International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
DOI: 10.22192/ijarbs Coden: IJARQG (USA) Volume 7, Issue 8 -2020

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2020.07.08.004

Assessment of knowledge, attitudes and practices of people about milk quality and common zoonotic diseases in small holder dairy production chain in selected sites of southern Ethiopia

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Abstract

The current study was conducted with the objective of assessing knowledge, attitude and practices of people about milk quality and common zoonotic diseases in small holder dairy production chain in selected sites of southern Ethiopia, which include Arsi-Negelle, Hwassa and Shashemene by using a face-to-face interviewing technique. A total of 119 smallholder dairy farmers were purposively selected for interviewing from three groups, namely: Arsinegelle (n=39), Hawassa (n=32) and Shashemene (n=48). According to the current study, most (92.4%) of respondents used separate housing system with 39.5% of them cleaned their barn on daily basis. In case of milk hygiene practices, 82.4% of the respondents always washed udder and teat before milking and 97.5% of the interviewed households always practiced washing their hands before milking and also 95.8% of them washed milk handling equipment's. Furthermore, all the interviewed smallholder dairy producers practiced hand milking and milking their cows twice a day during the morning and evening times. In the entire study areas, majority (95%) of the interviewed households used plastic jerry-cans as milking material but, 4.2% of them used stainless steel. In another way, about 91.6 of the respondents filter milk using plastic sieve and 9.2% of them used metal sieve but, 0.8% of them used close sieve. In all the study areas, majority of the interviewed households (97.5%) had access to pipe water followed by hand dug well water (11.8%) for cleaning milking utensils. In an other hand, about 84% of the respondents consumed milk daily and 2.5% consumed once a week while 13.5% of them did not consume at all. Besides, 82.4% of the respondents were consumed boiled raw milk while 17.7, 9.2, 8.4 and 0.8% consumed sour (ergo), raw fluid milk, cheese (Ayib) and pasteurized milk respectively. This finding also showed that most frequently known zoonotic diseases in the study areas were bovine tuberculosis (92.5%), followed by rabies (54.7%), taeniasis (28.3%), anthrax (22.6%) and brucellosis (3.8%) but none of the respondents had an awareness of echinococcosis. In general, the present study revealed that experience in dairying business leads to acquisition of more knowledge on zoonotic diseases and safe milk handling practices. However, this is not enough as the knowledge is gained gradually over a long period. It needs for public health promotion through education and inter-disciplinary one health approach with close collaboration among veterinarians, public health practitioners and policy makers.

Keywords: Milk, KAP, Zoonotic, Arsinegelle, Hawassa, Shashemene, Southern Ethiopia

Introduction

The cattle provide essential sources of meat, milk, other dairy products, fertilizer for crops, clothing, and animal traction to human beings (Coleman, 2002). Particularly in Africa, dairy cattle production is an important component of livestock. Dairy production, among the sector of livestock production systems, is a critical issue in Ethiopia where livestock and its products are important source of food and income, and dairying has not been fully exploited and promoted in the country (Sintayehu *et al.,* 2008). Milk and milk products have important role in feeding the rural and urban population of Ethiopia owing to its high nutritional value. Milk is produced daily, sold for cash or readily processed. It is a cash crop in the milk shed areas that enables families to buy other foodstuffs and significantly contributing to the household food security. Given the long tradition of using milk and milk products by the Ethiopian societies, there is no doubt that increasing smallholder dairy production and productivity would bring about a conspicuous impact on improving the welfare of women, children and the nation's population at large (MOA, 1998).

