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Assessment of community knowledge, attitude and practice on milk borne zoonoses disease in Debre-Birhan town, north Shewa, Ethiopia

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A cross-sectional questionnaire survey was conducted in Debre-Birhan town, North shoa, Ethiopia, with the objectives of assessing the knowledge, attitude and practices (KAP) of the study participants with respect to milk borne zoonoses; and to determine the effect of demographic character of respondents on knowledge, attitude and practice of zoonotic diseases. Data were collected from the respondents through administering semi-structured questionnaire across the randomly selected collection centers, retailers, consumers and smallholder dairy farmers of the towns. The questionnaire was administered to 230 respondents (5 milk collection centers, 100 consumers, 40 retailers and 85 smallholder dairy farms). The study result showed that 63.5% of the respondents from the total study population knew diseases can be acquired through consumptions of raw cow milk, 61.3% of respondents did not know the names of milk borne zoonotic diseases, and 50.9% of the respondents' forms of milk preference were raw milk. Of the total respondents, 35.2% had no idea of prevention of milk borne zoonotic diseases. In this study, 92.2% of the respondent did not get formal training on zoonotic diseases. Statistically there was strong association between educational level and KAP of the respondents on milk borne zoonosis, ($p<0.05$). There was statistically significance difference ($p<0.05$) on KAP of milk borne zoonosis of the respondents between urban and peri-urban areas. In the current study, the study population has low level of awareness regarding milk borne zoonoses. One way to approach this problem would be to develop educational outreach programs for dairy producers, and public at large, that focuses on issues related to the preventions of consumption of raw milk and milk borne zoonoses.

Key words: Debre-Birhan, milk borne zoonotic diseases, respondents.

INTRODUCTION

Ethiopia, one of the developing countries, constitutes both urban and peri-urban dairying as an important sub-sector of the agricultural production system. For smallholder farmers, dairying provides various

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opportunities to efficient use of land, labor and feed resources and generates regular income (Yitaye et al., 2009). However, the productivity of the livestock resources and the benefits obtained from the sector does not proportionate with the high livestock population. Given the considerable potential for smallholder employment and income generation from high-value dairy products, development of the dairy sector in Ethiopia can contribute significantly to poverty alleviation and nutrition in the country (Mohammed et al., 2004).

Researchers conducted in Ethiopia revealed that the microbial counts of milk and milk products produced and marketed in the country are generally much higher than the acceptable limits on the microbial properties of marketed milk and milk products. Samples taken from 10 dairy potential areas in the country reported a similar observation and mentioned that microbial counts in samples of whole milk are higher than the standard (Yilma, 2010). The higher count in milk could be attributed to the substandard hygienic conditions practiced during production and subsequent handling, while the high count in fermented milk products can also be partly explained by the presence of lactic acid bacteria (Yilma, 2010).

Nutritional-balanced foodstuff milk is a well-known medium that favors growth of several microorganisms. Up to 90% of all dairy related diseases are due to pathogenic bacteria found in milk. Several documented pathogens are known to cause milk-borne zoonotic diseases in humans including brucellosis, tuberculosis, leptospirosis, Q fever and campylobacteriosis (Shirima et al., 2003). Food-borne diseases are serious threat to people in Africa, and responsible for 33-90% cases of mortality in children (Flint et al., 2005). Although foods of animal origin are minor constituent in most diets, animal origin diets are responsible for the majority of incidents of food-borne illnesses; dairy products being implicated (De Buyser et al., 2001).

There has been emergence of new pathogenic bacteria along the food chain. For example, emergence of milk-borne bacterial pathogens with very serious health effects such as *Eschericia coli* 0157:H7 has been reported (Sivapalasingams et al., 2004). Some of the microbial contaminants are responsible for milk spoilage while others are pathogenic with potential health effects which cause milk–borne diseases (Kivaria et al., 2006). Pathogenic bacteria contaminants pose serious threat to human health, and constitute to about 90% of all dairy related diseases (Donkoret al., 2007). The common raw milk pathogenic bacteria contaminants include: *Brucellaabortus, Mycobacterium bovis, Campylobacter* spp*., Coxiellaburnetii, Leptospira*spp*., Listeria monocytogene, Yersinia enterocolytica,* Shiga toxin producing *E. coli, Staphylococcus aureus, Salmonella* spp*.,* and *Clostridium* spp. (Koo, 2008); most of which are pathogenic and zoonotic (Mosalagae et al., 2010).

