

Knowledge, attitude, and practices of cattle farmers regarding zoonotic diseases in Erzurum, Turkey

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ABSTRACT. This study aimed to determine the knowledge, attitude, and practices of cattle farmers regarding zoonotic diseases in Erzurum, Turkey, where cattle-raising is the most common occupation. A cross-sectional study was conducted on 1,045 cattle farmers in Erzurum. In terms of the diseases that can be transmitted from animal to human, 69.6% of the cattle farmers had information on anthrax, 62.8% on brucellosis, 18.4% on tuberculosis, 44.9% on rabies, 32.5% on Crimean-Congo hemorrhagic fever, 8.9% on hydatid cyst, 8.0% on toxoplasmosis and 7.9% on giardiasis. The knowledge level of cattle farmers who were university graduates was 94.8%. Cattle farmers having over 100 cattle had a knowledge level of 96.7% on zoonotic diseases and their positive attitudes and practices reached 95.1% and 91.8%, respectively. The results showed that the increase in education status, size of the enterprise, and monthly income of cattle farmers was related to an increase in knowledge, attitude, and practices regarding zoonotic diseases. However, it was found that the positive knowledge and attitudes of the cattle farmers could not be transformed into positive practices evenly.

Key words: zoonotic disease, cattle farmer, public health, knowledge level.

INTRODUCTION

Zoonotic diseases (also known as zoonoses) are caused by pathogens that spread between animals and people¹. On a global scale, an estimated 60% of known infectious diseases and up to 75% of new or reemerging infectious diseases are zoonoses (Salyer *et al* 2017). Zoonotic diseases are known to be the cause of nearly 2.5 billion people getting sick per year and lead to 2.7 million deaths among sick ones annually (Magwedere *et al* 2012).

Domestic and wild animal population movements have a role in the occurrence and spread of zoonoses (Shanku *et al* 2015). On the other hand, the trend in increasing urban green spaces and spatial expansion of urbanised areas into agricultural and natural habitats also increases the dispersal and abundance of vectors into urban areas and their contact with humans (Tomassone *et al* 2018). Moreover, unofficially traded animals are a much greater risk factor for disease spread because they are not necessarily subject to veterinary controls (Fèvre *et al* 2016). The animals with sub-clinic infections disease cannot be distinguished from healthy animals and, therefore, diseases can be carried into different regions by animal movements (Hardstaff *et al* 2015). Some occupations require contact with animals and one of these is livestock farming. Livestock farmers are particularly exposed to

zoonotic risks. Additionally, the lack of basic knowledge level, biosecurity precautions, and personal hygiene of livestock farmers can play a part in the infection and spread of zoonotic diseases (Weese *et al* 2002, Cedié *et al* 2012). Within the concept of activities occurring in the interface of human, animal, and environment, livestock farmers who have knowledge about zoonotic diseases can act more willingly in taking precautions and attending disease control programs.

Zoonotic diseases are important public health issues worldwide, including Turkey. Turkey, its geographical location and structure are exposed to many zoonotic diseases, including 107 different zoonotic infections such as Anthrax, brucellosis, rabies, Crimean-Congo hemorrhagic fever (CCHF) or tularemia (İnci *et al* 2018). Other zoonotic diseases investigated in this study, except for toxoplasmosis with a low incidence in cold areas, are seen much more frequently in intensive livestock farming regions in Turkey such as East Anatolia, Central Anatolia and Southeastern Anatolia (Ministry of Health 2011).

The East Anatolia Region, with 21% of the total area of Turkey, has crucial potential in terms of agriculture and livestock (Ateş and Terin 2008, TUIK 2018). Erzurum is the biggest province of the East Anatolia Region regarding surface area, and also has the highest amount of cattle. With 768,997 cattle, it is the second province of the country after Konya province in terms of the number of cattle (TUIK 2018). While some of the animals bred in the city are being used in animal production (Ünal 2011), about 20% are sold alive out of the city². In this city where livestock farming is performed heavily, cattle farmers play an integral role in implementing zoonotic diseases prevention and transmission. Their knowledge level on zoonotic diseases,

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¹ CDC, Centers for Disease Control and Prevention. 2020. Zoonotic diseases. Available at: <https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html>; last accessed 15.06.2020.

