

Assessment of Veterinary Health Extension Service and Public Perception on Major Infectious and Zoonotic Disease at Arsi-Negele Veterinary Clinic

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ABSTRACT

The survey was conducted to assess community awareness on veterinary extension service and major zoonotic disease at Arsi-negele Veterinary clinic, West Arsi zone of Oromia regional state, Ethiopia. A total of 400 (351 males and 49 females) animal attendants were interviewed. They interviewed using structured questionnaires. Half of the respondents (50%) heard about zoonosis. Among respondents, 95.2% knew rabies as a zoonotic whereas 9.5% knew bovine tuberculosis as a zoonotic disease. Regarding mode of transmission 92.8% and 5.2% of respondents knew rabies and BTB as a zoonotic disease contracted via the bite and milk respectively. In general, knowledge transfer from the professionals to the society is a key intervention for the prevention, control and eradication of the important endemic disease. The present study revealed a very low level of awareness by the public about major zoonotic diseases and veterinary extension services. There is an urgent need to improve upon the quality of extension services and signifying the need for public health promotion through education and interdisciplinary one health approach with close collaboration among veterinarians, public health practitioners and policymakers.

Key word: *Veterinary Extension service, Zoonosis, Arsi-negele,*

1. INTRODUCTION

The livestock sector in Ethiopia contributes 12 and 33% of the total and agricultural Gross Domestic Product (GDP), respectively, and provides livelihood for 65% of the population. The sector also accounts for 12-15% of total export earnings, the second in order of importance (Ayele *et al.*, 2003; Halderman, 2005). To ameliorate the development constraints and realize the benefits from the huge but untapped livestock resource, efforts have been made in various aspects to develop the livestock sector in Ethiopia. These efforts include the provision of input and services such as veterinary services, breed improvement, feed resources development, research, extension services and development, finance and marketing (Azage *et al.*, 2006).

The link among humans, animal populations and the surrounding environment is very close in many developing countries, where animals provide transportation, draught power, clothing and sources of protein (that is, 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 (WHO, 2010).

Knowledge transfer from the professionals to the society is a key intervention for the prevention, control and eradication of important endemic disease. Previously there is no strategically well designed approach to teach the society about the animal health and zoonosis. The eminent gap of perception of the society about the disease thus indicates the absence of well-designed attempt of animal health extension service (Venkatasubramanian and Rao, 2012). Even though the fact that animal health care means care of the society which comes in bold particularly in the case of zoonotic disease, it was partially neglected between the medical and veterinary professionals.

Currently there is increasing trend of veterinary professional diversity, number and also veterinary infrastructures, universities and other service posts which can be considered as baseline for health extension. But still the service given mainly targets the convectional attempt of disease treatment and pilot vaccination delivery to the animals with limited attempt for transfer of the knowledge about the disease and associated risk factors to the community at large. Chemotherapy becomes the dominant and routine attempt to prevent and treat sicknesses; which usually come up with problems of antibiotic resistance and other side effects (OPDC, 2012).

As it is known that “prevention is better than cure” the service to be delivered need to targeted more on the prevention of the disease. For sustainable development of the sector: efficient, multidisciplinary and community based health service is central. Clearly it needs to include an attempt of improving the understanding of the community about the disease as it is quite important to alert the mind of animal owners rather than only treating the physical body of the animal (Clayton *et al.*, 1997).

On other side disease determinant concept is very important as the cause of the disease may vary and will directly or indirectly determines the fate of an animal. Such determinant issue particularly environmental risk factors and animal management practice is usual manipulated by the farmers. Farmers are always key person behind the health of an animal as he can decide where to keep, how to keep, what to fed and when to bring the animals to the clinic. So, emphases need to be redirected to such prevailing determinants and it can easily be addressed using the animal owner themselves. The veterinary service should encompass the strategies of combating such area. Livestock owners have been living with their animals for generations and have built enormous experiences with animal health. It is recognized that illiterates can learn when visualization is used. People learn a lot by doing practice, from pictures, posters and other demonstrations. They easily understand by learning simple courses first and may gradually advance to more additional courses as needed. This enables us to build modern knowledge on existing fertile grounds by strategically linking the system of health extension to the conventional public and private veterinary services (Holtland, 1997).