Dairy-cattle feces and raw milk are sources of zoonotic bacteria such as *Campylobacter, Salmonella,* Shiga toxin producing *E. coli* and *Listeria* (Karns et al., 2005). Outbreaks of food-borne disease in humans are often caused by raw or improperly pasteurized milk and milk products that are contaminated with these bacteria (Denny et al., 2008). The traditional way of processing of milk plus the length of storage time with its high microbial count lead to serious health damage on consumers (Abebe et al., 2013).

Resource constrained countries, especially those in Sub-Saharan Africa, often lack information on the distribution of zoonotic diseases (Zinsstag et al., 2007). The link among humans, animal population and the surrounding environment is very close in many developing countries, where animals provide transportation, draught power, fuel, clothing and source of protein in the form of milk, meat and eggs. In the absence of proper care, this linkage can lead to a serious risk to public health with huge economic consequences (WHO, 2010). Furthermore, many African communities associate diseases shared between livestock and humans with misbehavior or witch-craft (Marcotty et al., 2009). Zoonotic diseases can be transmitted to humans in a number of ways which include consumption of infected raw milk and coming in contact with infected dairy animals, animal products and infected farm environments (Zinsstag et al., 2007). Milk plays a vital role in transmitting zoonotic and food borne diseases unless handled in very strict hygienic conditions. Producing quality milk that is safe for consumption is a major challenge in the Ethiopian context (FAO, 2009). Over 80% of the milk produced in the developing world is consumed unregulated. Of the total milk produced in Ethiopia, only less than one percent is consumed after pasteurizing (FAO, 2009).

Information regarding the impact of milk borne diseases is very limited in Ethiopia. However, taking the large amount of unregulated milk consumed and the risk associated with it, the impact is likely to be tremendous. During the past decade, the Ethiopian dairy sector has been progressing at a very fast rate while little attention has been paid to the importance of safety of milk and milk products produced by farmers and milk processors. To institute an appropriate intervention on public health impact of milk-borne zoonotic pathogens on the community, there is a need to have properly documented baseline information regarding to milk borne zoonoses diseases (Eyasu et al., 2016).

Currently, there is inadequate data on the knowledge, attitude and practice of our community towards food borne zoonotic diseases in general and milk borne zoonotic diseases in particular. This study was, thus, aimed at assessing the knowledge, attitude

and practices of the members of Debre-birhan collection centers, retailers, consumers and smallholder dairy farmers. Therefore, the objectives of the present study were: 1) to assess the knowledge, attitude and practice of the community on milk borne zoonoses and to determine the effect of demographic back ground on knowledge, attitude and practice of milk borne zoonoses.

MATERIALS AND METHODS

Study area

The study was conducted in Debre-Birhan town, which is one of the highest milk producing towns in the national regional states of Amhara, located at latitude of 9°36`N and longitude of 39°38`E; 130 kms North East of Addis Ababa, the capital city of Ethiopia. It is situated at an altitude of 2,828 meters above sea level. The climate is characterized by bimodal rainfall consisting of a long rainy season (June- September), short rainy season (February/March-April/May) and a dry season (October-January).

The mean annual rainfall of the area ranges from 781 to 1279 mm. The mean annual temperature ranges from 5 to 23°C (Ermias, 2007).

Sample size determination and Study population

The sample size for this study was calculated using the formula for estimation of single proportion with 95% CI, 5% of marginal error and rate of knowledge on zoonotic disease (82%) found in one study conducted in Arsi-Negelie, Ethiopia, taken as one component in the formula to calculate the sample size (Amenu et al., 2010).

$$\mathrm{n} = \frac{\left(Z1 - \frac{\alpha}{2}\right) 2\, p(1-p)}{d2}$$

Where, n= sample size; Z1-α/2 critical value= 1.96 for 95% CI; p= rate of knowledge on zoonotic disease (82%); d= marginal error (precision) =0.05.

Given this, $n= (1.96)^2\, 0.82(1-0.82)/0.05^2 =226$.

A total of 230 questionnaires were administered to milk collection center (5), consumers (100), retailers (40) and smallholder dairy farmers (85) by using simple random sampling techniques. The population under this study was considered to be heterogeneous comprising of varied gender and age groups.