² Anonymous. 2018. Republic of Turkey Ministry of Agriculture And Forestry Livestock Information System. Available at: <https://hbs.tarbil.gov.tr>

attitude towards risks associated with livestock production and hygiene practices may affect disease risks to humans and animals. In this sense, very few studies have been conducted in the region with a local base (Çakmur *et al* 2015, Kuşaslan Avcı *et al* 2017), and no studies had been carried out in Erzurum on this topic until now. This study aimed to determine the knowledge, attitude and practices of cattle farmers toward zoonotic diseases occurring in the city of Erzurum, Turkey, where animal breeding and livestock movement are performed intensely.

MATERIAL AND METHODS

This cross-sectional study was conducted between January 2016 and July 2017 on cattle enterprises located in 20 districts of Erzurum, Turkey. The province is the fourth largest city of Turkey and is located in the Eastern Anatolia region. Nearly 11% of Turkey's meadow and grasslands are in Erzurum.

The universe of the study consisted of 50,000 cattle enterprises located in 20 districts of the Erzurum province according to the 2016 Statistics of Animal Husbandry of Turkish Statistical Institute. Assuming that 50% of the farmers would have knowledge about zoonotic diseases, the sample size was calculated as 1,045 with confidence 95% and sampling error 0.03%. Questionnaires were handed out to enterprises selected using the random sample method and they were administered only to cattle farms, farmworkers and volunteers.

Data were collected using a questionnaire form that included 30 questions covering from demographic information to knowledge, attitudes and practices of cattle farmers regarding zoonotic diseases. The demographic information form included questions such as age, gender, number of children, educational status, monthly income and number of animals, and consisted of 10 questions. To evaluate the knowledge of the cattle farmers, certain questions were asked about important zoonotic diseases in Eastern Anatolia such as anthrax, brucellosis, tuberculosis, rabies, CCHF, toxoplasmosis, hydatid cyst, and giardiasis. Initially, the cattle farmers were asked if they had heard about the diseases transmitted from animals to humans and then they were told to identify which zoonotic diseases were transmitted to humans. The participants were informed of both the scientific and the local name of the diseases when doing the questionnaires. The questionnaire form containing the attitudes and practices related to zoonotic diseases included specific statements such as how do they dispose of animal waste, what protection equipment is being used when contacting animals, and what protective measures are being applied before consuming the obtained animal products.

Data were analysed using SPSS 20.0 software (SPSS Inc., Chicago, IL, USA). Percentage and frequency were examined as descriptive statistics. Pearson's chi-square was used to compare variables.

RESULTS

The study was conducted on 1,045 people aged between 18-79 years of which 1,015 (97.1%) were male and 30 (2.9%) were female. Out of the 1,045 cattle farmers who were the focus of the study, 134 (12.8%) of them were university graduates while 14 (1.34%) were illiterate. The number of married participants was 921 (88.1%), amongst them, 520 (56.5%) had less than five children and 13 (1.4%) had more than 10. The monthly income of the cattle farmers included in the questionnaire ranged between US\$ 350 and US\$ 8,500 (table 1).

It was established that 46.9% of cattle enterprises were dairy, 18.4% were fattening and 34.7% were mixed (dairy and fattening). The average cattle number was 39 and cattle farmers managed between three and 600 cattle. The number of enterprises with less than 10 cattle was 289, 329 enterprises had 11-30 cattle, 200 enterprises had 31-50 cattle, 151 enterprises had 51-100 cattle and 76 of them had over 100 (figure 1). One hundred and fifty of these enterprises were dealing with sheep and goat breeding at the same time.

To measure the knowledge level of the participants about zoonotic diseases they were asked the following question: "Do you have any knowledge about the diseases transmitted from animals to humans?", and 80.2% of the participants responded positively (figure 2). These participants were then asked: "Which of these infect humans: anthrax,

Table 1. Socio-demographic characteristics of the cattle farmers.

Characteristic	n	%
Sex		
Male	30	2.90
Female	1015	97.10
Age		
<25	47	4.50
25-40	276	26.41
41-65	691	66.12
65<	31	2.97
Education level		
Illiterate	14	1.34
Primary School	462	44.21
Secondary School	199	19.10
High School	236	22.60
University	134	12.82
Monthly income (US\$)		
<850	532	50.90
850-1700	440	42.11
1700<	73	6.99

n: Number of cattle farmers.