Milk and milk products are among the most important food products of dairy origin. Milk is said to be the most complete food item because of its great biological value as it contains a variety of nutrients and these nutrients in milk help make it nature's most nearly perfect food improving human nutrition status as well as health status of the small holder house hold (FAO, 2001). More than 75% of the milk produced is absorbed locally for home consumption (Getachew and Gashaw, 2001). However, milk is highly perishable product which losses quality within short period of time and become unwholesome for human consumption if not well kept and poses health risk acting as vehicle for transmission of diseases. Raw milk has been implicated in a number of food-borne disease outbreaks worldwide. A broad range of pathogens are milk-borne and the common ones fall under bacterial pathogens (Humphrey, 1997; Kivaria *et al*., 2006). The quality and safety of milk is affected by different factors: healthy status of the animal, hygienic practices in dairy premises, and post-milking handling and processing (Gran *et al*., 2002; Bonfoh *et al*., 2003; Vairamuthu *et al*., 2010). Therefore, the safety of dairy products with respect to food-borne diseases is a great concern around the world especially in developing countries where production of milk and various milk products takes place under unsanitary conditions and poor production practices (Mogessie, 1990).

Infections that are naturally transmissible from vertebrate animals to humans and vice versa are classified as zoonosis (WHO, 2009). It has been estimated that about 61% of human infections are zoonotic (Taylor *et al*., 2000). In the livestock sector, different farm animals naturally carry a wide range of zoonotic pathogens. In the dairy sector, zoonotic pathogens are normally present in dairy animals, raw milk, milk products, meat and the farm environment. This 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 (Zinsstag *et al.,* 2007).

Zoonosis are of both public health and economic importance in addition to causing serious economic losses in production, they pose a major barrier for trade of animals and animal products, and this could seriously impair socio-economic progress especially in developing countries like Ethiopia. Most developing countries often have inadequate infrastructure and limited financial resources to control animal diseases. Furthermore, the level of awareness among producers and consumers of the economic and public health importance of zoonotic diseases in most of these countries is low, and this further complicates efforts to control these diseases (Ekuttan, 2005; Munyeme *et al.*, 2010).

Improvement in the quality of the dairy then may help to stimulate the growth of this important economic sector. Considering that most smallholder dairy farmers sell milk to the public as well as there are no adequate control strategies for milk hygiene before consumption and given that consumption of raw milk is a common practice in these communities, this further exposes them to milk-borne zoonosis. Consumers often prefer imported dairy product because it is perceived that the locally available milk is produced and marketed under unhygienic conditions, and therefore is considered unsafe (Karikari *et al.,* 1998).

Public health concerns have also been raised over the consumption of local milk because zoonotic disease organisms such as *Mycobacterium, Brucella* and enter pathogenic *Escherichia coli* that may be present in milk can lead to health problems in the human

population such as tuberculosis (TB), brucellosis and hemorrhagic enteritis.

Tuberculosis is one of milk-borne disease which occurs in udder and may not be determined by the owner for a long time. *Brucellosis* is very common zoonosis in the world. It causes important economic loss and spreads easily. Tuberculosis, Brucellosis, Streptococcus infections, enterotoxigenic Staphylococcus intoxication (*Staphylococcus aureus)*, Salmonellosis, Q-fever, Cow-pox, Pseudo Cow-pox, foot-and-mouth disease, enterovirus infections, Anthrax, Leptospirosis, encephalitis Verno, Louping ill virus, breast actinomycosis, enteritis, metritis *Campylobacter* and Listeriosis are major milk borne diseases (Rohrbach *et al.*,1992*).*

Streptococcal infections (red fever), Staphylococcal infections and diphtheria are most common zoonotic diseases that contaminate from human to animal, animal to milk and milk to human. Adenovirus and Enterovirus infections, infectious hepatitis, diphtheria, cholera, tuberculosis, group A streptococci infections, paratyphoid, typhoid, and Shigellosis are also major milk borne diseases that contaminate animal to milk and milk to man. *Staphylococcus* and *Streptococcus* species were the most commonly isolated bacteria from bovine milk. Systemic disease can also result in localization of pathogens in the mammary gland or associated lymph nodes and consequent excretion of pathogens in milk (Dhanashekar *et al.*, 2012; Munyeme *et al.*, 2010).