Although veterinary teaching and health extension service can play critical role in the prevention and control of animal diseases, however in Ethiopia there are no policies and professionals allocated specifically to teach community about primary animal health care which subsequently affects the perception of animal owners. Hence it is very important to assess the current veterinary health extension service as well as the perception of the community about animal health. In this regard, the present study is initiated:

- To assess the current status of veterinary health extension service.
- To assess public perception on major infectious and zoonotic disease in ArsiNagele Veterinary Clinic.

2. MATERIALS AND METHODS

2.1 Study Area

The Arsi Negele district is located in the West Arsi Zone of Oromia Regional State. The capital of the district, Arsi Negele, is 225 km away from Addis Ababa. Geographically, it is located within grid coordinates of 70 08' 00'' N to 70 49' 00'' N latitude and 380 24' 04'' E to 380 48' 09'' E longitude and its altitude ranges from 1500 to 2300. The total population of the district is 264,314 (211,985 rural and 52,329 urban residents (CSA, 2007).

2.2 Study design

A cross sectional study with purposive sampling method was used. Structured questionnaires supplemented with interview were administered on 400 study participants approached to assess their perception on major zoonotic diseases and Veterinary health extension service.

2.3 Study population

Study population of the current study comprised of purposively selected animal attendants at Arsi Negele veterinary clinic

2.4 Sample size determination

Sample size was determined based on (Thrusfield 2005) derivation sample size.

$$N = \frac{1.96^2 \cdot p_{exp} (1 - p_{exp})}{d^2}$$

Where

N= required sample size

p_{exp} = expected prevalence

d= desired absolute precision

However, to increase the accuracy, 16 Respondents were added. Based on the above formula; the total sample size was calculated to be 400.

2.5 Study methodology

2.5.1 Questionnaire survey

A structured questionnaire was pre-tested and used for the face-to-face interview to evaluate the perception of the community about the common zoonotic disease (Unger and Munstermann, 2004). The questionnaire contains questions that can evaluate the perception of the respondents about zoonotic and infectious diseases importance, their transmission cycle and major clinical signs in humans and animals. In addition, the respondents will also asked questions regarding the Veterinary extension service.

2.6 Data management and analysis

The survey data was collected and store in Microsoft office Excel 2007 and analyzed by descriptive statistics and chi-square (χ^2) correlation analysis using Statistical Program of Social Sciences (SPSS) version 16.0 software packages (SPSS Inc, Chicago, IL, USA). For all analysis performed, P-value < 0.05 was set for statistical significance of an estimate.

3. RESULTS

3.1 Socio-demographic characteristics of respondents

The Socio-demographic profile of animal attendants involved in this study includes age, education, occupation, resident, marital status, religion and gender (Table 1). The survey revealed that about 52.8% respondents belong to 20-40 age group followed by 42.5% belonging to >40 and about 4.8% were <20 age category. With regards to education, 52.5% respondent's possessed primary and secondary schooling followed by 23.8 % were able to read and write and 20.8 % were illiterate. The study reported that 62.8 % of respondents are farmers followed by 15.2 % were merchants.

Table 1: Socio-demographic Characteristics of respondents

	Categories	Frequency	Percent
Peasant Association	0	69	17.2
	1	42	10.5
	2	112	28
	Sayomaja	37	9.2
	Adabaxixa	26	6.5
	Rafuharginsa	22	5.5
	Gambeltu	28	7
	Sirbalenda	33	8.2
	Qarsagara	19	4.8
	Makooda	12	3
	Total	400	100
	Gender	Male	351
Female		49	12.2
Total		400	100
Age	Less than 20	19	4.8
	20 to 40	211	52.8
	Greater than 40	170	42.5
	Total	400	100
Marriage	Married	310	77.5
	Divorced	1	0.2
	Unmarried	14	3.5
	Other	75	18.8
	Total	400	100
Education	Illiterate	83	20.8

