

Study on Assessment of Public Awareness Towards Common Zoonotic Diseases in and Around Bahir Dar Town, Amhara Region, Ethiopia

Walelign Aniley and Lamesgin Birku

Mekelle University, College of Veterinary Medicine, Mekelle, Ethiopia

Abstract: A questionnaire based cross-sectional study was conducted from November 2016 to April 2017 to assess the awareness of the community towards common zoonotic diseases in and around Bahir Dar town, Northwest, Ethiopia. About 384 randomly selected human populations were interviewed that comprised farmers, students, jobless, government employees and self-employees. Out of the 384 respondents interviewed, 68.2% of them were males and 31.8% females. After the data collected using semi-structure questionnaires, it was analyzed by using SPSS statistical software version 20. There was statistically significant difference ($P < 0.05$) between zoonotic disease awareness and age, educational status and occupation. In this study about 89.8% of respondents heard about zoonosis. Among the common zoonotic diseases 83.1, 19.8, 18.2, 15.6 and 14.8% of respondents heard about rabies, bovine tuberculosis, taeniasis, anthrax and brucellosis respectively. From these respondents 88.0% indicated that disease could be transmitted from animal to human while only 25.0% responded these diseases could be transmitted from human to animal. Respondents replied that infected animal bite (71.8%), contact (46.1%), consumption of raw milk and meat (34.9%) and inhalation (32.3%) were important for mode of disease transmission. In the study area 66.4% of respondents were consuming raw meat and milk. About 72.4 and 46.8% of respondents revealed that vaccination and limited contact with infected animals were respectively important measures to prevent disease transmission. Generally, this study indicated that the study area community awareness about zoonotic diseases was limited. Therefore, government and concerned bodies should work together to raise the awareness of the public about the importance of zoonotic diseases.

Key words: Awareness • Bahirdar • Community • Zoonotic diseases

INTRODUCTION

Ethiopia is one of the leading countries in livestock resources in Africa. The relationship between animals and their owners is very close and consumption of raw animal products is a welcoming tradition. Livestock of different species usually share common grazing lands. Moreover, there is a condition in which animals and humans share the same residences. Such conditions play a significant role in the transmission of zoonotic diseases between animals and humans [1].

Human health is highly linked to animal health and production. The link is close in developing countries where animals provide transportation, draught power, fuel, clothing and sources of proteins such as meat, eggs and milk. In the absence of proper care, this linkage can lead to a serious risk to public health with huge economic

consequences [2]. Zoonotic diseases and infections that are naturally transmissible between vertebrate animals and humans [3] are among the most frequent risks to which mankind are exposed. Zoonosis constitutes a diverse group of viral, bacterial, fungal and parasitic diseases with a variety of animal reservoirs, including wildlife, livestock, pet animals, and birds [4]. Globally, zoonoses are said to account for 60- 75% of emerging infectious diseases and a number of new zoonoses have emerged both in developed and developing countries. This might be the result of either newly discovered pathogens or agents that are already known, usually appearing in animal species in which the disease had not previously been detected [5].

Many diseases that affect humans which are emerging and re-emerging, were caused by pathogens that originated from animals. Moreover, a number of

zoonotic diseases, including rabies, brucellosis, bovine tuberculosis and taeniasis continue to affect humans and animals in many countries, particularly developing nations [6]. Zoonotic diseases can be spread in a variety of ways; through the air, by direct contact, by contact with inanimate object that harbors the disease and by oral ingestion [7]. This causes mortality and morbidity in people, while also imposing significant economic losses in the livestock sector. Their burden tends to fall most heavily on poor societies [8]. These losses encountered the food animals are lowering the productivity of the animal and death of the animal. These losses affect the economy of the human beings. Therefore, today the infectious diseases are not only a health issue; they have become a social problem with tremendous consequences for the wellbeing of the individual and the world we live in [9]. They have both direct and indirect effects on livestock health and production [10]. Direct effect occurs as a lowering productivity of the animal and death of the animal. Indirect effects occur as a result of the risk of human disease, the economic impact on livestock producers through barriers to trade, the costs associated with control programs, the increased cost of marketing produce to ensure it is safe for human consumption, and the loss of markets because of decreased consumer confidence [11].