Bovine tuberculosis and brucellosis are classic examples of zoonotic milk borne systemic diseases. The contribution of cattle to the epidemiology of these 2 diseases in humans was so important that enormous efforts were made to eradicate these infections among cattle. In summary, there are two primary factors that contribute to the microbiological quality of milk: the inclusion of organisms in excreted milk (pre-harvest) and the contamination of milk at the time of collection, processing, distribution, and storage (post-harvest). If pathogenic bacteria are among the contaminants, the product will pose a food safety threat. Several approaches have been used to minimize the possibility that milk contaminated with pathogenic organisms will reach the consumer. These include enhanced animal health, improved milking hygiene, and pasteurization. It is imperative that cattle owners and consumers are aware of milk- borne zoonosis that are prevalent in their areas, in addition to the risks they pose and how they are transmitted for them to make informed decisions on their control (Munyeme *et al.*, 2010).

Therefore, the major objectives of this study were to assess the knowledge, attitude and practices (KAP) of people about milk quality and common zoonotic diseases specifically milk-borne diseases in smallholder dairy production, milk handling practices and production of hygienic quality of raw whole milk in study area and the supply and availability of water and its role in production of hygienic quality milk.

Materials and Methods

Description of Study areas

The study was carried out in Hawassa milk shed areas, which include some districts around Hawassa such as Arsi-Negelle, and Shashemene. Hawassa is the capital of southern Nations and Nationalities People's Regional state (S.N.N.P.R.S.) and located about 273 km South of Addis Ababa (capital city of Ethiopia). Geographically located at latitude of 7^{o} 04'N and longitude of 38^{o}31'E and has an altitude of 1700 m above sea level. The area receives an annual rain fall of 900-1100 mm and temperature ranges from 10^{o} to 30.5^{0}C. Dairy production is widely practiced in the urban and peri-urban environments of Hawassa city administration (Welearegay *et al*., 2012).

Study design

Study population

The study populations were smallholder dairy producers which are residents of Arsinegell, Hawassa and Shashemene towns. Dairy producers of small scale were interviewed for their knowledge, attitude and practices about milk quality and common zoonotic diseases with particular emphasis on milk-borne zoonoses. The inclusion for the dairy farmers was designed to target those who were actively involved in dairy production.

Study type

The study design was a cross-sectional questionnaire survey on small holder dairy farmers of Arsinegell, Hawassa and Shashemene towns.

Sampling techniques and Sample Size determination.

Judgmental (purposive) and snowball sampling techniques were employed to generate primary data for this research. In order to get representative data of the study areas, each of the town was divided in to almost equal two parts based on one major road which crosses the towns and then sample kebeles were taken from this two divided town parts. Firstly, those sample kebeles were purposely selected from two divided parts of the town particularly where generally thinks there are more smallholder dairy producers in each town. This was done purposely so that the sample kebeles could spatially and sufficiently represent the study areas, Arsinegelle, Hawassa and Shashemene towns. Secondly, Snowball sampling technique was employed to select sample smallholder dairy producers from each kebele. With this approach, initially contacted few dairy producers (snowballs) and then asked them whether they know anybody practicing dairy cattle activities in their residence to recruit future subjects from among their acquaintances. This was done mainly because it was impossible to get the exact number of smallholder dairy producers in each kebele. The number of samples from each kebele was decided on the basis of the proportion of the population in the kebele to the total population of each town. At this juncture, it is obvious that one of the challenges was how to decide what should actually be the number of samples to be selected from a population. Obviously, large size of sample is advantageous in terms of accuracy of the study. However, sample size depends on a number of considerations of which the homogeneity of population, resources allocated for the study and the precision required are the most important ones (Agarwal, 2006). Taking this concept into account, this study was based upon a questionnaire administered to 119 smallholder dairy producers whom 39 from Arsinegelle, 32 from Hawassa, and 48 from Shashemen towns.