	Read and Write	95	23.8
	Primary School	144	36
	Secondary School	66	16.5
	College and University	12	3
	Total	400	100
Occupation	Farmer	251	62.8
	Merchant	61	15.2
	Employee	10	2.5
	House wife	43	10.8
	Jobless	1	0.2
	Others	34	8.5
	Total	400	100
Religion	Muslim	227	56.8
	Orthodox	142	35.5
	Protestant	31	7.8
	Total	400	100

3.2 Animal production characteristics and management practices in the area

To investigate the animal production and management characteristics practiced in the study area, animal type owned, and breed, feeding system, animal production and improvement intervention were assessed. Among the respondents 28.2% were owned mixed livestock, 27% of them own Cattle and equine, 26% own at least Cattle, 17% of them owned Cattle, Sheep and Goat. While from the respondents 67.8% had local breed animals. 93.2% of the animal owner did not get any training on animal production. The animal management practice in the area was mainly extensive management with delay in the frequency of cleaning animal house, roughage feeding and outdoor grazing predominates. Some concentrate feed type 26.2% is also supplemented to the animal feed. Animal production improvement intervention particularly artificial insemination service for 66.8% and castration for 69.2% of the respondent's animal get accesses (Table 2).

Table 2: Animal production management practice in the area

	Categories	Frequency	Percent
Animal Owned	Cattle	105	26.2
	Goat	2	0.5
	Horse	2	0.5
	Donkey	2	0.5
	Mixed Livestock	113	28.2
	Cattle, Sheep and Goat	68	17
	Equine and Cattle	108	27
	Total	400	100
Breed	Local	271	67.8
	Exotic	116	29
	Both	13	3.2
	Total	400	100
Training on Animal Production	Yes	27	6.8

	No	373	93.2
	Total	400	100
Who train on Animal production	Government	27	6.8
Clean Animal House	Yes	356	89
	No	44	11
	Total	400	100
House Cleaning Frequency	Daily	222	55.5
	Weekly	56	14
	Monthly	70	17.5
	Yearly	8	2
	Total	356	89
Feed Type	Concentrate	105	26.2
	Roughage	53	13.2
	Grazing grass	67	16.8
	Concentrate plus Roughage	88	22
	Roughage and Grazing grass	87	21.8
	Total	400	100
Artificial Insemination	Yes	267	66.8
	No	130	32.5
	Total	397	99.2
Castration Methods	Professional Veterinarian	277	69.2
	Traditionally	46	11.5
	Total	323	80.8

The major animal production and health constraints indicated in figure 1 show that 45% of the respondent complains that the animal feed is expensive due to shortage of feed followed by disease problem (19%) and unavailability of vaccine (Figure 1A). The other issue respondents complain is that the veterinary clinic is far away with average 3 kilometers from the residence of some rural kebeles although 47% of the urban respondent still found within 1 kilometer vicinity (Figure 1B).

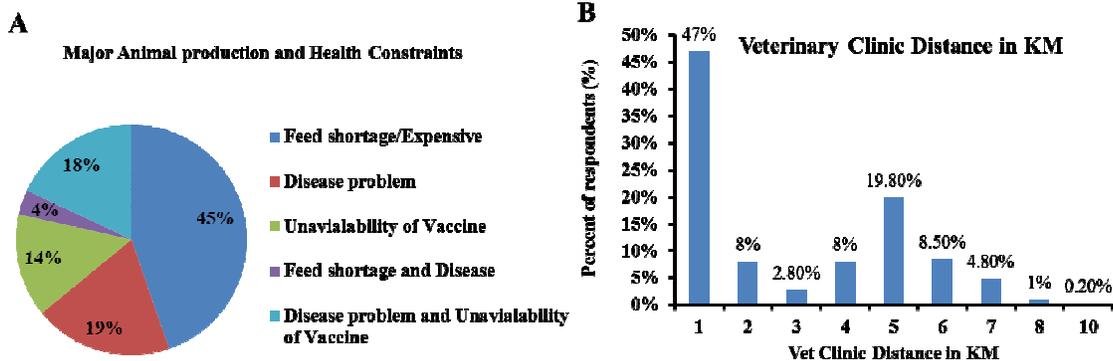


Figure 1: Major animal production and health constraints in the area.

A) The Pie-chart drawn using the percent of respondent selected each constraints. B) The Bar-chart showing the pattern of veterinary clinic distance from the residents. The average veterinary clinic distance from the farmer's resident was calculated.

