

# A Study on the Assessment of Knowledge, Attitude and Practices of Community Towards Milk Borne Zoonotic Diseases in Holeta Town, Oromia Region, Ethiopia

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## Abstract

*Milk borne zoonoses are a significant cause of morbidity as well as mortality both in the developing and developed nations of the world. A cross-sectional study has been conducted in Holeta town of Oromia region of central Ethiopia to assess the knowledge, attitude, and practices of the community on milk-borne zoonotic diseases. A total of 120 study participants from the different socio-demographic backgrounds were randomly selected and voluntarily filled out the semi structured questionnaire, which was distributed to gather the required information from the respondents. The results showed that 64.17% of the respondents knew that milk born zoonotic diseases could be acquired through the consumption of raw milk whereas 31.67% of the respondents prefer to consume unpasteurized milk. Of the total respondents, 81.67 % did not check the quality milk prior to use for consumption. The study revealed that 85% of respondents in this study did not receive formal training on milk-borne zoonotic diseases. About 6.67% of the respondents shared the same house with the animals. The overall knowledge, attitude, and practice of milk-borne zoonotic diseases in the study area were not adequate. Thus, community education and awareness-raising programs are required to further improve the community's knowledge, attitude, and practice on milk-borne zoonotic diseases that cause serious illness in humans worldwide.*

**Keywords:** Attitude; Community; Knowledge; Milk borne zoonotic diseases; Public health.

## 1. Introduction

Ethiopia has the largest livestock population in Africa estimated at 70.29 million cattle, 42.91 million sheep, 52.46 million goats, 2.15 million horse, 10.79 million donkey, 0.38 million mules, 8.15 million camels, 56.99 million poultry

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and 6.98 million bee hives [1]. Despite the country's abundant livestock, its sub-sector is generally less productive. In terms of capacity, and direct contribution to the country's economy is limited. According to [2], the average daily milk yield per cow is 1.37 litres of all the milk produced in Ethiopia, less than 1% are consumed after pasteurization [3].

Dairy and dairy products are one of the most important food products of the origin of milk. Milk is regarded as the most complete food item due to its high biological value, as it contains a variety of nutrients, which help to make it nature's most nearly perfect food, increasing human nutrition as well as the health of small-scale household members [4]. More than 75% of the milk produced is absorbed locally and consumed at home [5]. Milk, on the other hand, is a very perishable product that loses quality quickly and becomes unfit for human consumption if not properly stored, posing a health risk by acting as a vehicle for disease transmission. Raw milk has been implicated in a number of food-borne disease outbreaks worldwide [6], [7]. The list of milk borne zoonoses of varied aetiologies that cause high morbidity and mortality in humans is given in the book entitled "Zoonoses" authored by [6].

Zoonosis is the term used to describe infections that are naturally transmitted from vertebrate animals to humans and vice versa [8]. Approximately, 61 percent of human infections are thought to be zoonotic [9]. Different farm animals naturally carry a variety of zoonotic agents in the cattle industry. In the dairy business, zoonotic illnesses are regularly discovered in dairy animals, raw milk, milk products, meat, and the farm environment. Thus, zoonosis can be transmitted to humans in several ways that include consumption of infected raw milk and coming in contact with infected dairy animals, animal products, and infected farm environments [10], [11].

Consumption of contaminated milk is a major source of zoonotic milk-borne disease which are of public health and economic importance. In addition to causing huge economic losses to dairy producers, it is also a major barrier to trade in livestock and livestock products. To control animal diseases, these countries have limited financial resources, insufficient infrastructure, and limited financial resources. Furthermore, in many countries, the economic and public health importance of zoonotic diseases are low for farmers, making it difficult for them to control the disease [12].