Veterinary public health has been defined as one part of public health action which is committed to the protection and improvement of human health through application of the capabilities, knowledge, and profession as sources of veterinary services [12]. Since zoonoses can infect both animals and humans, the medical and veterinary communities should work closely together in clinic, public health, and research settings. However, most patients do not view veterinarians as a source of information for human health [13]. But, success in the preventing and controlling of major zoonoses depend on the capability to mobilize resources in different sectors and on coordination, especially, between national (Or international) veterinary and public health services [14].

According to the various studies conducted in Ethiopia, different types of zoonotic diseases are reported from different areas of the country. Among this, sporadic occurrence of anthrax in cattle and other domestic animals including man has been reported in different parts of the country [15]. WHO [3] also reported , rabies is a wide spread zoonotic disease that found on all the continents, but more than 95% of human deaths occur in developing countries like Asia and Africa.

The awareness of the community towards common zoonotic diseases plays an important role for the prevention and control of life cycle and transmission of these diseases to the different arrays of their hosts. Studying the awareness of the community on the risk factors, routes of transmission and life cycle of zoonotic diseases is a crucial step towards the development and implementation of appropriate disease prevention and control strategies. For this reason improving public awareness and practice could be useful in developing and improving existing control measures [16].

Therefore, the objective of this study was:

- ✓ To assess the awareness of the public's regarding the major zoonotic diseases in and around Bahirdar town, Amhara Regional State, Ethiopia.

MATERIALS AND METHODS

The study was conducted in and around Bahir Dar town from November 2016 to April 2017, the capital city of Amhara Regional State, located at 11°29'N latitude and 37°29'E longitude at about 578km North-West of Addis Ababa. The area has middle altitude ranges from 1500 - 2300 meters above sea level with an average annual rain fall ranges from 1200-1600mm. The mean annual temperature of the study area is 23°C. The presence of the biggest Lake Tana and River Abay influence the climatic condition of the study area. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia, Bahir Dar Special Zone has a total population of 221,991, of whom 108,456 are men and 113,535 women; 180,174 (81.16%) are urban inhabitants, the rest of population are living at rural kebeles like Meshenti, Tis Abay and Zege towns which are part of Bahir Dar Special Zone [17].

Study Population and Sample Size: The study participants were Bahir dar town populations comprised of different randomly selected communities including students of different educational levels (Elementary, high schools, colleges), jobless, farmers, government and self-employees. The study was tried to include all kind of society living in the city and its surroundings. The sample size of the study population was calculated according to Thurs field [18] using 95% confidence interval and 0.05 absolute precision.

$$n = \frac{1.96^2 P_{exp}(1-P_{exp})}{d^2}$$

where:

n; Required sample size,

P_{exp} ; Expected prevalence = 50%

d^2 ; Desired absolute precision = 5%

According to the above values and formula, the sample size of this study was calculated to be 384.

Study Design and Sampling Method: A questionnaire based cross-sectional study design was employed to look on the awareness of the public on common zoonotic diseases. Randomly sampled respondents were stratified based on their age and sex differences, occupational status, religion and educational levels. An organized open- and close-ended (Semi-structured) questionnaire was prepared and conducted on target respondents to look on the awareness of the public on zoonotic diseases; rabies, tuberculosis, anthrax, brucellosis and taeniasis. Respondents were selected during questionnaire administration in different parts of the town and youth associations around the town.

Methods of Data Collection: Data was collected using questionnaires and interviews to evaluate the community awareness about zoonotic diseases among the respondents. The questions were focused on evaluating the perception of the respondents about zoonotic diseases.

Data Management and Analysis: Data obtained from semi-structured questionnaires were collected and separately entered into a MS-Excel sheet and later transferred and analyzed using SPSS 20 version (2010), using descriptive statistics including chi-square for possible explanation of associations. P-value of less than 0.05 was considered to be significant at 95% level of confidence.

RESULTS

Socio-Demographic Characteristics of the Respondents:

A total of 384 respondents were responded to the questioner. More than half (68.2%) of the interviewed were males. Concerning age group, (49.7%) of the study participants were between 31-50 years old. The majority of the respondents(65.6%)were Orthodox followed by Muslim (23.7%), Protestant (9.9%) and Catholic (0.8%). Regarding educational status, 33.6% of the participants had completed diploma program and only 4.4% were illiterate. From the total respondents about 31.30% were government employees and 29.9% were self-employees (Table 1).