Study methodology

A semi-structured questionnaire formats with multiple choices and open ended questions was developed in English language and translated to Amharic language for proper understanding with the smallholder dairy farmers and an average of 25 minute has been spent with each respondent. Before face-to-face interview, verbal consent was obtained from the respondents by explaining objectives of the survey and expressing importance of the data to the society. The questionnaires were focusing on (1) demographic characteristic of the interview (age, sex, education and occupation), (2) knowledge and awareness on habit of milk consumption, milk handling practice and common zoonotic diseases particularly milk-borne zoonoses of smallholder dairy producers.

Data management and analysis

Data were administered using an interviewer questionnaire. The survey includes the general characteristics (age, sex, and educational attainments), practices of keeping hygiene milking equipment, milking environment, milker's hand, habit and frequency of milk consumption, awareness and knowledge of zoonoses. After collection of data based on interview finding, the data was interred into Microsoft excel sheet and it was analyzed using descriptive statistics with STATA/SE 9.0 version.

Results

Socio-demographic characteristics of respondents

All of the respondents were people living in Arsi-Negelle, Hawassa and Shashemene towns. Males accounted for 39.5% (47) and females 60.5% (72) of the respondents. The highest numbers of respondents were in age group 35 to 55 years. Regarding the educational level, 16.8, 22.7, 16.8 and 9.2% completed basic, primary, secondary and college respectively (Table 1).

Table 1 : Socio-demographic characteristics of the study participants (respondents)

Characteristics		Respondents(n=119)
Average age	Mean±Sd*	47±9.78
Sex (%)	Male	39.5
	Female	60.5
	Illiterate	34.5
	Basic	16.8
Educational level (%)	Primary	9.2
	Secondary	22.7
	College	16.8

*Sd = standard deviation

Housing and cleaning practices of smallholder dairy producers

According the current study the majority the interviewed households (92.4%) reported that they used separate housing system for their dairy cows while 4.2% of interviewed households used open paddock and the only 2.5% shared house with their cows. About 40.3% of the respondents cleaned the barn twice per day while 39.5% cleaned per day and only 3.4% of them reported that they cleaned weekly (Table 2).

Table 2: Housing status and frequency of cleaning of dairy produce

Sanitary practices		Study areas			
		Arsinegelle (n= 39)	**Hawassa (n=32)**	**Shashemene(n=48)**	**Overall (n=119)**
Types of livestock housing (%)	Separate housing	87.2	96.9	93.8	92.4
	Open paddock	10.3	-	2.1	4.2
	Share with family	2.6	3.1	2.1	2.5
Frequency of cleaning barn (%)	Daily	23.1	46.9	47.9	39.5
	Twice per day	56.4	43.8	25	40.3
	Three times per day	7.7	15.6	18.8	14.3
	Weekly	-	3.1	6.3	3.4
	Twice per week	2.6	3.1	-	0.8
	Three times per week	-	3.1	2.1	1.7

Milk Hygienic practices of smallholder dairy producers

About 82.4% of the Arsinegelle dairy owning household reported that always they perform udder washing before milking. 82.5, 90 and 87.5% of Arsinegelle, Hawassa and Shashemene smallholder dairy farmers reported to wash hand before milking. Overall, about 95.8 always, and 0.8% sometimes used warm water for cleaning of milking utensils respectively, but 3.4% of the producers does not used. The water sources used for cleaning purpose in all study areas were pipe water (95.7%) followed hand dug wells water by 11.8 % (Table 3).

Milking practices smallholder dairy producers

In the study area all the interviewed smallholder dairy farmers practiced hand milking and also all of them practiced milking their cows twice a day during the morning and evening times. In the entire study areas majority (95%) of the interviewed households using plastic jerry-cans as milking material and 4.2 of them are using stainless steel but only 2.1% the respondents in Arsinelle used traditional container made up of skin as a milking material. In both Arsinegelle and Hawassa all the interviewed households are using plastic mesh as a filtering material but only 79.2% of the interviewed households in Shashemene (Table 3).

