Epidemiologial study of bovine brucellosis in three selected agro-ecologies of central Oromia in Ethiopia

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Workshop: An Integrated Approach to Controlling Brucellosis in Africa, Addis Ababa, 29-31 January 2013

Introduction

- Bovine brucellosis is existing t in Ethiopia specially in extensive pastoral and in peri urban dairy farms in central highland.
- High prevalence as high as 38.7%, 22%,

  is reported by Rashid,M.(1993) and Sintaro,T.(1994) in cross breeds.

Background

- Midium prevalence, 8.1%, is reported by Asfow,Y.(1998)in urban and peri urban dairy farms and 12.3% by OADB (1998).
- Low prevalence 0.2 and 0.77 is reported by (Taddalle,2004) and 1.66 and 2.4 percent by (Ksshun, 2004) in cross and local breeds, respectively.
- The status of the disease in smallholder dairy cattle in different Agro-ecology is not yet well assessed.
- There are several un coordinated studies using different serological test procedures.

Study gaps

- Current epidemiological picture of B*rucellosis* in Ethiopia.
- Prevalence of *Bovine brucellosis* in Ethiopia.
- Determining potential risk factors and the effect agro ecology on prevalence of brucellosis in Ethiopia.
- Determining zoonotic significance of Brucellosis in farming households and consumers
- Its economic burden in livestock production in Ethiopia

Sero- epidemiological study of Bovine brucellosis in central Ethiopia

3.Materials and methods

Study areas

- Central Oromia/ Ethiopia
- Three districts
  - Adami Tululu……lowland agro ecology
  - Lume= Modjo Midland…… agro ecology
  - Holota ……Highland agro-ecology

3.2. Study population.

- All cattle population above 6 months age in the study areas were used as the study population.
- Local breed
- Cross breed dairy cattle

3.3.Study design and methods

- Cross-sectional Sero- Epidemiological study and
- questionnaire survey

3.4. Sampling methodology

Sampling methodology

- One stage cluster sampling method
- Random selection of three Farmers' Associations from each of the three agro-ecologies and the main town of each of the three districts.
- Random selection of 29 households (clusters)
- All animals under the management of the selected households above six month of age were sampled.

Sample size

Sample size determination

- the actual cluster size at 95% CI ,5% absolute precision and P = 12.3%%(OADB) is as given by the formula:

$$g = \frac{1.96^2 (nVc + Pexp(1-Pexp))}{nd^2}$$

where,

g= number of clusters to be sampled,

P_{exp} =expected prevalence, d = desired absolute precision and Vc =between cluster variance (Thrusfield 1995).

Sample size cont…

- Actually 1238 animals and 176 households were
- Included in the study
- 59 HHS 423 animals from lowland
- 58HHS 385 animals from mid highland
- 59HHS 430 animals from highland

Data collection

- About 10ml blood was collected from jugular vein by clean vacutuner tubes
- The collected blood was kept at room temperature for clot retraction and serum separation
- The separated serum was collected by pipette and stored at -20 o_c until tested by RBPT and CFT

3.5.Materials used

Materials used for Rose Bengal Plate Test (RBPT)

1. Brucella Antigen for RBPT
2. Known Brucella positive Control sera
3. Known Brucella Negative control sera

3.Test serum

4.micropippete tips and epindorf tube

4.Enamel plate and Glass slide

5.Plastic applicator

Materials needed cont…

Materials needed for Complement Fixation Test (CFT)

1.Micro well plates (U-shaped), Multi channel and single channel micro pipets, pipet tips

2.Flasks and measuring cylinders

3.Beam balance (Digital balance)

4.Incubetor, water bath, deep freezer, Centrifuge

5.Vernal buffer, Alsever solution,

6. Complement, Hemolysin (Amboceptor), Control Serra, Sheep RBC

7 . CFT Antigen

4.Data recording and analysis

- Microsoft Excel spread sheet was used for row data recording &management.
- Intercooled stata 7.0 , spss & Win Episcope 2.0 soft wares were used as appropriate.
- for data summary and analysis descriptive and analytical statistics of various dependant variables, stata 7.0(2001) was used.
- Chi square test and Fisher's exact t-tests were used to test Brucella Sero- prevalence with incriminated categorical risk factors.
- Univarate and multiple logistic regression test were used to see the effect of potential risk factors on the prevalence of Bovine brucellosis

5.Result

Table 6.Overall individual animal seroprevalence of *Bovine brucellosis* in the three agro-ecological zones

Agro-ecology	N	Number of seropositive animals (prevalence)	
		RBPT	CFT
Lowland	423	24 (5.67%)	18 (4.26%)
Mid-highland	385	10 (2.60%)	4 (1.04%)
Highland	430	27 (6.26%)	15 (3.48%)
Total	1238	61 (4.92%)	37 (2.99%)