Study design

A cross–sectional questionnaire based study was employed to assess knowledge, attitude and practicing (KAP) of smallholder dairy farmers (SDF), consumers, milk collection centers and retailers on milk borne zoonotic disease.

Data collection

Smallholder dairy farmers, consumers, milk collection centers and retailers were visited and the questionnaires were administered to randomly selected sample of the population in the study area. A close-ended questionnaire was developed and pre-tested to assess knowledge, attitudes and practice towards milk borne zoonoses.

Statistical analysis

The collected data was entered and stored to MS- excel sheet (version-2010). Statistical analysis was performed by using statistical software of SPSS version-20; descriptive analysis was employed and expressed in terms of percentage and frequencies. Chi-square analysis was used to determine statistical associations of outcome and explanatory variables. The level of significant was held at 95% confidence interval and 0.05 level of precision.

RESULTS

Demographic characteristics of respondents

Out of 230 respondents, 148 (64.3%) were females and 82 (35.7%) were males. Most of the respondents participating in milk value chain were females constituting 4(80%) of milk collection center, 28 (70%) of retailers, and 61 (71.8%) of SDHs. In educational level perspectives, 42.6% of the respondents were illiterate followed by elementary level comprising 27% part of respondents. High school and greater than high school each covers 15.2% of the total study sample (Table 1).

KAP of the respondents

In this study, only 7.8% of the respondent took formal training on milk borne zoonosis. Of the total study population, 73.5% of the respondents had the habit of checking milk quality; however, most (72.6%) of the respondents employed organoleptic method of checking milk quality. Majority (61.5%) of the respondents in this study used boiling of milk as a method to prevent milk borne disease. In this study, 61.3% of the respondents did not know milk borne diseases that were transmitted through consumptions of infected milks (Table 2).

The effect of educational level on KAP of milk borne zoonosis

In this study, 64.3% of the illiterate respondents did not know prevention methods of milk born zoonosis diseases. 25 and 0% of the respondents with educational level of high school and greater than high school did not know prevention of milk born zoonosis. Most (57.1%) of the illiterate respondents did not check milk for its quality. However, 91.1% of elementary, 100% of high school and greater than high school had the habit of checking milk quality. In this study, there was strong association between educational level and KAP of the respondents against zoonotic disease ($p<0.05$) (Table 3).

The effect of place of residence on KAP of milk borne zoonosis

Most (75.9%) of the urban respondents thought diseases

Table 1. Demographic characters of respondents.

Demographic characters		Frequencies (%)	Total sampled
Gender	Male	82(35.7)	230
	Female	148(64.3)	
Residence	Urban	112(48.7)	230
	Peri-urban	118(51.3)	
Educational status	Illiterate	98(42.6)	230
	Elementary	62(27)	
	High school	35(15.2)	
	>high school	35(15.2)	
Age	<25	53(23)	230
	≥25	177(77)	

Table 2. KAP of the respondents on milk borne zoonosis.

Variables	Number of respondents (%)	Total sampled
Got training yet?		
Yes	18(7.8)	230
No	212(92.2)	
Milk borne disease prevention methods		
Pasteurization	8(3.5)	230
Boiling	141(61.5)	
I do not know	81(35.2)	
Disease transmission through milk		
Yes	146(63.5)	230
No	84(36.5)	
Name of milk borne disease you know		
Brucellosis	5(2.2)	230
Tuberculosis	49(21.3)	
Typhoid	35(15.2)	
I do not know	141(61.3)	
Checking of milk quality		
Yes	169(73.5)	230
No	61(26.5)	
Method of checking milk quality		
Organoleptic	167(72.6)	230
Specific gravity	2(0.9)	
Decision for bad milk		
Boil	9(3.9)	230
Discard	84(36.3)	
Sell	18(7.8)	
Mix with normal	35(15.2)	
Forms of milk preference		
Boiled	113(49.1)	230
Raw	117(50.9)	

Table 3. Effects of educational levels of the respondents on KAP of zoonotic disease.