Table 1: Socio-Demographic Characteristics of the Respondents (n=384)

Characteristics		Frequency	%
Sex	Male	262	68.2
	female	122	31.8
Age (in years)	15-30	162	42.2
	31-50	191	49.7
	>50	31	8.1
Religion	Muslim	91	23.7
	Orthodox	252	65.6
	Protestant	38	9.9
	Catholic	3	0.8
Educational Level	Illiterate	17	4.4
	Elementary	43	11.2
	Secondary	85	22.1
	Diploma	129	33.6
	Degree and above	110	28.6
Occupation	Farmer	12	3.1
	Student	73	19
	Jobless	64	16.7
	Government Employee	120	31.3
	Self-employee	115	29.9

Knowledge of the Respondents on Zoonotic Disease:

Majority of the respondents (89.8%) had heard about zoonosis while 10.2% of respondents never heard about zoonosis. With regarding source of information 15.6, 10.9% and 12.8% respondents got information from school, media and written material, respectively. About 26.0% of respondents get information about zoonotic diseases from more than one source. Of the total respondents 83.3, 19.8, 18.2, 15.6 and 14.8% have heard about rabies, bovine tuberculosis, taeniasis, anthrax and brucellosis respectively, while 10.2% of respondents did not heard about the above diseases. Majority responded dogs (47.9%), cattle (7.0%) and cats (3.1%) were important animals for transmission of these diseases to human being while 27.3% responded that all animals are responsible for transmission of disease.

With regard to transmission of zoonotic diseases; through bite from infected animals, contact, raw meat and milk consumption and inhalation were indicated by 71.8, 46.1, 34.9 and 32.3% of respondents respectively, however 9.4% of respondents showed that they didn't know mode of transmission. The modes of transmission of rabies perceived by respondents were bites, contact with saliva, and inhalation were indicated by 81.5, 65.1 and 15.1% respectively. Only 5.5% respondents didn't know rabies transmission. Concerning the prevention of zoonotic diseases 72.4 and 46.8% respondents were replied that vaccinating animals and avoid contact with infected animals were important tools for disease prevention respectively while 4.7% respondents were having no idea for preventive measures (Table 2).

Table 2: Knowledge of the Respondents on Zoonotic Disease (n=384)

General parameters		Frequency	%
Everheard about zoonosis	Yes	345	89.8
	No	39	10.2
Source of information	Only Media	42	10.9
	Only School	60	15.6
	Only Written materials	49	12.8
	Only Friends	55	14.3
	Only Traditional healers	7	1.8
	Only Health professionals	28	7.3
	Only veterinarian	4	1
	More than one source	100	26
	Not heard about zoonosis	39	10.2
Which zoonotic disease They heard	Rabies	320	83.3
	Tuberculosis	76	19.8
	Taeniasis Anthrax Brucellosis	70	18.2
	I don't know	60	15.6
		57	14.8
	39	10.2	
Animals that transmit disease to humans	Cattle only	27	7
	Sheep and goat only	10	2.6
	Dog only	184	47.9
	Cat only	12	3.1
	Equine only	7	1.8
	All animals	105	27.3
	I don't know	39	10.2
Mode of transmission of zoonotic diseases	Bite of infected animals	276	71.8
	Contact with infected animals	177	46.1
	Consumption of raw milk and meat	134	34.9
	Inhalation	124	32.3
	I don't know	36	9.4
Mode of transmission of rabies	Bite of rabid animal	313	81.5
	Contact with saliva	250	65.1
	Inhalation	58	15.1
	I don't know	21	5.5
Mode of transmission of anthrax	Consumption of raw meat	192	50
	Contact with infected animals	116	30.2
	Inhalation	25	6.5
	I don't know	156	40.6
How zoonotic disease Can be prevented	Avoid contact with infected animals	180	46.8
	Washing hands after handling	163	42.4
	Take pasteurized milk	178	46.4
	Avoid eating raw meat	179	46.6
	Vaccinate animals	278	72.4
	I don't know	18	4.7