3.3 Assessments of veterinary extension service using animal attendants

The Assessments of veterinary extension service indicated that among the 373 respondents (93.3 %) of them hadn't taken any training on animal health from animal health professional although they bring their animals to clinic when they get sick. Treatment care, consultancy, distance from clinic, method of transmission and other related things are recorded and put in Table 3. The overall veterinary extension service in the area is fine but not satisfactory.

Table 3: Respondent's perception and practice on animal health service

	Categories	Frequency	Percent
Training on Animal Health	Yes	27	6.8
	No	373	93.2
	Total	400	100
Consultant presence	Yes	119	29.8
	No	281	70.2
	Total	400	100
Treatment care	Yes	398	99.5
	No	2	0.5
	Total	400	100
Disease transmission method	Meat	32	8
	Bite	118	29.5
	Saliva	8	2
	Milk	1	0.2
	Dust	11	2.8
	Faeces	14	3.5
	Meat and Bite	15	3.8
	Dust and faeces	44	11
	Dust and Bite	24	6
	Meat and Faeces	4	1
	Meat and Saliva	1	0.2
	Faeces and Bite	4	1
	Meat and Milk	1	0.2
	Total	277	69.2
	Vet clinic distant	Yes	171
No		229	57.2
Total		400	100
Know disease transmission	Yes	280	70
	No	117	29.2
	Total	397	99.2
Care sick animals	Yes	374	93.5
	No	26	6.5
	Total	400	100
How fast bring sick animal to clinic	Immediately	374	93.5
Reason for delay in animal	Due to Distance	8	2

attendance	Can be Traditionally	5	1.2
	Treated at home	11	2.8
	Do nothing	2	0.5
	Total	26	6.5
Perception on vaccine	Yes	321	80.2
	No	79	19.8
	Total	400	100
Treatment type given	Treat with traditional medicine	5	1.2
	Treat with veterinary prescription	395	98.8
	Total	400	100

3.4 Perception about major infectious and zoonotic diseases

Present study revealed that 50% study respondents were aware about zoonotic diseases while 32% had exposure experience on zoonotic diseases. About 95.2% (381) of respondents are aware about rabies while 371 (92.8%) of respondents are said rabies transmitted through biting, 2.5% (10) are transmitted through saliva. 9.5% (38) of respondents are knowing BTb as a zoonosis, while 5.2%(21) respondents are knew BTb transmit through Milk(Table 4).

Table 4: Perception and practice on zoonotic disease

Variables	Variable category	Frequency	Percent
Perception on zoonosis	Yes	200	50
	No	200	50
	Total	400	100
Zoonosis exposure experience	Yes	128	32
	No	272	68
	Total	400	100
If Yes which zoonosis you know	Anthrax	91	22.8
	Rabies	50	12.5
	Anthrax and Rabies	48	12
	Anthrax and BTB	1	0.2
	Rabies and BTB	9	2.2
	Total	199	49.8
	System	201	50.2
Rabies zoonosis perception	Yes	381	95.2
	No	19	4.8
	Total	400	100
Rabies transmission methods	Biting	371	92.8
	Saliva	10	2.5
	Total	381	95.2

	System	19	4.8
		400	100
TB Zoonosis perception	Yes	38	9.5
	No	362	90.5
	Total	400	100
TB transmission methods	Milk	21	5.2
	Air	15	3.8
	Total	36	9
	System	364	91
		400	100
Zoonosis control measure taken	Vaccination	130	32.5
	Clean the environment	200	50
	Boiling milk	14	3.5
	Cooking meat	24	6
	Boiling milk and cooking meat	11	2.8
	Vaccination and cleaning	18	4.5
	Other way	3	0.8
	Total	400	100
Measure taken on rabies animal	Take to veterinary clinic	369	92.2
	Cull or sellout	3	0.8
	Traditionally treated	28	7
	Total	400	100
Habit of eating raw animal product	Raw meat	232	58
	Raw milk	91	22.8
	Raw meat and Milk	44	11
	Raw Egg	1	0.2
	Raw Fish	0	0
	None	32	8
	Total	400	100
Perception on abattoir	Yes	261	65.2
	No	139	34.8
	Total	400	100

In the present study, the major zoonotic disease and its transmission pattern were characterized by respondent. It was found that Anthrax, Rabies, FMD and BTB were listed as a major zoonotic disease with different percentage of respondents listing (Figure 2A). The disease transmission pattern computed from the respondent shows that 44% says to be by Biting, 22% says by Dust/air, 17% says by faces contamination. Only few respondents say transmission of zoonotic disease to human by meat, saliva and milk indicating their perception on zoonotic disease transmission to human is low (Figure 2B).

