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Knowledge, attitude and practices relating to zoonotic diseases among livestock farmers in Punjab, India

B.B. Singh[a,*], R. Kaur[a], G.S. Gill[a], J.P.S. Gill[a], R.K. Soni[b], R.S. Aulakh[a]

[a] School of Public Health & Zoonoses, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana 141004, Punjab, India
[b] Dayanand Medical College & Hospital, Ludhiana 141004, Punjab, India

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ABSTRACT

Zoonotic diseases cause significant health and economic impact in developing countries such as India. Many zoonotic diseases are prevalent in the livestock and as an occupational zoonosis in the livestock farmers in India. Lack of knowledge on the disease transmission, prevention and control measures is a potential high risk for the occurrence of zoonotic diseases in the livestock and its keepers in India. We conducted this study to understand knowledge, attitude and practices of livestock farmers regarding zoonoses. Five villages from each of the 22 districts of the state were conveniently selected (n = 110). Farmers available at village community sites were enrolled in the study and requested to complete a custom designed questionnaire (n = 558). In addition, livestock farmers attending basic livestock husbandry training were also surveyed (n = 301). Data from questionnaires was used to create three index variables: (a) knowledge score; (b) attitude score and (c) practice score. Association between demographic and other explanatory variables with knowledge score was evaluated using linear regression analyses. Similarly, the association between knowledge and attitude score with practice score was evaluated. Of the 859 participants, 685 (80%) livestock farmers had heard the term 'zoonoses' but only 345 (40%), 264 (31%) and 214 (25%) farmers were aware of the zoonotic nature of tuberculosis, Japanese encephalitis and taeniosis, respectively. For practices, 23% farmers reported consumption of raw milk and only 10% and 8% livestock farmers ever got their animals tested for brucellosis and tuberculosis, respectively. The low level of education and being a cattle farmer were negatively associated with the farmer's knowledge on zoonotic diseases. The attitude score was positively associated with the practice score of the participants. The results indicate need for educating the livestock farmers particularly those with a low level of education to reduce the health and economic impact of zoonotic diseases in India.

1. Introduction

Livestock is one of the most important assets of the poor to meet livelihood needs (Perry and Grace, 2009). Animal diseases including zoonoses are crucial constraints in enhancement of livestock-production systems (FAO, 2002). Transboundary, zoonotic and foodborne diseases negatively impact poor populations and national economies (Gall and Leboucq, 2003). Huge losses have been reported in livestock sector due to diseases such as brucellosis and cystic echinococcosis in India (Singh et al., 2014, 2015).

Zoonotic diseases cause significant health and economic burden in developing countries (Halliday et al., 2015). Many zoonotic pathogens are a serious animal and public health concern in India. For example, about 20,000 deaths due to rabies (Knobel et al., 2005) and 2.2 million new cases of tuberculosis (WHO, 2013) occur every year in the human populations in India and human neurocysticercosis-associated active epilepsy causes 2.10 million disability adjusted life years in India (Singh et al., 2017).

Many zoonotic diseases are also considered as significant occupational health hazards (Battelli, 2008). Livestock owners have different type and intensity of human–livestock contacts which may result in transmission of microorganisms and associated zoonoses (Klous et al., 2016). Livestock farmers are exposed to a number of zoonotic pathogens such as *Coxiella burnetti* and *Toxoplasma gondii* (Thomas et al., 1999). In the US, zoonoses are an important occupational hazard and a health concern for livestock workers (Lejune and Kersting, 2010). In Italy, occupational exposure to zoonotic agents such as *Coxiella burnetti* and *Leptospira* species among agricultural workers have been reported (Tabibi et al., 2013).

There are number of zoonotic diseases prevalent as occupational

* Corresponding author.
E-mail address: bbsdhaliwal@gmail.com (B.B. Singh).

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zoonosis in livestock farmers in India. The brucellosis sero-prevalence between 0.9%–18.1% with a high risk in veterinarians and farm attenders has been reported from India (Seleem et al., 2010; Agasthya et al., 2007; Mantur and Amarnath, 2008). The zoonotic *Giardia duodenalis* Assemblage A1 has been detected in both calves and dairy workers in West Bengal, India (Khan et al., 2011).

Punjab is an agrarian state of Northern India (Latitude of 30°4′N and Longitude 75° 5′ E) with a human population of 27,704,236 and 63% of its population reside in rural areas (Census of India., 2011). The state has the highest per capita milk availability (932 gm/person/day) in the country with a cattle and buffalo population of 2.42 and 5.16 million, respectively (BAHS, 2014). There are 128 534 sheep, 327 272 goat and 32 221 pigs in Punjab (BAHS, 2014). The state is home to 737 352 backyard poultry consisting of fowls and chicken below 5 months of age (BAHS, 2014). There are 4 610 921 households/household enterprises owning animals/poultry birds in Punjab state of India (BAHS, 2014). There are 718 cattle, 1543 buffaloes, 39 sheep, 97 goat and 7 pigs per thousand households in the rural areas of Punjab (BAHS, 2014). The official estimates indicate the presence of 100 991 stray cattle in the state (BAHS, 2014). Over 70% of the households own livestock in the rural areas (Ali, 2007). The animal husbandry and crop agriculture are intrinsically linked and important for overall food security in the state (DAHDF, 2017). Mixed farming is commonly practiced in Punjab, India. Based on their occupation, there are three categories of people keeping livestock in the state a) crop farmers keeping livestock b) livestock farmers growing crops or involved in other secondary activities c) People primarily involved in non-agriculture activities but raise livestock at home.