Attitude of the Respondent on Zoonotic Disease: Of total, 88.0% respondents had awareness of zoonotic disease transmission from animal to human and 5.7% of respondents had perception as it cannot be transmitted from animal to human. However, 6.3% of respondents didn't know whether it can be transmitted from animal to human or not. Only 25.0% responded that these diseases could be transmitted from human to animal and 36.2 % respondents did not know disease can transmit from human to animals. 75.5% of respondents had perception

that zoonotic diseases could be prevented and 9.4% responded that disease cannot be prevented. However, 15.1% of respondents didn't know whether it could be prevented or not. Out of 384 respondents, 66.4 % respondents of the study area were consuming raw meat and milk and the remaining 33.6% of respondents were not consuming raw meat and milk. Among all respondents 33.3% showed as they vaccinated their animals against zoonotic diseases but 66.7% responded they didn't vaccinate their animals (Table 3).

Table 3: Attitude of the Respondents on Zoonotic Disease (n=384)

General parameters		Frequency	%
Can these diseases be transmitted from Animal to human	Yes	338	88
	No	22	5.7
	I don't know	24	6.3
Can these diseases be transmitted from human to animal	Yes	96	25
	No	149	38.8
	I don't know	139	36.2
Do you think zoonotic diseases can be prevented	Yes	290	75.5
	No	36	9.4
	I don't know	58	15.1
Do you consume raw meat and milk	Yes	255	66.4
	No	129	33.6
What you do for infected person	Go to hospital	360	93.75
	Using traditional Medicine	122	31.8
Ever vaccinate your animals	Yes	128	33.3
	No	256	66.7

Table 4: Relationships between awareness about zoonotic diseases and risk factors among study respondents of Bahir Dar town (n=384).

Risk factors		Ever heard about Zoonotic disease		Chi-square	p-value
		Yes	No		
Age of respondent	15-30	138(85.2%)	24(14.8%)	6.668	0.036
	31-50	178(93.2%)	13(6.8%)		
	>50	29(93.5%)	2(6.5%)		
Sex of respondent	Male	234(89.3%)	28(10.7%)	0.255	0.614
	Female	111(91.0%)	11(9.0%)		
Educational Level	Illiterate	12(70.6%)	5(29.4%)	47.609	0
	Elementary	29(67.4%)	14(32.6)		
	Secondary	72(84.7%)	13(15.3%)		
	Diploma	123(95.3%)	6(4.7%)		
Occupation	Degree and above	109(99.1%)	1(0.9%)	22.827	0
	Farmer	10(83.3%)	2(16.7%)		
	Student	58(79.5%)	15(20.5%)		
	Jobless	53(82.8%)	11(17.2%)		
	Government employee	118(98.3%)	2(1.7%)		
	Self-employee	106(92.2%)	9(7.8%)		

✓ % with in age, sex, educational level and occupation of respondents

Relationships Between Awareness about Zoonotic Disease and Risk Factors among Study Respondents of Bahir Dar Town:

Association between risk factors and awareness about zoonotic diseases was assessed using Pearson's Chi-square (Table 4). There was significant association between awareness about zoonotic disease and age ($\chi^2 = 6.668$, $p < 0.05$). Age group of greater than fifty has a good awareness about zoonotic diseases. Educational status was significantly associated with awareness about zoonotic diseases ($\chi^2 = 47.609$, $P = 0.000$, $P < 0.05$) but there was no any association between sex and zoonotic diseases awareness in the respondents ($\chi^2 = 0.255$, $p = 0.614$, $p > 0.05$). Respondents with government employee had good awareness about zoonotic diseases (22.827 , $p = 0.000$, $P < 0.05$).

DISCUSSION

The findings of this study had significant association ($p < 0.05$) between awareness about zoonotic diseases and some risk factors but there was no any association between sex and zoonotic diseases awareness in the respondents ($p > 0.05$). The current study indicated that, 89.8% of the respondents heard about zoonotic diseases. This finding is less as compared to the study from Addis Ababa, where all respondents (100%) heard about zoonotic diseases [19]. This could be due to better ability and practice of reading written information about zoonosis in Addis Ababa than Bahir Dar and difference in educational level of respondents. In the present study majority of the respondents get information about

zoonotic diseases from school (15.6%) and friends (14.3%) or more than one source (26.0%). Gizachew *et al.* [20] also reported the same source of information like family and friends as well as from school or more than one source (31.8, 16.8 and 34.6% respectively) in and Around Asella, Eastern Arsi Zone, Ethiopia. In contrast to the present study Kidane *et al.* [21] reported electronic media like radio and television as a major source of information among high school students in Addis Ababa, Ethiopia. This might be due to the age group of respondents as high school students usually spent more time on electronic media.