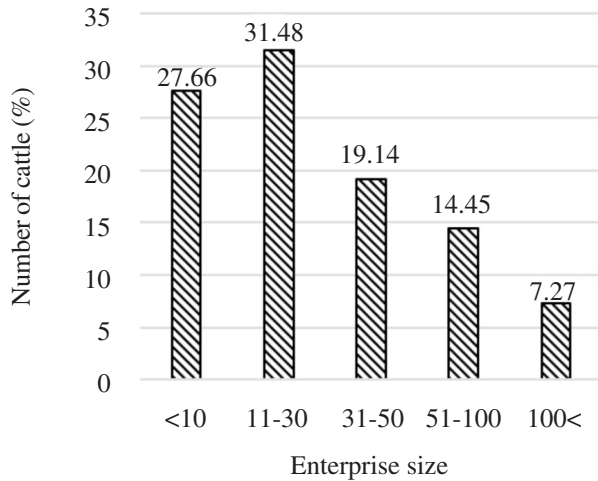


Figure 1. Enterprise size according to the number of cattle.

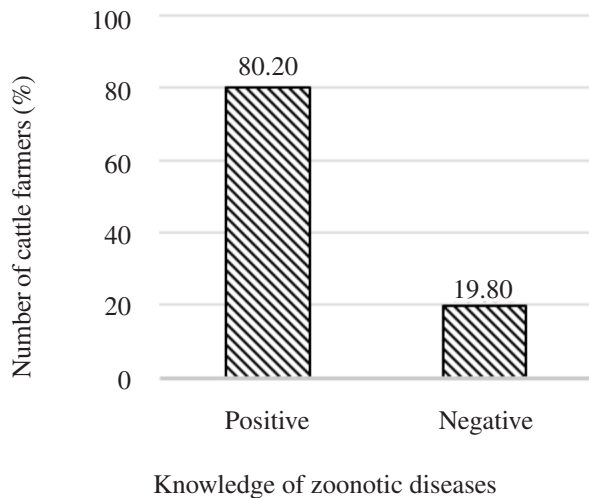


Figure 2. Knowledge level of cattle farmers related to zoonotic diseases.

brucellosis, tuberculosis, rabies, CCHF, toxoplasmosis, hydatid cyst, or giardiasis?”.

Regarding the infectious diseases transmitted from animals to humans, 69.6% (583) of the participants mentioned anthrax, 62.8% (526) brucellosis, 18.4% (154) tuberculosis, 44.9% (376) rabies, 32.5% (272) CCHF, 8.9% (75) hydatid cyst, 8.0% (67) toxoplasmosis and 7.9% (66) giardiasis (figure 3).

Table 1 shows the attitude and practices of cattle farmers toward zoonotic diseases. The question “Do animals need to be controlled regularly by a veterinarian?” was posed and 93.7% (979) of them responded positively. In the case of the question “Do you arrange regular veterinarian controls for your animals?” 90.3% (944) gave positive answers. However, when the frequency of this practice was asked, 33.8% (353) of them stated that they had their veterinarian control in two years period or more. Therefore, the answers

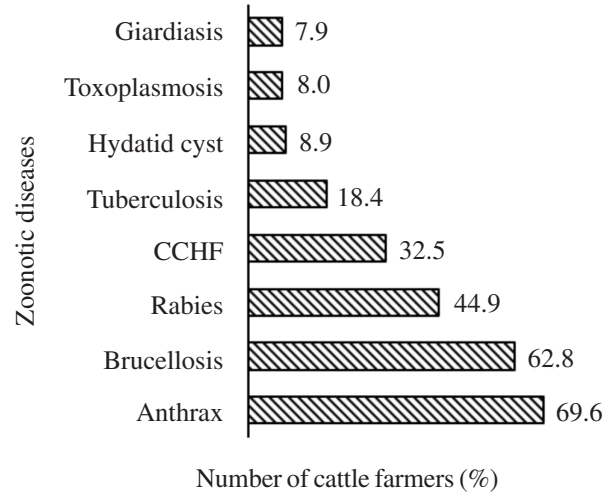


Figure 3. Knowledge level of cattle farmers related to the question “Which of these diseases infect humans?”.

of cattle farmers who scheduled their control one year or less were accepted as positive while the data was being evaluated. The farmers requesting regular veterinarian controls were 57.1% (597) (table 2).