New harmful bacteria have emerged as part of the food chain. For example, the rise of milk-borne bacterial infections, such *Escherichia coli* 0157:H7, which can cause major health problems, has been documented [13], [14]. Some microbial contamination induces milk spoiling, while others are pathogenic and can cause health problems, resulting in milk-borne illnesses. Pathogenic bacteria pose a severe health risk to humans, accounting for around 90% of all dairy-related disorders [15]. The common raw milk pathogenic bacteria contaminants include: *Brucella abortus*, *Mycobacterium bovis*, *Campylobacter* spp., *Coxiella burnetii*, *Leptospira* spp., *Listeria monocytogenes*, *Yersinia enterocolytica*, Shiga toxin producing *E. coli*, *Staphylococcus aureus*, *Salmonella* spp., and *Clostridium* spp. most of which are pathogenic and zoonotic [10], [16].

The udder can be infected with a series of pathogenic fungi and actinomycetes, which are released in large quantities from milk. *Nocardia asteroides*, a pathogenic actinomycetes that occurs in the environment, is responsible for serious form of mastitis in dairy cattle [17], [18]. The disease is caused by various fungus species, such as *Candida tropicalis*, *Candida albicans*, and *Teunomyces (Candida) krusei*, which can be transmitted through improperly digested milk, posing

a risk of fungal infection, particularly in immune compromised patients [19]. A few other parasites, such as *Taenia* spp. as well as *Toxoplasma gondii* can sometimes contaminate milk and transmit on to people [20]. Hepatitis A virus and hepatitis, in particular, tick-borne viruses and also polioviruses that were linked to milk contamination during the pre-vaccination period. These are the pathogens that can be transmitted through milk [21].

## 1.1. Statement of the Problem

In Ethiopia, there is a scarcity of data on the impact of milk-borne diseases. The impact, however, is likely to be enormous, given the large amount of unregulated milk consumed and the risk associated with it. Over the past decade, the Ethiopian dairy industry has been growing at a tremendous rate with very little attention to the safety of milk and dairy products produced by dairy farmers and processors. To incorporate appropriate interventions into the public health impact of milk-borne diseases in the community, it is necessary to clearly document the basic information regarding dairy-borne diseases [22].

In order to establish an appropriate intervention on public health impact of milk-borne zoonotic pathogens on the community, there is a need to have properly documented baseline data concerning the same. Among the many approaches devised to have such data is conducting KAP survey [22]. There is currently insufficient data on our community's knowledge, attitude, and practice about milk-borne zoonotic illnesses, particularly in Holeta town of Ethiopia. Therefore, the objectives of the present study were to assess the community's knowledge, attitudes, and practices on milk-borne zoonotic diseases in Holeta town Oromia region, Central Ethiopia.

## 2. Literature Review

### 2.1. Etiology

The list of bacteria that can cause milk-borne illnesses is extensive, and it includes *Brucella* spp, *Campylobacter jejuni*, *Bacillus cereus*, Shiga toxin-producing *E. coli* (E. coli O157:H7), *Coxiella burnetii*, *Listeria monocytogenes*, *Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium avium* subspecies *paratuberculosis*, *Salmonella* spp, *Yersinia enterocolitica*, and certain strains of *Staphylococcus aureus*, which are capable of producing highly heat-stable toxins [10], [17]. Milk-borne illnesses can be caused by a variety of viruses, especially in impoverished countries with poor sanitation. Poliomyelitis epidemics were devastating in the pre-vaccination era, with poliovirus infections being linked to contaminated milk [23].

Pathogenic fungi, such a *Cryptococcus neoformans*, *Candida albicans*, *C.guilliermondii*, *C.kefyer*, *C.parapsilosis*, *C tropicalis*, *Teunomyces (Candida) krusei*, *Geotrichum candidum*, *Aspergillus fumigatus* etc can infect a cow's udder, causing enormous volumes of milk to be expelled [10] . *Nocardia asteroides*, an aerobic actinomycetes, which is discharged in milk for several months, has been proven to induce mastitis in cows. In addition, *Prototheca zopfii*, an alga, is also implicated in the etiology of bovine mastitis [24]. *Taenia* spp. and *Toxoplasma gondii*, for example, can contaminate milk and be passed to people. The atmosphere of milk procurement, which is carefully regulated in industrialized farms, is another source of infection. The soil pollution can also result in the presence of parasites carried by the soil in milk (e.g.,

*Ascaris lumbricoides*, *Trichuris trichiura*). To avoid such contaminations, sanitary conditions, adequate pasteurization, and hygienic conditions must be maintained [25].