The most frequently known zoonotic diseases among the respondents in this study area were rabies (83.3 %), followed by bovine tuberculosis (19.8%), taeniasis (18.2%), anthrax (15.6%) and brucellosis (14.8%). This study indicated lower level of awareness of the respondents in the study area as compared to the report of Girma *et al.* [19] 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. In the other study reported by Tesfaye *et al.* [22] indicated that rabies (97.1%) followed by taeniasis (83.4%), anthrax (55.4%), and bovine tuberculosis (29.1) in Jimma, Southwestern, Ethiopia. This may be due to variation the study area, educational level of respondents and information access of the two study areas.

The most frequently known modes of zoonotic diseases transmission among the respondents were bite from infected animal (71.8%), contact (46.1%), consumption of raw meat and milk (34.9%) and inhalation (32.3%). This finding had high level awareness about mode of transmission as compared with Amenu *et al.* [23] who reported that inhalation and contact with sick animals as modes of transmission of zoonotic disease responded by 15.0 and 6.3% respectively in Arsi-Negele District, Ethiopia. In contrast to the present study, Jaspal *et al.* [24] from Punjab, India reported that 98.4% responded transmission of rabies through dog bite. In another study, participants indicated inhalation (94.1%), contact (2.2%) and ingestion of animal products as modes of transmission of zoonotic diseases in Addis Ababa, Ethiopia [21]. The variations in these findings show the

presence of knowledge gap from place to place and between city and rural residents. Such variability could be due to the difference in the participants' educational status, their access to media and other public health information services and the prevalence of the diseases in the specific area.

The modes of transmission of rabies perceived by respondents were bites, contact with saliva, and inhalations were reported by 81.5, 65.1 and 15.1% respectively. In contrast to this finding Awoke *et al.* [25] reported that biting (57.8%), contact with saliva (30.2%) and inhalation (7.8%) in DebreTabor, Northwest Ethiopia. The variation among the community awareness could be due to better source of information access found in Bahir Dar town. In the current study, respondents showed anthrax transmission via raw meat consumption (50.0%), contact with infected animals (30.2%) and inhalation (6.5%). Tesfaye *et al.* [22] reported that transmission through the consumption of raw meat was mentioned by 54.9% of the respondents, whereas contact and inhalation transmission routes were only mentioned by 14.3 and 2.3% of respondents, respectively. The difference could be due to lack of equal information access about the disease educational status and residence of respondents in the two study areas.

In the present study, a total of 72.4, 46.6 and 46.8% responded as zoonotic diseases could be prevented by vaccinating animals, consuming cooked meat products and avoid contact with infected animals respectively. The present study had higher findings when comparing with Tirsit *et al.* [26] who reported that 4.6% of the respondents from Mana and Limmukosa District of Jimma zone, Ethiopia where vaccinating their dogs against zoonotic diseases. Similarly, the study reported by Amenu *et al.* [23] indicated that cooking of animal products like meat and milk due to fear of disease transmission was reported by 33.7 and 64.3% of respondents respectively in Arsi-Negele District, Ethiopia. The preventive method of zoonotic diseases stated by respondents depends on awareness creation and other public health information services.

From the total respondents participated in the current study about 25.0% had awareness about zoonotic diseases transmission from human to animal. This figure had similar result to that reported by Gizachew *et al.* [20] which indicated that about 26.0% of respondents from Asella, Eastern Arsi Zone, Ethiopia agreed with idea that these diseases could be transmitted from human to animals. The current investigation showed that 88.0% responded that zoonotic diseases could be transmitted

from animal to human. This result had higher percentage than the study of Tirsit *et al.* [26] who reported that 15.6% of respondents from Mana and Limmukosa District of Jimma Zone had awareness that these diseases could be transmitted from animal to human but it had lower result when comparing with Swai *et al.* [16] indicated that about 93.2% respondents had awareness that zoonotic diseases could be transmitted from animal to human. The variations in these findings showed the presence of knowledge gap from place to place and between city and rural residents.