Along with 73.2% (765) cattle farmers thinking that gloves should be used in animal contact, there were 56.1% (586) cattle farmers mentioning the necessity of using masks. Those who use gloves and masks while in contact with animals had a ratio of 65.8% (688) and 23.9% (250), respectively. Only 89.7% (937) of cattle farmers knew that they might be infected through a scar on the hand while contacting animals. It was detected that 19.8% (207) of cattle farmers continued to contact the animal with a scar on their hand. Regarding infected animals, 92.4% (966) of cattle farmers stated that the dead body of an infected animal should be buried under the soil deeply. The percentage of those who exterminate the dead body in this way was 90.7% (948). While 80.0% (836) of cattle farmers said that milk needed to be boiled at least 5 minutes, the ones who actually boiled the milk at least five minutes were 76.7% (802) (table 2).

There were differences between the positive knowledge level, attitude and practices of cattle farmers regarding zoonotic diseases and their educational level, enterprises size, and monthly income. The positive knowledge level of illiterate farmers about zoonotic diseases was determined as 65.7% whereas those who graduated from university had a positive knowledge level of 94.8%. On the other hand, despite the high knowledge level of university graduates, there was a decrease in the transformation of knowledge into positive practices as high as approximately 10%. Regardless of the size of enterprises, all cattle farmers had a high level of positive knowledge about zoonotic diseases. However, their positive attitude and practice ratios were

low. In enterprises having more than 100 cattle, 96.7% of cattle farmers had positive knowledge level, 95.1% had a positive attitude and 91.8% had positive practice. It was detected that there were differences in the positive

knowledge, attitude, and practices of cattle farmers depending on their monthly income. The increase in monthly income was associated with an increase in the level of positive knowledge, attitude, and practices (table 3).

Table 2. The rates of positive attitude and practices of cattle farmers related to zoonotic diseases.

	Positive Attitude		Positive Practice	
	n	%	n	%
Getting veterinary support for treatment	982	94.0	947	90.6
Making regular veterinarian control	979	93.7	597	57.1
Washing hand	997	95.4	957	91.6
Using glove	765	73.2	688	65.8
Using mask	586	56.1	250	23.9
Wearing boot	903	86.4	903	78.3
Avoid contact with scary hands	937	89.7	838	80.2
Disposal of animal carcass	966	92.4	948	90.7
Boiling milk	836	80.0	802	76.7
Make cheese with boiled milk	908	86.9	813	77.8
Avoid raw meat eating	941	90.0	926	88.6

n: Number of cattle farmers.

Table 3. Distribution of factors affecting positive knowledge, attitude and practices of cattle farmers related to zoonotic diseases.

Factors	Knowledge			Attitude			Practice		
	n (%)	χ^2	P	n (%)	χ^2	P	n (%)	χ^2	P
Illiterate	9 (64.3)	31.934	0.0001***	9 (64.3)	7.953	0.093	8 (61.1)	15.354	0.004**
Primary School	347 (75.1)			390 (84.4)			338 (73.2)		
Secondary School	162 (81.4)			170 (85.2)			154 (77.4)		
High School	203 (86.0)			206 (87.4)			195 (82.6)		
University	127 (94.8)			120 (89.6)			113 (84.3)		
<10	173 (77.6)	15.164	0.004**	138 (69.5)	63.985	0.0001***	110 (61.9)	125.110	0.0001***
10-30	318 (80.4)			352 (89.1)			322 (81.5)		
31-50	168 (83.2)			182 (90.1)			172 (85.1)		
51-100	142 (86.8)			150 (91.5)			143 (87.2)		
100<	59 (96.7)			58 (95.1)			56 (91.8)		
<850	427 (80.3)	21.860	0.0001***	466 (87.6)	6.543	0.034*	411 (77.3)	16.154	0.0001***
850-1700	394 (89.5)			401 (91.1)			376 (85.4)		
1700<	69 (94.5)			70 (95.9)			67 (91.8)		

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.0001$.

n: Number of cattle farmers.

DISCUSSION

This study applied a broad concept in terms of the knowledge, attitude, and practices level of cattle farmers in Erzurum related to zoonotic diseases. Despite the knowledge level of cattle farmers about the diseases transmitted from animals to humans being high (80.2%), their knowledge level to identify which diseases are zoonoses was low. Three out of 8 zoonotic diseases included in the questionnaire were identified as zoonoses by the cattle farmers (anthrax, brucellosis, and rabies). As for hydatid cyst, toxoplasmosis, and giardiasis diseases, their knowledge level was low (figure 3). Cattle farmers had a high level of knowledge about some of the zoonotic diseases probably because of the impact of mandatory vaccination campaigns targeting those diseases, applied to all bovines by the authorities in Turkey.