Variable		Education level (frequency, %)				χ^2(p-value)
		Illiterate	Elementary	High school	>high school	
Knowledge						
Milk borne Diseases you know	Brucellosis	1(1)	0(0)	0(0)	4(11.4)	118.055(0.000)
	TB	5(5.1)	17(27.4)	8(22.9)	19(54.3)	
	Typhoid fever	0(0)	12(19.4)	11(31.4)	112(34.3)	
	Nothing	92(93.9)	33(53.2)	16(45.7)	0(0)	
Prevention methods known	Pasteurization	1(1)	1(1.6)	0(0)	6(17.1)	86.694(0.000)
	Boiling	34(34.7)	52(83.9)	26(74.3)	29(82.9)	
	I do not know	63(64.3)	9(14.5)	9(25.7)	0(0)	
Attitude						
Transmission through cow milk?	Yes	23(23.5)	53(85.5)	35(100)	35(100)	120.889(0.00)
	No	75(76.5)	9(14.5)	0(0)	0(0)	
Practice						
Habit of checking milk quality	Yes	42(42.9)	57(91.9)	35(100)	35(100)	83.257(0.000)
	No	56(57.1)	5(8.1)	0(0)	0(0)	
Method of checking	Organoleptic	42(42.9)	57(91.9)	35(100)	33(94.3)	93.337(0.000)
	Specific gravity	0(0)	0(0)	0(0)	2(5.2)	
Forms of milk preference	Boiled	22(22.4)	35(56.5)	24(68.6)	32(91.4)	59.593(0.000)
	Raw	76(77.6)	27(43.5)	11(31.4)	3(8.6)	

can be transmitted through consumption of raw cow milk, and 1.8, 26.8, and 26.8% of urban respondents knew brucellosis, TB and typhoid, among the diseases transmitted by raw milk, respectively. Large proportion (48.3%) of the respondents from peri-urban area thought that diseases could not be transmitted through cow milk and 77.1% did not know any milk borne diseases. This study showed that there was statistically significance difference ($p<0.05$) on KAP of the respondents on milk borne diseases between urban and pre-urban areas (Table 4).

KAP of milk collection centers, retailers, users and smallholder dairy farmers (SDFs)

In this questionnaire survey, the respondents were categorized into milk collection centers, retailer, users and smallholder dairy farms. Most of the classes had significant relation with KAP ($p<0.05$). There was statistically significant difference (p-value<0.05) between prevention method and respondents types. There was no statistically significant difference (p-value> 0.05) between knowledge of diseases transmission through milk and respondents types. There was no statistically significance difference ($P>0.05$) between respondents types and milk of preference. 20% of milk collection centers, 12.5% of retailers, 2% of users and 0% of SDHs use pasteurization as prevention method of milk born zoonosis (Table 5).

Influence of demographic characteristics on milk collection centers, retailers, users and smallholder dairy farms

This study also shows that there was no significant difference between respondent types and sex ($p>0.05$). However, there was significant difference between respondent types and age ($p<0.05$). There was no statistically significant difference between respondent types and educational level (p-value>0.05). In contrast, there was statistically significance difference between place of residence and respondent types (p-value<0.05). (Table 6)

DISCUSSION

A total of 230 respondents from Debre-Birhan town were selected randomly and most of them had low level of awareness on milk borne zoonosis. The fact that most (92.2%) respondents had no formal training in milk borne zoonosis was a cause for having the low level of knowledge, attitude and practice concerning milk borne zoonosis. So, education changes the knowledge and practice of persons. In this study, most of the respondents were held by traditional believe and attitude; not by scientific reason. This is due to the lack of awareness about the health risks of milk borne diseases. A similar result was recorded in the coastal savannah

Table 4. The effect of place of residence on KAP milk borne zoonotic disease of respondents.

Variable		Residence place (frequency, percentage)		χ^2(p-value)
		Urban	Peri-urban	
Knowledge				
Prevention methods you know	Pasteurization	7(6.2)	1(0.8)	28.311(0.0000)
	Boiling	84(75)	57(48.3)	
	I do not know	21(18.8)	60(50.8)	
Milk borne diseases you know	Brucellosis	2(1.8)	3(2.5)	32.314(0.000)
	TB	30(26.8)	19(16.10	
	Typhoid fever	30(26.8)	5(4.2)	
	I do not know	50(44.6)	91(77.1)	
Attitude				
Thought of diseases Transmission through cow milk	Yes	85(75.9)	61(51.7)	14.513(0.00)
	No	27(24.1)	57(48.3)	
Practice				
Habit of checking milk quality?	Yes	102(91.1)	67(56.8)	34.673(0.000)
	No	10(8.9)	51(43.2)	
Method of checking	Organoleptic	100(89.3)	67(56.8)	35.946(0.000)
	Specific gravity	2(1.8)	0(0)	
Forms of milk preference	Boiled	81(72.3)	32(27.1)	46.978(0.000)
	Raw	31(27.7)	86(72.9)	

Table 5. KAP of milk collection centers, retailers, users, and SDFs on milk borne disease.