Many zoonotic diseases such as brucellosis, tuberculosis, rabies, taeniosis, ringworm and toxoplasmosis are endemic in Punjab state of India (Dhand et al., 2005; Brookes et al., 2018; Singh et al., 2010). In addition, human cases of swine flu and japanese encephalitis have been reported from other states of India (Prakash et al., 2011; Tiwari et al., 2012).

Knowledge on zoonotic disease transmission, prevention and control measures is a must for livestock farmers. It will help prevent and control zoonotic diseases as an occupational hazard and reduce the incidence of zoonotic diseases in human as well as livestock populations. Therefore, the current study was planned to assess knowledge, attitude and practices (KAP) relating to zoonotic diseases among livestock farmers for policy development and to help formulate and improve existing zoonotic disease educational programs.

2. Methods

The necessary ethical permission for the conduct of this study was obtained from the Institutional Ethics Committee, Dayanand Medical College & Hospital, Ludhiana, Punjab (Ethics approval number: DMCH/R&D/2016/372).

The study was conducted as a cross-sectional study between 2015 and 2016.

2.1. Target and study population

The target population comprised of livestock (cattle/buffalo/sheep/goat/pig) farmers residing in the rural areas of Punjab. The study population was the farmers belonging to 110 villages of Punjab representing all the 22 districts (5 villages from each district) of Punjab as well as those attending livestock trainings at Guru Angad Dev Veterinary & Animal Sciences University (GADVASU). The basic trainings are being conducted by the Department of Veterinary and Animal Husbandry Extension Education, GADVASU. The trainings are organised across the year and usually 30–50 participants are enrolled in batches. These trainings are advertised on the University website and farmers are nominally charged for such trainings. As these trainings are organised on-campus, more farmers from the nearby districts enrol in the training programs. The villages were conveniently selected, for example, those closer to the main roads.

The unit of study was an individual livestock farmer.

2.2. Sampling procedure

As per the Census of India. (2011) there are 12,581 villages (assumed equivalent to animal herds) in Punjab state of India. We selected 110 villages representing approximately 1% of the total villages. Assuming that 50% of the farmers would have knowledge about zoonotic diseases, a sample size of 534 was required to estimate the knowledge proportion with 5% precision and 95% confidence assuming a response rate of 70% and a population of 13 114 farmers in the 110 villages selected (Dhand and Khatkar, 2014). As per the National sample survey office data, the total operational holdings for all the livestock classes in Punjab have been reported to be 1 499 900 (NSSO, 2013). By assuming that livestock operational holdings will be uniformly distributed across whole of the state, we estimated that there will be 13 114 livestock operational holdings in the 110 villages selected in the study.

The research team visited the selected villages and requested livestock farmers at community sites to participate in the study. In addition, livestock owners attending livestock husbandry trainings GADVASU were requested to participate in the study. The participant information statement explaining the purpose of study was provided to all the participants and a written consent was obtained from the participants indicating their willingness to participate in this study. After this, the participants were asked to complete a questionnaire to assess their KAP relating to zoonotic diseases. The participants were offered the questionnaire either in English or in the local language (Punjabi). After completion of the questionnaire, participants were provided with information brochures explaining prevention and control measures of important zoonotic diseases.

2.3. Questionnaire design and data collection

The questionnaire was developed to collect detailed demographic information and related to KAP of livestock farmers about zoonotic diseases. The demographic information collected included age, gender, family size, and the educational qualifications. The livestock farm associated details included years in livestock farming, number and species of the animal present at the farm. For knowledge assessment of the livestock farmers, the basic questions were asked about endemic or historically important zoonotic diseases such as brucellosis, rabies, tuberculosis, plague, swine flu, taeniosis, hydatidosis, toxoplasmosis and ringworm. Initially, the farmers were asked if they have heard about these diseases and were later told to identify animal hosts associated with the transmission of these zoonotic pathogens. The answer was only considered ‘correct’ if the farmer was able to correctly identify at least one of the animal hosts; however additional selection of an animal host not related to the disease was considered as an incorrect reply. Information related to practices included animal deworming practices, habit of consuming raw milk, washing hands after contact with animals, the habit of walking bare feet at home or at the farm and testing of the herds for brucellosis or tuberculosis. The attitude related information for disposal of carcasses and deworming practices were also collected.

2.4. Data handling and statistical analysis

The analyses were conducted using IBM SPSS Statistics for Windows, Version 22.0 statistical software (released 2013. © 2013, Armonk, NY: IBM Corp).

2.5. Explanatory and outcome variables

We used demographic characteristics and whether the livestock owner came for basic husbandry training as explanatory variables. A