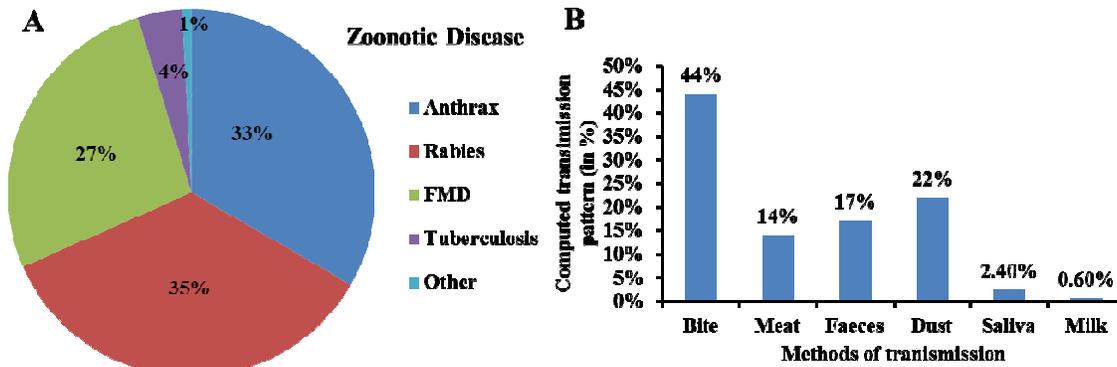


Figure 2: Major Zoonotic disease and its transmission pattern

3.5 Evaluation of factors affecting KAP on Veterinary Health Extension Service

To evaluate the factors that affect veterinary health extension service, KAP of animal attendants was investigated. From the demographic characteristics, residence area, gender, marriage and occupation significantly associated with knowledge towards animal disease transmission among study participants (Table 5). The correlation analysis shows that, an urban settlement has also better knowledge on disease transmission than peri-urban settlements and residents from rural kebeles ($p = 0.024$). The perception of male on animal disease transmission is better than women animal attendant ($p = 0.015$). Among study participants, the occupation for which farmers and houses-wife have lower knowledge towards animal disease transmission ($p = 0.003$).

There was also a significant ($P < 0.05$) difference on knowledge towards zoonotic disease and animal disease transmission among study participants. Factors associated with knowledge towards zoonotic disease among study participants listed in

Table 6.

Table 5: Factors associated with knowledge towards animal disease transmission among study participants

Variables	Variable category	Yes	No	P-value
		Count (%)	Count (%)	
Peasant Association	0	54(78.3)	15(21.7)	0.024
	1	32(80)	8(20)	
	2	82(73.2)	30(26.8)	
	Sayomaja	22(59.5)	15(40.5)	
	Adabaxixa	21(80.8)	5(19.2)	
	Rafuharginsa	15(68.2)	7(31.8)	
	Gambeltu	16(57.1)	12(42.9)	
	Sirbalenda	20(62.5)	12(37.5)	
	Qarsagara	14(73.3)	5(26.3)	
	Makooda	4(33.3)	8(66.7)	
	Total	280(70.5)	117(29.5)	

Gender	Male	254 (72.6)	96(27.4)	0.015
	Female	26(55.3)	21(44.7)	
	Total	280(70.5)	117(29.5)	
Marriage	Married	228(73.7)	81(26.2)	0.026
	Divorced	1(100)	0(0)	
	Unmarried	10(71.4)	4(28.5)	
	Other	41(56.1)	32(43.8)	
	Total	280(70.5)	117(29.47)	
Occupation	Farmer	181(72.1)	70(27)	0.003
	Marchant	51(85)	9(15)	
	Employee	4(40)	6(60)	
	House wife	25(59.2)	17(40.4)	
	Jobless	1(100)	0(0)	
	Others	18(54.5)	15(45.4)	
	Total	280(70.5)	117(29.4)	