## 2.2. Epidemiology

The frequency and spread of zoonoses are influenced by domestic and wild animal population movements. The tendency toward expanding urban green spaces and urbanisation into agricultural and natural ecosystems, on the other hand, enhances vector distribution and abundance in urban regions, as well as their contact with humans. Moreover, unofficially traded animals are a much greater risk factor for disease spread because they are not necessarily subject to veterinary controls [26]. Animals with subclinical infections can't be recognized from healthy ones, therefore, diseases can spread across borders [27].

Livestock husbandry is one of those vocations that need interaction with animals. Livestock farmers are especially vulnerable to zoonotic diseases. Furthermore, livestock farmers' lack of basic knowledge, biosecurity precautions, and personal hygiene may contribute to the infection and spread of zoonotic diseases. Livestock farmers who are aware of zoonotic diseases can be more willing to take precautions and participate in disease control programs, according to the concept of activities occurring at the interface of human, animal, and environment [28].

Food products may become contaminated at different stages along the food chain could be during production, processing, distribution, preparation, and/or final consumption. Risk of food getting contaminated depends largely on the health status of the food handlers, their personal hygiene, knowledge, and practice of food hygiene [29].

Foodborne diseases are infectious or toxic disorders that are spread by the ingestion of food or water, according to the World Health Organization. Intoxication (toxin produced by the pathogens causes food poisoning), infection (ingestion of food containing pathogens), and toxico- infections (producing toxins while growing in the human intestines) are the three types of food-borne diseases. Diseases of animal origin can be transmitted between humans and animals through direct contact, indirect environmental contact, and/or through food consumption [6], [10], [30].

Around 60% of human diseases are originated from animals, and approximately 75% of new emerging human infectious diseases are transmitted from vertebrate animals to humans. Milk-borne pathogens are microorganisms (i.e., bacteria, viruses, and fungi) as well as a number of parasites, and they are the primary cause of food spoilage and milk borne diseases. Microbes found in milk are a major source of foodborne illness, causing infections in humans after consuming animal products infected with microbes or their toxins [31].

## 2.3. Diagnosis

Brucellosis diagnosis in animals by milk ring test, serological tests like Rose Bengal plate test (RBPT), standard tube agglutination test (STAT) are the commonly used screening tests and complement fixation test (CFT) is the confirmative test [10]. Other serological tests like ELISA are also used. To confirm the diagnosis of brucellosis [10]. Isolation and molecular tools like polymerase chain reaction (PCR) can be used for detecting *Brucella* organisms in the milk. In humans, serological tests and clinical symptoms are helpful to make the diagnosis of brucellosis [10], [32].

Most cases of salmonellosis in animals particularly in carriers, which may not show any sign of the disease generally go unnoticed and undiagnosed. A specific fimbrial antigen based latex slide agglutination test and flagellar antigen based competitive ELISA are being used for identification of *Salmonella Enteritidis*. Simple PCR protocols with or without pre-enrichment of faecal samples have enabled detection of *Salmonella* within 24 hours. Bovine Tuberculosis detection can be made from milk by isolation and PCR. In humans and animals, diagnosis can be made by tuberculin testing, acid fast staining, and molecular techniques like PCR [10], [33].

#### 2.4. Control and Prevention

Zoonoses are a severe health concern to the entire world's population. Human diseases are communicable in about 58–61 percent of cases, and zoonotic in up to 75 percent of cases (transmitted from animals). Zoonosis is caused by the interaction of humans, animals, and the environment, necessitating a multi-sectoral strategy to ensure successful control. To prevent and control zoonotic illnesses, surveillance is essential. It can be used to identify early infection, infected persons and animals, reservoirs, vectors, and endemic locations, including "hotspots," among other things. It aids in the adaptation of control measures against emerging and re-emerging illnesses in order to promote human health, properly manage disease, and reduce human and animal morbidity and mortality [34].