Variables		Respondent types(frequency, percentage)				χ^2	p-value
		Mcc	Retailor	User	SDH		
Knowledge							
Prevention methods you know	Pasteurization	1(20)	5(12.5)	2(2)	0(0)	36.42	0.00
	Boiling	4(80)	12(30)	61(61)	64(75.3)		
	I do not know	0(0)	23(57.5)	37(37)	21(24.7)		
Diseases known	Brucellosis	0(0)	1(2.5)	2(2)	2(2.4)	20.893	0.013
	TB	4(80)	11(27.5)	24(24)	10(11.8)		
	Typhoid fever	1(20)	5(12.5)	19(19)	10(11.8)		
	Nothing	0(0)	23(57.5)	55(55)	63(74.1)		
Attitude							
Diseases Transmission thought through milk	Yes	5(100)	21(52.5)	63(63)	57(67.1)	5.436	0.143
	No	0(0)	19(47.5)	37(37)	28(32.9)		
Practice							
Habit of checking milk quality	Yes	5(100)	28(70)	66(66)	70(82.4)	8.358	0.039
	No	0(0)	12(30)	34(34)	15(17.6)		
Method of checking	Organoleptic	3(60)	28(70)	66(66)	70(82.4)	98.001	0.000
	Specific gravity	2(40)	0(0)	0(0)	0(0)		
Forms of milk preference	Boiled	4(80)	19(47.5)	43(43)	47(55.3)	4.745	0.191
	Raw	1(20)	21(52.5)	57(57)	38(44.7)		

mcc. = milk collection centers.

Table 6. Influence of demographic characteristics on vendors, retailers, users and SDFs.

Variables	Respondents type(frequency, percentage)				X^2	P- value
	Mcc.	Retailers	Users	SDH		
Age						
<25 years	2(40)	11(27.5)	29(29)	11(12.9)	8.151	0.043
≥25 years	3(60)	29(72.5)	71(71)	74(87.1)		
Sex						
Female	4(80)	28(70)	55(55)	61(71.8)	6.938	0.074
Male	1(20)	12(30)	45(45)	24(28.2)		
Educational status						
Illiterate	0(0)	13(32.5)	48(48)	37(43.5)	11.444	0.247
Elementary	2(40)	12(30)	22(22)	26(30.6)		
High school	1(20)	9(22.5)	12(12)	13(15.3)		
>high school	2(40)	6(15)	18(18)	9(10.6)		
Residence						
Urban	5(100)	25(62.5)	44(44)	38(44.7)	9.743	0.021
Peri-urban	0(0)	15(37.5)	56(56)	47(55.3)		

mcc. = milk collection centers.

zone, one of the six agro-ecological zones in Ghana by Addo et al. (2011); 83.9% of the respondent did not take formal training.

In this study most of respondents from smallholder dairy farms were female. This may be from the traditional attitude that male most of the time do not participate with milk related issues and tasks. Similar to this finding, Mosalagae et al. (2010) who studied in selected smallholder and commercial dairy farms of Zimbabwe reported higher involvement of females.

In this finding, 42.6% of the respondents were illiterate followed by 27% of elementary level, 15.2% of high school and 15.2% of greater than high school. This descending of respondent percentage with increasing education level reflects unwillingness of the educated society to participate in dairy business. This high percentage of illiterate with low level of zoonosis diseases awareness may expose the public to critical health risks. In contrast to the findings of the present study; studies conducted by Juma, (2013) in Tanzania revealed that majority of the respondents from all categories; milk vendors (97.1%, n=34), milk retailers (88.6%, n= 31) and smallholders dairy farmers (94.3%, n=33) reported that milk-borne zoonoses diseases associated by consumption of raw milk could be prevented through boiling of milk.

In this study, 80% of milk collection centers are elementary and greater than high school (40% each) while 20% were high school level; however, there was 0% of illiterate in vending business. 43.5% smallholder dairy farmers were illiterate, followed by 30.6, 15.3, and 10.6% for elementary, high school and greater than high school respectively. Contrary to this finding, Juma (2013) from Tanzania had reported that 94.3% of the sampled smallholder dairy farmers were elementary and 5.7% were secondary level, but there was no respondents from greater than high school education level.