Table 6: Factors associated with knowledge towards zoonotic disease among study participants

Variables	Variable category	Yes Count (%)	No Count (%)	P-value
Peasant Association	0	28(40.6)	41(59.4)	0.0001
	1	28(66.7)	14(33.3)	
	2	40(35.7)	72(64.3)	
	Sayomaja	18(48.6)	19(51.4)	
	Adabaxixa	19(73.1)	7(73.1)	
	Rafuharginsa	11(50)	11(50%)	
	Gambeltu	18(64.3)	10(64.3)	
	Sirbalenda	15(45.5)	18(54.5)	
	Qarsagara	14(73.7)	5(26.3)	
	Makooda	9(75)	3(25)	
Total	200(50)	200(50)		
Age	Less than 20	5(26.3)	14(73.7)	0.005
	20 to 40	96(45.5)	115(54.5)	
	Greater than 40	99(58.2)	71(41.8)	
	Total	200(50)	200(50)	
Marriage	Married	168(54.2)	142(45.8)	0.003
	Divorced	1(100)	0(0)	
	Unmarried	2(14.3)	12(85.7)	
	Other	29(38.7)	46(61.3)	
	Total	200(50)	200(50)	
Education	Illiterate	54(65.1)	29(34.9)	0.035
	Read and Write	45(47.4)	50(52.6)	

	Primary School	67(46.5)	77(53.5)	
	Secondary School	30(45.5)	36(54.5)	
	College and University	4(33.3)	8(66.7)	
	Total	200(50)	200(50)	
Religion	Muslim	127(55.4)	100(44.1)	0.007
	Orthodox	56(39.4)	86(60.6)	
	Protestant	17(54.8)	14(45.2)	
	Total	200(50)	200(50)	

4. DISCUSSION

The assessment of animal production characteristics and management practices as well as the veterinary health extension services in the study are shows that different animal species are kept in a mixed stock mainly under extensive production with some feed supplements. The peri-urban settlement keeps cattle for dairy production with access to artificial insemination and castration. Major constraints production and health respondent complain includes lack of animal feed, disease challenges and unavailability of animal vaccine. The respondent explains that there is no proper animal health and production training and the veterinary clinic is found far from the peri-urban settlements and rural kebeles around the Arsi-Negele district.

The community in the current study has found with lower knowledge towards zoonotic disease than previous report from Addis Ababa where 100% respondents heard about zoonotic disease (Girma *et al.*, 2012). Furthermore, rate of most frequently mentioned zoonotic diseases in the current study was found lower than study reported by Girma *et al.* (2012) from Addis Ababa who mentioned as rabies (100 %), anthrax (94.27%), taeniasis (89.06%), bovine tuberculosis (88.54%) and brucellosis (49.48%) as known disease by the respondents. The difference could be due to variation in community's access to information about zoonotic diseases by different means. Addis Ababa is a capital city where information can be assessed more easily than the current study area and in these researches asking the respondent about zoonotic diseases without specifically list the diseases, difference might be due to these.

Current study revealed relatively low level of knowledge about modes of transmission of zoonotic disease to humans. In contrast, Tesfaye *et al.* (2013) from Jimma reported that dog bite (94.3%) as a mode of transmission for rabies. The might be due to variation on educational status, where about 81.6% of respondents from Jimma were attending basic education. The findings on knowledge about zoonotic disease transmission in current study was higher than that reported by Tirsit *et al.* (2013) to be 15.6% from Mana and Limmukosa Districts of Jimma zone. The difference could be due to variation on educational status, where about 45.4% of the respondents from Mana and Limmukosa districts didn't attend formal education.

In agreement with the current study Amenu *et al.* (2010) reported 58.20% and 57.1% of study participants from Arsi-Negele district had a habit of consuming raw meat and unpasteurized milk, respectively. In contrary, lower value was reported by Swai *et al.* (2010) from Arusha and Tanga of Tanzania indicated 40% and 16.3% consumed unpasteurized milk and raw meat, respectively. This variation could be due to their habitat difference (urban and rural) and cultural variation of community from different locality and country on use of food of animal origin.

