health education messages on human risks from pig diseases are unlikely to be credible to the pig raisers. Strategies to reduce disease transmission among pigs might provide a stronger motivation for pig raisers to accept health interventions and would serve the dual purpose of preventing economic loss and reducing the risk of zoonotic disease transmission.

Conclusions

Our study had certain limitations. Our main limitation was the selection of our informants: the study findings exclusively report the perspective of pig raisers. To understand pig diseases and obstacles in accessing treatment, it would be useful to explore the experience of veterinary practitioners that would also provide insights on their opinion about treating pigs. On several occasions, the pig raisers reported illnesses that occurred several years ago that might be affected by recall bias. Our two backyard pig raising study sites were from urban and peri-urban areas. It might be useful to add more sites from rural areas to provide a diverse understanding.

Pig raisers reported several outbreaks of illness that resulted in high mortality of pigs, including an outbreak that the study team observed directly. Although beyond the scope

of our study, these outbreaks probably often result from the introduction of a new or genetically distinct pathogen into a susceptible pig population that has not yet developed an adaptive immune response. Such outbreaks may represent a period of particularly high risk for the introduction of novel agents into the human population as that which occurred during the Nipah virus outbreak in Malaysia (22) and therefore, it may be particularly important to investigate and understand these events.

Establishing a One Health-oriented surveillance to identify and promptly investigate such outbreaks could improve both human and animal health. In addition, pig raisers can be included as an efficient human sentinel to detect cross-species disease spill-over from pigs. Such efforts require improved communication and collaboration between human and animal health authorities within the government, but collaboration on outbreak investigations can provide a shared platform that engages both public health and veterinary professionals to work towards One Health solutions (13, 32). Pig raisers will be motivated to report outbreaks to the health authorities if, in return, they receive a rapid response for outbreak management and adequate prevention and treatment facilities.

Preventing and interrupting outbreaks would also improve the safety of the food supply to the human population. However, there are challenges to the establishment of effective surveillance to identify outbreaks. There might not be effective strategies to manage all outbreaks that incur high mortalities among the pig populations, which would affect the motivation of pig raisers to report outbreaks and damage their relationship with surveillance teams. The previous experience of pig raisers with veterinary practitioners who were unwilling to treat sick pigs might not encourage pig raisers to participate in such a surveillance initiative. Better communication with pig raisers, improved access and acceptance to specifically identified veterinary health facilities with their pigs might help to overcome these difficulties to detect, monitor and control zoonoses.

Acknowledgments

We are grateful to those who participated in our study for their time, co-operation and valuable information. The ICDDR,B acknowledges with gratitude the commitment of the CDC to the Centre's research efforts.

Grand support

This study was funded by the Centers for Disease Control and Prevention (CDC), CoAg Grant Number 5-U01-CI000298-03.

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Conflict of interest/competing interests

The authors declare no conflict of interest.

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