N=number of animals tested

Overall herd sero prevalence

Table 8: Overall herd seroprevalence of bovine brucellosis in the three agro-ecological zones

Agro-ecology	NF	Number of seropositive households(prevalence)	
		RBPT	CFT
Lowland	59	14(23.7%	10 (17%)
Mid-highland	58	6(10.3%)	3 (5.17%)
Highland	59	8 (13.6%)	11 (18.64%)
Total	176	28 (16 %)	24 (13.64%)

NF=number of farms tested

Table 9.Factors affecting the overall individual animal seroprevalence in the study areas (univariate logistic regression analysis)

Risk factors	Group	N	Number positive (prevalence)	95% CI	P-value	OR
Breed	Indigenous	892	20 (2.24%)	1.16-4.26	0.017	2.22
	Crossbred	346	17 (4.91%)			
Age group	0.5-3 years	412	17 (4.12%)	0.36-1.11	0.115	-
	3-10 years	729	18 (2.47%)			
	> 10 years	97	2 (2.06%)			
Herd size	1-6	296	16 (5.41%)	0.72-2.39	0.373	-
	7-16	537	9 (1.68%)			
	>16	405	12 (2.96%)			
Management system	Intensive	266	13 (4.88%)	1.00-2.03	0.046	1.43
	Semi-intensive	70	2 (2.86%)			
	Extensive	902	22 (2.43%)			
Agro-ecology	Lowland	423	18 (4.26%)	0.59-1.30	0.519	-
	Mid-highland	385	4(1.04%)			
	Highland	430	15(3.49%)			
Mating method	Natural	894	20(2.2%)	0.87-1.86	0.213	
	Artificial	116	11(9.5%)			
	Both	228	6(2.6%)			
Source of replacement stock	Regional market	891	20(2.24%)	0.91-1.70	0.176	-
	Village breeders	236	13(5.51%)			
	Government farms	6	1(16.67%)			
	Urban dairy farms	105	3(2.86%)			

Table 10. Factors affecting individual animal seroprevalence in the lowland areas (univariate logistic regression analysis)

Risk factors	Group	N	Number positive (prevalence)	95% CI	P-value	OR
Breed	Indigenous	336	9(2.7%)	1.61-10.91	0.015	4.19
	Crossbred	87	9(10.3%)			
Age group	0.5-3 years	143	7(4.9%)	0.35-1.66	0.498	-
	3-10 years	237	10(4.2%)			
	> 10 years	43	1(2.3%)			
Herd size	1-6	98	10(10.2)	0.22-0.77	0.006	0.41
	7-16	143	4(2.8%)			
	>16	182	4(2.2%)			
Management system	Intensive	87	9(10.3)	1.27-3.30	0.003	2.05
	Extensive	336	9(2.7%)			
Mating method	Natural	335	9(2.7%)	1.59-10.74	0.004	
	Artificial	88	9(10.3%)			
Source of replacement stock	Regional market	335	9(2.7%)	1.59-10.74	0.004	-

Table 11. Factors affecting individual animal seroprevalence in the mid-altitude areas (univariate logistic regression analysis)

Risk factors	Group	N	Number positive (prevalence)	95% CI	P-value	OR
Breed	Indigenous	280	1(0.4%)	0.97-9.86	0.056	-
	Crossbred	105	3(2.9%)			
Age group	0.5-3 years	104	2(1.9%)	0.06-2.28	0.279	-
	3-10 years	253	2(0.8%)			
	> 10 years	28	0			
Herd size	1-6	112	3(2.7%)	0.02-1.35	0.092	-
	7-16	198	1(0.5%)			
	>16	75	0			
Management system	Intensive	105	3(2.9%)	0.92-8.93	0.070	-
	Extensive	280	1(0.4%)			
Mating method	Natural	283	1(0.4)	0.94-9.12	0.065	-
	Artificial	102	3(2.9%)			
Source of replacement stock	Regional market	280	1(0.4%)	0.95-4.30	0.070	-
	Urban dairy farm	105	3(2.9%)			

Table 12. Factors affecting individual animal seroprevalence in the highland areas (Univariate Logistic Regression Analysis)

Risk factors	Group	N	Number positive (prevalence)	95% CI	P-value	OR
Breed	Indigenous	276	10(3.6%)	0.48-2.23	0.937	-
	Crossbred	154	5(3.2%)			
Age group	0.5-3 years	165	8(4.8%)	0.25-1.59	0.334	-
	3-10 years	239	6(2.5%)			
	> 10 years	26	1(3.8%)			
Herd size	1-6	86	3(3.5%)	0.70-3.13	0.306	-
	7-16	196	4(2%)			
	>16	148	8(5.4%)			
Management system	Intensive	286	12(4.2%)	0.0.25-1.41	0.232	-
	Semi-intensive	70	2(2.9%)			
	Extensive	74	1(1.4%)			
Mating method	Natural	276	10(3.6%)	0.46-1.56	0.608	-
	Artificial	28	2(7.1%)			
	Both	126	3(2.4%)			
Source of replacement stock	Regional market	276	10(3.6%)	0.42-2.99	0.830	-
	Village breeders	148	4(2.7%)			
	Government farm	6	1(16.7%)			