Regarding to veterinary service that provided health care of their livestock when animals were sick is higher than reported by Abera *et al.* (2016) from Asella who mentioned as 59%. This difference might be due to educational status.

5. CONCLUSION AND RECOMMENDATION

In conclusion, the results from this study suggest that animal production and veterinary extension service is low. The current study indicates presence of gaps on community knowledge, and attitude about extension service and zoonotic disease risk with its mode of transmission. The communities in the study area indicated poor practices which could predispose to most zoonotic diseases. Common practices performed by the community includes; consumption of raw meat and unpasteurized milk, backyard animal slaughtering and etc. Hence, continues community education and governmental officials` sensitization on mass awareness creation about animal production and health in general and zoonoses in particular are crucial.

6. REFERENCES

- Abera, G., Kumar, N., Gebrewahd, T. T. and Yizengaw, H. A. (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), 83-90.
- Ayele, S., Assegid W., Jabbar M.A. Ahmed M.M. and Belachew, H. (2003): Livestock marketing in Ethiopia: A review of structure, performance and development initiatives. Socio economics and Policy Research Working Paper 52. ILRI (International Livestock Research Institute), Nairobi, Kenya. pp 35.
- Azage, T., Berhanu, G. and Dirk, H. (2006): Input supply system and services for Market oriented Livestock Production in Ethiopia. Paper presented at the 14th annual conference of the Ethiopian Society for Annual Production (ESAP) on: Institutional arrangements and challenges in market oriented livestock agriculture in Ethiopia. September 5-7, 2006. Addis Ababa, Ethiopia.
- Clayton, A., P. Oakley and B. Pratt (1997): Empowering People - A Guide to Participation. UNDP. To be downloaded from <http://www.undp.org/csopp/paguide.htm>
- CSA, (2007): Central Statistical Agency. 2007. Summary and Statistical Report of the 2007 Population and H using Census: Population Size by Age and Sex. Addis Ababa, Ethiopia.
- Girma, S., Zewde, G., Tafess, K. and Jibat, T. (2012): Assessment of awareness of food born zoonosis and its relation with veterinary public health services in and around Addis Ababa. *Journal of public health and epidemiology*, 4 (2):48-51.
- Halderman, M. (2005): The Political Economy of Pro Poor Livestock Policy making in Ethiopia. Working Paper.PPLPI, FAO, Rome, Italy, xiii+59 pp.
- Holtland, G. (1997): Basic skills in participatory extension planning. Training manual and Trainer's guide.Stoas.Wageningen, the Netherlands.
- OPCD, (2004): Oromia Pastoral and Agropastoral areas CAHWs Training Manual. December 2004, Adama, Ethiopia.
- Swai, E., Schoonman, L. and Daborn, C. (2010): Knowledge and attitude towards zoonoses among animal health workers and livestock keepers in Arusha and Tanga, Tanzania. *Journal of Health Research*.12:4.
- Tesfaye, D., Fekede, D., Tigre, W., Regassa, A. & Fekadu, A. (2013): Perception of the public on common zoonotic diseases in Jimma, southwestern Ethiopia. *International journal of medicine and medical science*, 5(6):279-285.

- Thursfield, M. (2005): Veterinary epidemiology 3rd ed., UK, Black well Science. Pp. 178 - 197.
- Tirsit, K., Benti, D., Fana, A. & Worku, T. (2013): Farmer's awareness and practices on rabies, bovine tuberculosis, taeniasis, hydatidosis and brucellosis in Mana and Limmukosa Distincts of Jimma Zone, Southwest Ethiopia. *Journal of World Applied Science*.23 (6):782-787.
- Unger F, Munstermann S. (2004).Asssessment of the impact ofZoonotic infections in selectedregions of T he Gambia, Senegal, Guinea and Guinea Bissau. DFID, animal health program. Banjul, the Gambia.
- Venkatasubramanian V. and Rao S.V.N. V. (2012): Livestock Extension Education. ICAR, New Delhi
- 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/food safety. Accessed in August 2012.