Table 3: Milk handling practices of smallholders dairy producers

Practices		Study areas			
		Arsinegelle (n= 39)	Hawassa (n=32)	Shashemene(n=48)	Overall (n=119)
Milk hygiene practices (%)	Always wash udder before milking	94.9	98.1	77.1	93.3
	Always wash hands before milking	87.2	96.9	97.9	97.5
	Always wash milking utensils with hot water	100	98.3	79.2	95.8
Source of water for cleaning milking utensils (%)	Pipe water	100	90.6	100	97.5
	Hand dug-wells water	2.6	37.5	2.1	11.8
Milking utensils (%)	Plastic jerry-cans	97.4	96.9	91.7	95
	Stain less steel	2.6	3.1	6.3	4.2
	Traditional container made up of skin	2.6	-	-	0.8
Containers used for store & transport milk (%)	Plastic jerry-cans	97.4	96.9	89.6	94
	Stain less steel	2.6	3.1	6.3	4.2
Milk filtering utensils (%)	Close as a filtering	-	-	2.1	0.8
	Plastic mesh	100	100	79.2	92
	Metal mesh	2.6	6.3	16.7	9.2

Habit of milk consumption and milk marketing of smallholder dairy producers

About 84% of the respondents consumed milk daily and 2.5% of them consumed once a week but 13.5% of them do not consume at all. Among the respondents 82.4% consume boiled raw milk (reason for boiling is fear of zoonotic diseases) , while 17.7%, 9.2%, 8.4% 0.8% consumed sour (Ergo), raw fluid milk, cheese (Ayib) and pasteurized milk respectively. Overall, most farmers (56.3%) indicated that they sell their milk to individual consumers with a relatively low percentage 25.2%, 13.5% and 1.7% sell to Restaurants/cafeteria, processing plant and intermediate suppliers respectively (Table 4).

Table 4: Habit of milk consumption and milk marketing of smallholder dairy farmers

Habit of respondents		Study areas			
		Arsinegelle (n= 39)	Hawassa (n=32)	Shashemene(n=48)	Overall (n=119)
Frequency of milk consumption (%)	Daily	92.3	71.9	85.4	84
	Once a week	-	6.3	2.1	2.5
	Not at all	7.7	21.9	12.5	13.5
Habit of milk or milk products consumption (%)	Pasteurized milk	-	3.1	-	0.8
	Pasteurized milk	-	3.1	-	0.8
	Raw fluid milk	2.5	9.4	14.6	9.2
	Boiled fluid milk	94.9	68.8	81.3	82.4
	Cheese or Ayib	10.3	-	12.5	8.4
	Sour(Ergo)	10.3	12.5	27.1	17.7
Purpose of milk production (%)	Home consumption only	2.6	9.4	10.4	7.6

	Market only	7.7	21.9	12.5	13.5
	Market and home consumption	89.7	68.8	77.1	79
Buyers of milk and milk products (%)	Individual consumers	28.2	62.5	75	56.3
	Processing/ plant/associations	-	-	4.2	13.5
	Intermediate suppliers	38.5	-	2.1	1.7
	Restaurants/cafeteria	33.3	40.6	8.3	25.2

Knowledge and awareness of dairy producers about common zoonotic diseases

About 54.7% of the respondents said they were familiar that rabies can be transmitted from dogs to humans. The study revealed that about 28.2, 18.8 and 25% of Arsinegell, Hawassa and Shashemene dairy cow owners interviewed, respectively, know that rabies is a zoonotic disease transmitted to human. Of the total respondents, 92.5% of them knew that tuberculosis can be transmitted from cattle to humans. The knowledge of tuberculosis as a zoonotic disease of the respondents interviewed was 35.9% in Arsinegelle, 34.4% in Hawassa and 50% in Shashemene town. When asked specifically on their awareness of milk-borne zoonoses, 98.1% of the respondents are aware tuberculosis can transmit through milk to human (Table 5).