In our study, 69.6% of the cattle farmers knew that anthrax was a zoonotic disease and 62.8% of them also knew brucellosis. However, these ratios were much higher in a study conducted in Kars (Çakmur *et al* 2015). These differences between cities can be explained by the prevalence rate. In Turkey, between 1995 and 2010, the prevalence rate of anthrax cases was much higher in Kars when compared to Erzurum (Ertek 2011).

Turkey is still an endemic region in terms of rabies, with approximately 250,000 rabies-risk contact reports being made annually, averaging one to two rabies cases per year (Anonymous 2019). In our study, 44.9% of the cattle farmers knew that rabies was a zoonotic disease. However, the level of knowledge was not as high as in those who knew that anthrax and brucellosis were zoonoses. In a study conducted in Erzurum, 73% of the cases in emergency services due to the risk of rabies contact came from urban areas (Can *et al* 2020).

It was reported that the first human case of CCHF in 2002 was in Central Anatolia, Turkey. A total of 11,040 cases were reported in Turkey between 2002 and 2018, and 528 of them died (Anonymous 2019). In our study, 32.5% of the cattle farmers knew that CCHF was a zoonotic disease. Studies conducted in different provinces of Turkey have reported that knowledge about CCHF was insufficient (Ozer *et al* 2008, Yılmaz *et al* 2009, Çilingiroğlu *et al* 2010).

Inadequate personal hygiene and farming sanitation during close contact with animals, infected animal slaughtering and skin stripping, wrong extermination of sick animal waste, and infected material can cause zoonotic diseases (Tebug *et al* 2015, Rajkumar *et al* 2016). Therefore, the people involved in such activities with livestock are always under a high risk in terms of zoonotic diseases (Martin *et al* 2011, Musallam *et al* 2015). In the study, among the preventive methods from zoonotic diseases, over 90% of cattle farmers had both positive attitudes and positive practices regarding handwashing after the contact with an

animal, the burial of dead animal bodies, and separation of sick animals from the herd (table 2).

Only for treatment of their animals, 90.6% of cattle farmers had veterinary services whereas 57.1% had regular veterinary controls for their cattle. In a study conducted in the Çayırılı district of Erzincan, east of Erzurum, it was reported that 73.3% of dairy farmers benefitted from veterinary services when their animals were sick, 6.6% of them had regularly veterinary controls (Özyürek *et al* 2014). In our research, the frequency of practices such as wearing boots inside the enterprise (78.3%) and using gloves while in contact with animals (65.8%) was higher than the practice of using a mask (23.9%) (table 2). Odo *et al* (2015) and Munisamy *et al* (2017) reported percentages related to the use of gloves (51% and 36.8% respectively) and masks (26.0% and 18.4% respectively) among livestock farmers that were lower than those in our research.

Production of animal products, contaminations during this production, wrong feeding habits and lack of knowledge can be effective in the transmission of zoonotic diseases (Tebug *et al* 2015, Rajkumar *et al* 2016). It must be highlighted that through the consumption of raw milk and milk products, several bacterial zoonotic diseases can infect people except for brucellosis and tuberculosis (Özlu and Atasever 2018). In this study, nearly $\frac{3}{4}$ of cattle farmers mentioned that they consumed milk after a minimum of five minutes of boiling and did not make cheese from raw milk. A research conducted on sheep and goat farmers in the Van province, located in Southeast Erzurum, and in the same geographical region (Eastern Anatolia Region), showed that most of the participants made cheese from raw milk and some consumed the cheese they made freshly. (Kuşaslan Avcı *et al* 2017). In a meta-analysis study done on the awareness level of brucellosis disease globally (21 studies), it was found that ratio of awareness was 44.5% that raw milk consumption for being a risk factor for brucellosis. (Zhang *et al* 2019). In our study, attitude and practice levels of cattle farmers regarding the topic of non-consumption of raw milk and cheese made from raw milk were high.