Out of 384 respondents, 66.4% respondents of the study area had usual practice of consuming raw meat and milk. Similarly raw meat consumption was also reported by large proportion of respondents (69.1%) in Jimma, Southwestern Ethiopia [22]. In Tanzani [16] also recorded that about 40 and 16.3% responded as they consume unpasteurized milk and raw meat respectively. The difference between the two study sites for consumption of raw food of animal origin could be due to variations in the living style and the culture of the community from different localities and country on use of food of animal origin. Most respondents (33.3%) in this study vaccinated their animals against zoonotic diseases. In contrast to this, Tesfaye *et al.* [22] indicated only 25.6% of respondents reported that they were treating or vaccinating their dogs. This difference might be because of the fact associated with the source of information determining the appropriateness of the knowledge transferred.

According to the present study, Age group of greater than fifty (93.5%) had a good awareness about zoonotic diseases. The statistically significant difference ($p < 0.05$) among age groups might be due to increased reading habit as age increases and they had get more awareness about disease through experience. The other factor that identified to be significantly associated ($p = 0.000$) with awareness on zoonotic diseases was educational status, where higher levels of educations were associated with higher knowledge scores. All respondents with first degree and above education levels had good awareness on zoonotic diseases. The possible explanation could be educated person would have better information access and can easily understand the disease. This result is also supported by the result of the study conducted in Debretabor [25].

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, even though, this study has shown that the public awareness about rabies was good in the

study area when compared to other diseases, the community knowledge about other zoonotic diseases were limited. This might be due to poor or absence of awareness creation activities that should have been done by medical and veterinary health care professionals of the state government. There was also knowledge gap about zoonotic disease transmission from human to animals and had high common practice of consuming raw meat and milk which exposed for zoonotic disease infection. Animal vaccination activity of the community was low in the study area; hence level of awareness creation practice in the area was less. Ages, educational and occupational status of the respondents were the risk factors found to be significantly associated with zoonotic disease awareness.

Therefore, based on the above conclusion the following recommendations were forwarded:

- The concerned body should provide periodic education to raise community knowledge on zoonotic diseases and provide accurate information targeted to people who have lower educational level, student's and youngers in the area.
- Continuous community education and awareness creation about zoonoses are important.
- Government and concerned institutions should work hard to strengthen the contribution of public health veterinarians in the public health for better community health.

ACKNOWLEDGEMENTS

The authors are indebted to the respondents for their time and willingness to participate in this study.

REFERENCES

1. Kuma, T., B. Deressa, F. Alem and W. Tigre, 2013. Farmer's Awareness and Practices on Rabies, Bovine Tuberculosis, Taeniasis, Hydatidosis and Brucellosis in Mana and Limmukosa Districts of Jimma Zone, South West Ethiopia. World Applied Sciences Journal, 23(6): 782-787.
2. WHO, 2010. Managing zoonotic public health risks at the human animal- ecosystem interface. Strong inter-sectoral partnerships in health. Food safety and zoonoses. Available at: www.who.int/foodsafety. Accessed in 25 October 2016.
3. WHO, 2011. Rabies, Media Center, fact sheet number 99. Available at: <http://www.who.int/mediacentre/factsheets/fs099/en/>. Accessed in 15 October 2016.