The overall proportion of respondents having knowledge of taeniasis (Cysticercus bovis) as a zoonotic disease was 28.3%. Taeniasis was perceived by 15.4% of Arsinegell, 12.5% of Hawassa and 10.4% Shashemene as a zoonotic disease transmitted to humans when raw meat is consumed. In addition to consumption of raw meat, 5.7% of the respondents reported that it can be transmitted by consumption of raw milk (Table 5). In the study areas, respondents were asked if they aware Echinococcosis as a zoonotic disease transmitted from dogs to humans. But none of the respondents were aware of such a disease. Anthrax was known as a zoonotic disease transmitted to humans by 17, 6.3, and 6.3% of dairy cow owners in Arsinegelle, Hawassa and Shashemene respectively. Most of the responde reported that consumption of meat from infected animals was the major source of infection for humans. Of the total respondents 3.8% were aware of a disease that can cause abortion in cattle (Brucellosis) and transmitted to humans but none of them aware in Shashemene town (Table 5).

Table 5 : Knowledge and awareness of dairy producers about common zoonotic diseases (n=119)

Zoonotic awareness	Arsinegell e(n=39)	Hawassa(n =32)	Shashemsn e(n=48)	Overall(n=119)
Know zoonoses %	38.5	37.5	54.2	44.5
Zoonotic diseases %				
Bovine tuberclosis	35.9	34.4	50	92.5
Rabies	28.2	18.8	25	54.7
Anthrax	17.9	6.3	6.3	22.6
Black leg	7.7	-	2.1	7.6
Taeniasis	15.4	12.5	10.4	28.3
Brucellosis	2.6	3.1	-	3.8
Trachoma	2.6	-	-	1.9
Influenza	-	3.1	-	1.9
Cholera	2.6	-	-	1.9
Mastitis	-	-	2.1	1.9
Bacerial diseases	5.1	-	-	3.8
Pasteurlosis	-	-	2.1	1.9

Foot and mouth disease	2.6	-	-	1.9
Meaningitis	2.6	-	-	1.9
Diseases acquired through milk %				
Bovine tuberclosis	38.5	37.5	52	98.1
Taeniasis	2.6	-	4.2	5.7
Anthrax	5.1	-	2.1	5.7
Rabies	5.1	3.1	-	5.7

Discussion

Housing status and frequency of cleaning of smallholder dairy producers

According the current study most (92.4%) of respondents interviewed households used separate housing while some (2.5%) of them shared house with their cows. About 40.3% of the respondents cleaned the barn twice per day while 39.5% cleaned per day and only 3.4% of them reported that they cleaned weekly (Table 2). Similarly to this study, Zelalem (2010) reported that about 87% of the respondents cleaned their barn on daily basis, while few (9%) of them cleaned only once or twice a week in the Ethiopian highlands. In general, providing proper shelter for animals has not been given the required attention. Housing conditions in many of households were dirty and unclean. This may have a negative impact on the quality of milk and milk products produced and processed. Proper and clean housing environment is a prerequisite to produce milk and milk products of acceptable quality (Asaminew, 2007). These poor hygienic conditions had also negative impact on reproductive physiology of dairy cattle as showed by the studies conducted in Asella Town, Central Ethiopia (Beredu and Biruk, 2019). Some of the smallholder dairy farmers reported that they share their own houses with their animals, which is not recommended from public health point of view. Milking was also performed in the same place after cleaning.

Milk Hygienic practices of smallholder dairy producers

Cleaning the udder of cows before milking is important since it could have direct contact with the ground, urine, dung and feed refusals while resting and washing of udder before milking can reduce contamination of the milk. 82.4% of the interviewed households always practicing udder washing before milking (Table 3). This study is in opposite with other reports (Lemma et al.,2004; Fayo, 2004; Derese, 2008 and Bereda et al., 2012) all respondents did not use udder washing before milking. However, this study is similarly to, Haile *et al*. (2012) reported that 82.5% of the small size farm owning households in Hawassa city are practicing pre milking udder washing. Also FSA (2006) reported that cleaning of the udder before milking is important to remove both visible dirt and bacteria from the outer surface of the udder. Unless properly handled, milk can be contaminated by microorganisms at any point from production to consumption. Dairy cow producers should therefore make udder washing a regular practice in order to minimize contamination and produce good quality milk.