This study indicated that 61.3% of respondents do not know any milk borne diseases. This might reduce hygienic cares during handling and consumption of raw milk. Tuberculosis and typhoid fever were first and second known diseases of the respondents; 21.3 and 15.2% of the respondent known tuberculosis and typhoid fever as milk borne zoonosis disease respectively. Brucellosis was the least known diseases, only 2.2% know it. Addo et al. (2011) from Ghana reported that TB was known by 88% of the respondents and brucellosis by 76% which is far from the findings of this study. This might be due to the educational status and life experience of the respondents in Ghana. Mihiret-ab (2012) also reported that 5.6% of the respondents were aware of the zoonotic importance of brucellosis in and around Dire Dawa, Ethiopia. Dawit et al. (2013) reported contrary to the present findings that none of the respondents from Jimma knew about zoonotic importance of brucellosis.

Even though 63.5% of respondents were aware of diseases that might be transmitted through cow milk, but 61.3% of the respondents did not know the particular names of diseases of milk borne zoonotic diseases. This study indicated that respondents were to some extent aware of general milk borne zoonosis but did not know specific names of the diseases. Similar observations were noticed in Kenya (Ekuttan, 2005) where dairy farmers were generally aware of zoonosis but lack of knowledge on specific milk-borne zoonosis.

In this finding, only 3.5% of the respondents knew pasteurization as means of prevention of milk borne zoonosis. Similarly, 61.3% of the respondents knew boiling as means of prevention of milk borne zoonosis. The unpasteurized or un-boiled milk have been reported to be associated with milk borne zoonotics diseases such as brucellosis and bovine tuberculosis (Fetene et al., 2011).

Most of the respondents from the total study population knew diseases can be acquired through cow milk. This result was due to the fact that 100% of high school and greater than high school knew diseases can be acquired from consumption of raw cow milk but 76.5% of illiterate did not know this fact. In this study, even though 63.5% respondents were aware of diseases that are transmitted through the consumption of raw cow milk, 50.9% of the respondents' forms of milk preference were raw milk. Hundal et al. (2016) from Punjab were reported that 69.6% of the respondents drink raw milk and 55.6% of the respondents knew diseases can be transmitted through consumption of contaminated milk. Large amounts of *E. coli*, *S. aureus*, *Candida albicans* and other health hazard microbes have been reported in raw milk, cultured pasteurized milk and naturally soured raw milk (Gran et al., 2003), and this emphasizes need for improved hygienic practices and precaution at all levels of milk processing value chain. Ingestion of infected raw/unpasteurized milk was cited as the most possible way of contracting milk-borne zoonosis (Chahota et al., 2003).

Study by Kilango et al. (2012) reported that boiling of milk prior to consumption is the best approach to prevent milk-borne diseases especially in low income communities but in this study only 61.3% of respondents know that boiling of milk can prevent milk born zoonosis.

The difference in awareness of milk borne zoonosis is due to various circumstances present in the study area. Most of the variation in developing country described by Ameni and Erkihun (2007) which includes remoteness, lack of health facilities, poor extension services, low training status on rearing and handling animals and low literacy rate had been reported as major contributors to low level of awareness among smallholder dairy farmers. Furthermore, many African communities associate diseases shared between livestock and humans with misbehavior or witchcraft (Marcotty et al., 2009), and all these practices are due to little information or lack of knowledge about milk quality at farm level and on different aspects of dairy husbandry issues (Marcotty et al., 2009).

CONCLUSION AND RECOMMENDATIONS

In this study survey, the respondents knowledge, attitude and practice concerning milk borne zoonosis was found at lower level. This was mostly due to low level of educational status. Without information on milk-borne zoonosis, milk collection centers, retailers, users, and smallholder dairy farmers are neither informed nor motivated to take the simple precautions necessary to protect themselves, their families, workers and the public. Generally, the sampled population had low level of awareness regarding milk borne zoonosis. Based on the above findings the following recommendations are forwarded: 1) awareness about zoonotic disease and trainings on zoonotic risks of milk borne diseases and their prevention methods should be given to milk producers, collection centers, retailers, consumers and also people working with milk handling and processing and 2) the public should be educated and informed on public health significance of milk borne zoonotic diseases.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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