4. Nkuchia, M., L. Ruth, A. Chris and V. Henriette, 2007. Infectious disease surveillance. Blackwell Publishing. USA, pp: 246-248.
5. WHO. 2004. Water borne Zoonoses, Identification, Causes and control. Available at: http://www.who.int/water_sanitation_health/diseases/zoonoses. Accessed in 15 October 2016.
6. Meslin, F., K. Stöhr and D. Heymann, 2000. Public health implications of emerging zoonoses. *Revue Scientifique Technique* office of International Epizootic, 19(1): 310-317.
7. Kevin, D. and C. Nancy, 2009. Zoonotic Disease of Cattle. Virginia Cooperative Extension programs publication, pp: 4000-4600.
8. WHO, 2005. The Control of Neglected Zoonotic Diseases. Report of a Joint WHO Meeting with the participation of FAO and OIE. Geneva, September 2005. Available at: <http://whqlibdoc.who.int/publications/2006/97892415eng.pdf>. Accessed in 20 October 2016.
9. Gracey, F., O. Collins and R. Huey, 1999. Meat hygiene, 10th ed., London, Bailliere Tindall., pp: 223-260.
10. Smits, L. and J. Cutler, 2004. Contributions of biotechnology to the control and prevention of brucellosis in Africa. *African Journal of Biotechnology*, 3: 631-636.
11. McDermott, J. and M. Arimi, 2002. Brucellosis in sub-Saharan Africa: epidemiology, control and impact of *Veterinary Microbiology*, 90: 111-134.
12. Bogel, K., R. Griffiths and M. Mantavania, 2000. Guiding principles for Planning, Organization and Management of veterinary public health programs. *Veterinary Public Health Reports*, pp: 11-14.
13. Grant, S. and C. Olsen, 1999. Preventing zoonotic diseases in immune compromised persons: the role of physicians and veterinarians. *Emerging Infectious Disease*, 5: 159-163.
14. Abdou, A., 1998. Preventing and control of zoonotic diseases. *Eastern Mediterranean Health Journal*, 4(2): 223-224.
15. Shiferaw, G., 2004. Anthrax in Wabessa Village in Dessie Zuria District, Ethiopia. *Revue Scientifique Technique*, 23(3): 951-956.
16. Swai, E., L. Schoonman and C. Daborn, 2010. Knowledge and attitude towards zoonoses among animal health workers and livestock keepers in Arusha and Tanga, Tanzania. *Journal of Health Research*, 12: 4-5.
17. CSA, 2007. Population and Housing Census 2007 Report, National. [ONLINE] Available at: <http://catalog.ihsn.org/index.php/catalog/3583/download/50086>.
18. Thursfield, M., 2005. Survey in Veterinary Epidemiology. 2nd edition UK: Blackwell Science, Limited, Cambridge, pp: 297-302.
19. Girma, S., G. Zewde, K. Tafess and T. Jibat, 2012. Assessment of awareness on food borne zoonoses and its relation with veterinary public health services in and around Addis Ababa, *Journal of Public Health and Epidemiology*, 4(2): 48-51.
20. Gizachew, A., K. Niraj, T. Tsegay and A. Hailelule, 2016. Study on Assessment of Community Awareness towards Common Zoonotic Diseases in and Around Asella, Eastern Arsi Zone, Ethiopia. *International Journal of Livestock Research*, 6(5): 2-3.
21. Kidane, A., D. Sifer, M. Aklilu and M. Pal, 2015. Knowledge, Attitude and Practice towards Human and Bovine Tuberculosis among High School Students in Addis Ababa, Ethiopia. *International Journal of Livestock Research*, 5(1): 1-11.
22. Tesfaye, D., D. Fekede, W. Tigre, A. Regassa and A. Fekadu, 2013. Perception of the public on the common zoonotic diseases in Jimma, Southwestern Ethiopia. *International Journal of Medicine and Medical Sciences*, 5(6): 279-285.
23. Amenu, K., E. Thys, A. Regassa and T. Marcotty, 2010. Brucellosis and Tuberculosis in Arsi-Negele District, Ethiopia: Prevalence in Ruminants and People's Behavior towards Zoonoses, 28(4): 205-210.
24. Jaspal, S., S. Smirinder, G. Aparna, S. Jaswinder and S. Udeybir, 2016. Awareness knowledge and risk if zoonotic disease among livestock farmers in Punjab. *Veterinary World*, 9(2): 186-191.
25. Awoke, A., A. Ashenafi, D. Samuel and A. Birhanu, 2015. Assessment of Knowledge, Attitude and Practice on Rabies in Debre Tabor town, South Gondar, Northwest Ethiopia. *International Journal of Basic and Applied Virology*, 4(1): 28-34.
26. Tirsit, K., D. Benti, A. Fanta and T. Worku, 2013. Farmers awareness and practices on rabies, bovine tuberculosis, Taeniasis and brucellosis in Mana and Limmukoso District of Jimma Zone, Southern Ethiopia. *Journal of World Applied Science*, 23(6): 782-787.