Production of milk of good hygienic quality for consumers requires good hygienic practices (clean milking utensils, washing milker's hands, washing the udder and use of individual towels) during milking and handling, before delivery to consumers or processors (Getachew, 2003). In the study areas, the survey results showed that cleaning of milk handling equipment is common among most of the interviewees. Accordingly, overall 95.8% of the interviewed households always practiced washing of milk handling equipment's and milker's hands (97.5%) before milking. However, the cleaning is not efficient and milk handling equipment's are not properly dried. Milkers dip their fingers in the milking vessel to moisten teats of the cows with the intention of facilitating milking. Such practice may cause microbial contamination of the milk from the milker's hand. The sources of water available to smallholder dairy producers used for different purposes (to drink dairy animals, to clean milk equipment and hands) similar in all the study areas). Majority of the interviewed households (97.5%) had access to pipe water followed by hand dug well water (11.8%) in all the study areas (Table 3). This study is in opposite with the report by Bereda *et al.*, (2012) that majority of the dairy cow producers in Ezha district of the Gurage zone, used river and hand dug wells water which may not be of the required standard.

Milking practices of smallholder dairy producers

In the study area all the interviewed smallholder dairy producers practiced hand milking. Cows in the study areas are usually milked twice a day during the morning and evening times. The practices of milking found in this study were similar with other reports (Lemma *et al*., 2004; Asrat, 2009 and Bereda *et al.*, 2012). Equipment used for milking, processing and storage determine the quality of milk and milk products. 95% of the interviewed households in the study areas used plastic jerry-cans as milking utensil while 4.2% of them used stainless steel but only 0.8% used traditional container made up of skin (Table 3). The use of plastic jerry-cans and traditional containers can be a potential source for the contamination of milk by bacteria, because this allows the multiplication of bacteria on milk contact surfaces during the interval between milking's. This is mainly due to the difficulty of removing all milk residues from traditional containers that are porous by nature with the common cleaning systems. Producers need, therefore, to pay particular attention for the type as well as cleanliness of milk equipment. Milking equipment should be easy to clean. Aluminum and stainless steel equipment are mostly preferred. Another milking practice in the study area was filtering milk after milking before pouring into bulk container to remove any dirty material. The respondents used 91.6% plastic sieve, 9.2% metal sieve, and 0.8% close sieve as a filtering equipment (Table 3). This oppose with Asrat (2009), reported that no practice of milk filtering before mixing with the previous lot or use for other purposes.

Knowledge and awareness of dairy producers about common zoonotic diseases

The most frequently known zoonotic diseases among the respondents in the study areas were bovine tuberculosis (92.5%), followed by rabies (54.7%), taeniasis (28.3%), anthrax (22.6%) and brucellosis (3.8%). This study indicated a relatively lower level of awareness of the respondents in the study areas for rabies, anthrax, taeniasis and brucellosis as compared to the report of Girma *et al*., (2012) who indicated that all respondents in Addis Ababa mentioned rabies as a zoonotic disease, followed by anthrax (94.27%), taeniasis (89.06%), bovine tuberculosis (88.54%) and brucellosis (49.48%). The difference in the overall awareness between the two study sites for the common zoonotic diseases could be due to variations in the living style between the two settings, where in Addis Ababa, as a capital city, information might be acquired more easily than in the current study area. But respondents of this study area have more awareness on brucellosis (3.8%) than of Tesfaye *et al*., (2012) none of the respondents in Jimma town were aware of such a disease.