Although raw meat consumption has been applied for generations in many social groups located in Russia, Cuba and Africa (Abera *et al* 2016), there is no habit of raw meat consumption in our country. Raw meat consumption creates dangerous situations in terms of public health due to parasite diseases originated from food as well as bacterial diseases (Murrell 2013, Bintsis 2017). Although Erzurum is a city with high red meat consumption, 88% of cattle farmers included in the questionnaire answered that they did not consume raw meat. This situation showed similarity with the work of Çakmur *et al* (2015). Zoonotic diseases constitute 70% of community-acquired diseases.

In relation to the occurrence of these diseases, it is known that sociocultural habits and socioeconomic conditions have a strong influence (Dinçer *et al* 2003). If factors such as socioeconomic status of cattle farmers, their

education levels, and the enterprise sizes are considered, it is important to put forward the risks of enterprises related to zoonotic diseases, prevent these diseases and develop control strategies. In this research, no significant differences were found between “ages of the cattle farmers” and “their knowledge, attitude, and practices about zoonotic diseases” ($P>0.05$). However, there was a significant difference between “education levels, enterprise sizes, income levels” and “knowledge, attitude, and practices toward zoonotic diseases” ($P<0.05$).

When the knowledge and practice of cattle farmers related to zoonotic diseases were compared with their education status, there was a significant difference between groups ($P<0.01$), but if only their attitudes were compared, it was observed that there was no significant difference. It was confirmed that especially the ones who had high school and university education had a knowledge level distinctly higher and their attitude and practices, except for those who were not illiterate, were closely related to each other. In the same manner, studies conducted in Tajikistan, Senegal, Nepal, and India reported that livestock farmers with low education level had a low level of knowledge, attitude, and practices toward protection from zoonotic diseases (Lindahl *et al* 2015, Tebug *et al* 2015, Kelly *et al* 2018, Prasad *et al* 2019).

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Small scale livestock enterprises play a significant role as a source of income and feeding for low and middle-income countries (Herrero *et al* 2013). Small scale and poor livestock farmers are more often affected by animal diseases, which reduce their income and kill or weaken their animals, destroying much of their food resources and assets (Pradere 2014). In this study, as the number of animals increased in cattle enterprises, knowledge, attitude, and practice levels of cattle farmers also increased. It was also observed that there was a significant difference between groups ($P<0.01$). It was found that most of the cattle farmers included in the questionnaire had a high level of knowledge related to zoonotic diseases and also a high level of knowledge regarding the attitude causing the infection of these diseases but they did not transform that knowledge into practice evenly. Cattle farmers who had more than 100 cattle had knowledge, attitude, and practices toward zoonotic diseases at a level of over 90% and it was higher than other groups (table 3). At the same time, most of the enterprises with more than 100 cattle were having regular veterinary surgeon services. This situation

decreases the cost of veterinarian service per unit as the number of animal increases. In any case, cost increase causes small and middle scale enterprises to benefit less from veterinarian service depending on the decrease in the animal count (Haan and Umali 1992).

Livestock farming composes at least 70% of poor people’s mainstay who live in rural areas in the world (Schelling *et al* 2007). Animal production accounts for 64% of the agricultural economy of Erzurum and it is one of the primary sources of income for the community (Çoban *et al* 2013). In this study, when the monthly income of cattle farmers was compared with their knowledge, attitude, and practices toward zoonotic diseases, the difference was significant ($P<0.05$). It was observed that as the monthly income increased, cattle farmers’ knowledge, attitude, and practice levels also increased. Nearly all of the enterprises having more than 100 cattle had a monthly income of over US\$ 1,700 (table 3). In major scale enterprises, regardless of the count, one or more animals being sick can affect the health of all animals negatively. For this reason, cattle farmers are well aware of keeping a budget for taking veterinarian service in protection of animal health and treatment.

In Erzurum province, where cattle farming is performed intensely, the knowledge, attitude, and practice levels of cattle farmers increased depending on the increase in their education level, their enterprise size and their monthly income. However, regardless of education level, enterprise size and monthly income, it was determined that the positive application levels of all cattle farmers were always lower than the positive attitude levels. Further studies are needed to identify the reasons for the low level of positive practices among cattle farmers. Besides, to prevent and decrease the risks of zoonotic diseases throughout the city, cattle farmers should be given training on topics such as public health, animal health, food security, environment protection, personal cleaning and hygiene. By conducting such studies and providing training to livestock farmers, the opportunity to intervene in a number of zoonotic disease transmission cycles can be improved. It could also be applied to the One Health approach, i.e. public veterinary, environmental and human health function as part of an integrative system.

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