Treatment of sick persons, immunization of healthy individuals and animals, restriction of animal movement, animal population control, and test and cull (anthrax, glanders, and Rift Valley fever) are all methods that can be used to control zoonoses. To limit the risk of contracting new diseases, infected materials must be decontaminated. The safe disposal of an aborted foetus, for example, can help to lower the occurrence of brucellosis [10].

It is necessary to exercise personal hygiene management and the use of personal protection equipment, such as gloves, face masks, lab coats, helmets, and goggles. To assist in reducing the spread of brucellosis, salmonellosis, and tuberculosis, thorough disinfection of contaminated materials and areas should be carried out when applicable [35]. The importance of clean milk production from food safety point of view has been discussed by [24].

### 3. Material and Methods

#### 3.1 Study Area

The study was conducted in Holeta town located 45 km away from Addis Ababa in the south west direction, 9° 3' N and 38° 30' E, at an altitude of 2,400m above sea level in central highlands. The area is characterized by mild subtropical weather with minimum and maximum temperature ranging from 2 to 9 °C and 20 to 27 °C, respectively. The area receives annual rainfall of 1060 mm [36].

#### 3.2 Study Population

The study population was communities of Holeta town those were simple randomly selected individuals of the town with the age of above eighteen years.

### 3.3 Study Design

A cross-sectional questionnaire-based survey study was conducted from July 2021 to August 2021. A standard questionnaire was designed and employing face to face interview on assessing knowledge, attitude, and practices among communities living in Holeta town regarding milk borne zoonotic disease.

### 3.4 Sample Size

This study covered residents of Holeta town who were over the age of 18 and had lived in the town for at least six months. The number of people who needed to be sampled was determined using Arsham's formula [37].  $N = 0.25 / SE^2$ , Where N = sample size, S = standard error, 5%. Accordingly, the required sample size was 100. But in order to increase the precision 20% the study sample were added and total respondents increased to 120.

### 3.5 Method of Data Collection

A questionnaire was interviewed each randomly selected individual. A standardized questionnaire was also created to measure the community's knowledge, attitude, and practice in the research areas' urban and peri-urban areas. Each respondent's socio-demographic history was also documented. The target groups of the study were randomly selected individuals who lived within the study area.

Data were collected using pre-tested interview administered structured questionnaire. The questionnaire was created using information acquired from books as well as what is currently being done in the community. The questionnaire was first prepared in English and later translated to Afaan Oromoo for full consistency. The interviewers were administered the questionnaires and record information through face to face interviews. Besides, they were briefed about the objective of the survey and asked for their consent before the interview was commenced. Individuals were interviewed as part of the research.

### 3.6 Data Management and Statistical Analysis

All collected data were entered into the Microsoft Excel 2016 spread sheet and imported to STATA version-13 statistical software for descriptive statistical analysis, and test of association between different risk factors and outcome variables.

## 4. Results

### 4.1 Questionnaire Results Regarding Socio-Demographic Characteristics of Respondents

Out of 120 respondents, 24 (20%) were females and 96 (80%) were males. The majority of the respondents' age group lied in the range between the age of (36-55 years old) which accounts for 58.33%, followed by a range of age the groups (56-85 years old) and (18-35 years) with 33.33% and with 8.33%, respectively. In educational level perspectives, 43.33% of the respondents were elementary level followed by illiterate comprising 27.5% part of respondents. High school and greater than high school each covers 29.17% of the total study sample. The majority of participants (84%) owned dairy cows, and 57.5% of the respondents were claiming to possess other domestic animals (Table 1).