High percentage of dairy farmers were aware milk-borne zoonoses, but they failed to name them. Similar observations were noted in Kenya (Ekuttan, 2005) where dairy farmers were generally aware of zoonoses but lacked knowledge on specific milk-borne zoonoses. However some smallholder dairy farmers in the survey area were particularly aware of tuberculosis (98.1), taeniasis (5.7%), anthrax (5.7%) and rabies (5.7%) in all the study areas. In all the study areas, 98.1% and 92.5% of them knew tuberculosis can be transmitted through milk or directly from cattle to human respectively. In case of each area Shashemene (52%), Arsinegelle (38.5%) and Hawassa (37.5%) had awareness to bovine tuberculosis as a zoonotic disease transmitted through ingestion of infected milk and meat. This is in opposite with the work of Amenu *et al*. (2010) and Tesfaye *et al*., (2012) whom reported that a high number of respondents had no detailed and accurate knowledge about zoonotic tuberculosis. In this study area, smallholder dairy farmers had high awareness on zoonotic tuberculosis. This high level of awareness among the smallholder dairy farmers could be attributed to their living inside the town that might facilitate to have information about the zoonotic importance of bovine tuberculosis from private veterinary practitioners. However, in this study, no participants had an awareness of echinococcosis. This disagrees with the work of Tigre (2012) who reported that 32.2% of the study participants in Jimma town had an awareness of echinococcosis. Finally respondents listed as zoonotic diseases like blackleg, trachoma, cholera, mastitis, meningitis and also taeniasis and rabies through milk. This incorrect awareness should require further education.

Conclusion and Recommendations

This study has proven that formal education on milk handling can have a great impact on knowledge, attitude and practices of proper milk handling. In addition to this regular and sustained onsite education and regular training could lead to improved milk quality with benefits to both producers and consumers. It is believed that these training programs will meet the herdsmen's need for adequate knowledge in milk handling practices and zoonotic diseases. Such

training may not only improve the safety of milk but also will lead to a reduced health risk for the herdsmen, their family and their livestock and will contribute to economic development and prosperity the country. Furthermore, this study showed that the level of knowledge and awareness of dairy producers in all study areas on the potential zoonotic transmission of tuberculosis to man through unsafe milk consumption is generally high but low level of knowledge and awareness of brucellosis. Based on the findings of the present study, the following recommendations are made:

- The current study showed that only few smallholder dairy farmers had trained on dairy production and milk hygiene practices so it requires joint cooperation of the government and local NGos to provide training and experience sharing to dairy keeper to improve milk production and milk quality.

- Awareness should be created among dairy cow owners as to the importance of adequate udder p reparation, hygienic milking technique, use of clean dairy equipment, washing of utensils and milkers hands using properly treated water to improve the milk hygienic quality and shelf life.

- Without information on milk-borne zoonoses, dairy farmers are neither informed nor motivated to take the simple precautions necessary to protect themselves, their families, workers and the public. Therefore, animal health workers are important in raising the awareness on milk-borne zoonoses. Hence, veterinarians are a crucial link in keeping dairy farmers fully informed of ways to reduce the risk of zoonotic transmission.

Regulation of the dairy development enterprise, establishment of standards and the use of effective enforcement are essential in order to fulfill the consumers' expectations of safe and wholesome milk and milk products. Extension workers to be motivated to educate farmers on the importance of milk borne diseases as a disease of public health concern. Furthermore extension workers should be more close to farmers and train them on good animal husbandry including hygienic milking and handling of milk.

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Website: www.ijarbs.com

Subject: Veterinary Sciences

Quick Response Code

DOI:10.22192/ijarbs.2020.07.08.004

How to cite this article:

Senay Gebre Gebremedhin, Shemlash Engdaw Mequnnent, and Arega Anullo Gichamo. (2020). Assessment of knowledge, attitudes and practices of people about milk quality and common zoonotic diseases in small holder dairy production chain in selected sites of southern Ethiopia. Int. J. Adv. Res. Biol. Sci. 7(8): 25-36.

DOI: http://dx.doi.org/10.22192/ijarbs.2020.07.08.004