**Table 1:** Results of the Questionnaire Regarding Socio-Demographic Characteristics in the Study Area.

Questions regarding Socio-demographic characteristics	No. of respondents	Percentage (%)
Sex		
Males	96	80%
Females	24	20%
Age (years)		
18-35	10	8.33%
36-55	70	58.33%
56-85	40	33.33%
Marital status		
Married	110	91.67%
Unmarried	10	8.33%
Education level		
Illiterate	33	27.33%
Elementary	52	43.33%
High school and above	35	29.33%
Occupation		
Peasant	47	39.17%
Small and medium business owners	47	39.17%
Government employee	12	10%
Other	14	11.66%
Religion		
Christian	110	91.67%
Muslim	8	6.67%
Wakefata	2	1.67%
Respondents address		
Urban	87	72.5%
Rural	33	27.5%
Dairy cow ownership		
Yes	84	70%
No	36	30%
Other domestic ownership		
Yes	69	57.5%
No	51	42.5%

#### 4.2 Questionnaire Survey Results for Knowledge of the Respondents on Milk borne Zoonotic Disease in Study Area

Most (64.17%) of the respondents thought that diseases can be transmitted through consumption of raw cow milk, and 64.17%, 20.83%, 7.5%, 5.83% and 1.67% of urban respondents knew about tuberculosis, typhoid, salmonellosis, brucellosis, and others among the diseases transmitted by raw milk, respectively.

Regarding prevention methods, 67.5% thought boiling as the best prevention method. Large proportion (62.5%) of the respondents replied that raw milk could be the cause of health problems and 85% of participants did not get any training regarding milk borne zoonotic diseases (Table 2).

**Table 2:** Knowledge of the Respondents on Milk Borne Zoonotic Disease in Holeta Town.

Categories regarding knowledge of respondents	No. of respondents	Percentage (%)
Did disease transmit through milk		
Yes	77	64.17%
No	43	35.83%

Any milk borne zoonosis you know		
Tuberculosis	77	64.17%
Typhoid	25	20.83%
Salmonellosis	9	7.5%
Brucellosis	7	5.83%
Other	2	1.67%
Raw milk could cause serious health problem		
Yes	75	62.5%
No	45	37.5%
Prevention methods for milk borne zoonosis		
Boiling	81	67.5%
Treating sick animal	30	25%
Pasteurization	3	2.4%
Other methods	6	5%
Milk borne zoonosis you experienced		
Tuberculosis	64	53.33%
Typhoid	43	35.83%
Salmonellosis	3	2.5%
Brucellosis	2	1.67%
Other	8	6.6%
Did you get training on milk borne zoonosis		
Yes	18	15%
No	102	85%

#### 4.3 Results Regarding Attitudes and Practices of Respondents Towards Milk-borne Zoonosis

Around half of the respondents about 51.67 % agreed with raw milk is healthier and nutritious than pasteurized or boiled milk. And about 80% of the respondent believed not only sick cattle could be a source of milk born zoonotic diseases. From the entire respondent, about 13.33% have no idea on milk born zoonotic disease wither it is fatal or not (Table 3).

The majority of the respondents around (31.67%) consumed raw milk. while about 61.67% and 6.67% of the respondents consumed the milk after boiling and other processing methods, respectively. From the total respondent, only 18.33% of them have the habit of checking the quality of milk besides, about 75% of the respondents used boiling tests and the rest 15%, 5%, 2.5%, 1.67%, 0.83% used other methods, organoleptic, alcohol tests, pasteurisation, lactometer, respectively. And also, about 6.67% of respondents shared the same house with their animals (Table 3).

**Table 3:** Attitudes and Practices of Respondents Towards Milk Borne Zoonotic Diseases in the Study Area.

Categories regarding attitudes and practices of respondents	No. of respondents	Percentage (%)
Raw milk is healthier and nutritious than pastearized/boiled		
Agree	62	51.67%
Dis agree	58	48.33%
No risk of disease from drinking raw milk right after milking		
Agree	18	15%
Dis agree	102	85%
Only sick cattle could be a source of milk born zoonosis		
Agree	24	20%
Dis agree	98	80%
Milk-borne diseases are fatal		
Agree	52	43.33%
Dis agree	52	43.33%

I don't know	16	13.33%
<b>Milk consumption habit</b>		
By boiling	74	61.67%
Raw milk	38	31.67%
Other	8	6.67%
<b>Checking of milk quality?</b>		
Yes	22	18.33%
No	98	81.67%
<b>Method of checking milk quality</b>		
Boiling test	90	75%
Organoleptic method	6	5%
Alcohol test	3	2.5%
Pasteurization	2	1.67%
Lactometer	1	0.83%
Other	18	15%
<b>Share the house with your animal</b>		
Yes	8	6.67%
No	112	93.33%

## 5. Discussion

In the present study, the questionnaire survey for participants in the study area revealed that 43.33% of the respondents had education at elementary level, whereas 27.5% were illiterate, 29.17% had high school and above. This finding contradicted from the previous report of [38] in Debre-Birhan Town, report that 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. The decrease in respondent percentage as education level rises reflects the educated society's unwillingness to participate in the dairy industry.

In response to the questionnaires about milk born zoonoses, more of the respondents knew about tuberculosis (64.17%), typhoid (20.83%), salmonellosis (7.5%), brucellosis (5.83%), and others (1.67%), which can be transmitted through milk. As compared to the previous report by [39] from Jinka town, Ethiopia, respondents knew concerning the existence of zoonotic diseases, such as tuberculosis (39.39%), salmonellosis (2.02%), and brucellosis (33.33%) As a result, the respondent in the current research area knew more about tuberculosis and salmonellosis. According to Addo and co-investigators [40] from Ghana, 88 percent of respondents knew about tuberculosis and 76 percent knew about brucellosis, which contradicts the findings of the current study. This could be related to the respondents' educational backgrounds and life experiences in Ghana.

In present study, about 67.5 of respondent have perception of boiling as a means of prevention that is slightly lower than the findings of Abebe and others [39] from Jinka town south Ethiopia with (80.16%). The current study's findings are greater than those of Abebe and co-workers [39] in Debre-Birhan Town, who found that 3.5 percent employed pasteurization as a preventative measure.

The current study assessed most of the respondents 85% couldn't get training regarding milk-borne zoonotic diseases. In prior observations, a similar outcome was recorded from Debre-Birhan Town (92.2%) by Abebe and others [39] and from Jinka town 74.94% by Addo and co-workers [40]. This is due to a lack of understanding about the health concerns

associated with milk-borne illnesses. Reason for a lack of understanding, attitude, and practice in the area of milk-borne zoonoses.

In this finding, about 51.67% of the respondents agreed about raw milk is healthier and nutritious than pasteurized or boiled milk. This result is lower than that of Abebe and co-investigators [39] from Ethiopia's North Showa Zone, who reported 65.8%, and higher than the result of the research of Addo and others [40] from Jinka town with (40.25%). This indicates that pasteurized or boiled milk was disliked by a sizable portion of the responders. Despite the lack of scientific evidence, the majority of people still prefer raw milk to pasteurized milk because they believe raw milk has better nutritional content, flavour, and other health benefits [41]. It is very pertinent to mention that raw milk poses a risk to human health, and therefore, must be pasteurized or properly boiled before consumption from safety point of view [6,] [10].

## 6. Conclusions and Recommendations

Milk borne zoonoses caused by multiple etiological agents are responsible for morbidity and mortality in the susceptible throughout the world. The respondents' knowledge, attitude, and practice on milk-borne zoonoses were found to be at a lower level in this cross-sectional questionnaire-based survey. This was primarily due to a lack of formal education. Furthermore, the respondents in the study areas, the overall practice on milk-borne zoonotic diseases were found to be poor, which could predispose people to these infections. Consumption of raw and unpasteurized milk, as well as sharing a residence with animals is normal behaviours in the community. The sampled community had a low level of awareness about milk-borne zoonoses in general.

The following recommendations are made based on the above conclusions.

- The awareness about milk borne zoonotic diseases and training on zoonotic risks of milk-borne diseases and their prevention methods should be given to people working with milk handling and processing practices.
- The public should be educated and informed on public health significance of milk borne zoonotic diseases by him-self from available information.
- The stake holders in the study area (governmental and non-governmental) bodies should be alerted regarding milk borne zoonotic diseases awareness creation and prevention.

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## 8. Authors' Contribution

All the authors contributed equally. They read the final version and approved it for publication.

## 9. Conflict of Interest

The authors declare that they do not have a conflict of interest.

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