Questionnaire survey result

- Association of Bovine brucellosis sero-prevalence with the cause of culling

Table 14. Brucellosis sero-prevalence Vis a' Vis reason of culling

reason of culling	NHHs Interview)	CFT		
		Number of animals tested	Number(%) positive animals	Number (%) positive HHs
Sick animal	2	12	0(%)	0(0%)
Infertility	60	430	9(21%)	6(10%)
Poor production	6	42	2(3%)	2(33.34%)
Overstock	55	385	23(6%)	14(25%)
Miscellaneous and urgent cash need	53	368	3(0.8%)	2(4%)
Total	176	1237	37	24

NHHS = Number of households, HHS = Households
OR = 1.45, p-value = 0.013

	holders (n=89)	(n=87)	
Traditional (from the family)	71/89(81%)	59/87 (67.82%)	130/176(74.71%)
Agricultural Extension	16/89(18%)	21/87 (24.14%)	37/176(21.26%)
Formal Agricultural Training school	0	7/87 (8.05%)	7/176(4.02%)
Type of Matting used			
Natural	89/89	13/87(14.94%)	100/176(57.47%)
Artificial	0	20/87 (22.98%)	20/176(11.44%)
Natural + Artificial	0	54/87 (62.10%)	56/176(31.03%)
Knowledge of brucellosis and abortion causing disease			
Yes	7/89	11/87 (12.64%)	21/176(12%)
No	82/89(94.25%)	76/87 (87.36%)	158/176(88%)
Method of disposal of aborted materials and after birth			
Proper	7/89(5.74%)	67/87 (77.01%)	72/176(41.37%)
Improper	82/89(94.25%)	20/87 (22.99%)	104/176(59.63%)
Presence of separate parturition pen	11/89(12.64%)	15/87(17.24%)	26/176(14.94%)
Regular cleaning of animal premises.	49/89(56.32%)	57/87(65.52%)	106/176(60.91%)

Table 14: Summary of farmers attributes on cattle management in the study areas

Educational back ground of the farmers	Indigenous(Traditional Local Breed)Holders (n=89)	Dairy Cross Breed Holders (n=87)	Total
Traditional (from the family)	71/89(81%)	59/87 (67.82%)	130/176(74.71%)
Agricultural Extension	16/89(18%)	21/87 (24.14%)	37/176(21.26%)
Formal Agricultural Training school	0	7/87 (8.05%)	7/176(4.02%)
Type of Matting used Natural	89/89	13/87(14.94%)	100/176(57.47%)
Artificial	0	20/87 (22.98%)	20/176(11.44%)
Natural + Artificial	0	54/87 (62.10%)	56/176(31.03%)
Knowledge of brucellosis and abortion causing disease			

Source of Replacement Stock			
Regional Market	89/89(100%)	62/87 (71.26%)	149/176(84.65%)
Village Breeders	0	17/87 (19.54%)	17/176(9.77%)
Government Farms	0	8/87 (9.19%)	8/176(4.5%)
Urban Dairy Farms	0	40/87(45.97%)	40/176(22.77%)
Reasons of culling			
Disease	0	4/87 (4.60%)	4/176(2.30%)
Infertility	33/89(37.93%)	31/87 (35.63%)	64/176(36.78%)
Poor production	0	14/87(16.09)	14/176(8.05%)
Other reasons (Old age, over stock and urgent cash needs)	26/89(29.88%)	38/87 (43.67%)	64/176(36.78%)
Combination of the above reasons	28/89(32.18%)	21 (24.14%)	49/176(28.16%)

n= number of households

Prevalence of reproductive diseases

Table 15: Summary of the proportion of productive cows by physiological status vis-à-vis abortion, stillbirth, and retained fetal membrane, prevalence

Physiological status	Dairy cross breed	Traditional local breed	Total
Lactating and pregnant cows	197/347 (57.06%)	217/890 (24.38%)	414/1237 (33.47%)
Dry pregnant cows	8/347 (2.31%)	30/890 (3.37%)	38/1237 (3.07 %)
Total	205	247	452
History of abortion	9/205 (4.39%)	6 /247 (2.43%)	15/452 (3.32%)
History of stillbirth	6/205 (2.92%)	2/247 (0.81%)	8/452 (1.77%)
History of retained fetal membrane	9/205 (4.39%)	3/247 (1.21%)	12/452 (2.65%)

zoonotic importance

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Table16. Association of *Bovine brucellosis* sero prevalence with prolonged fever in the households (families surveyed)

Existence of prolonged fever in the family	NHHS(Interview)	CFT	
		NHHS with no sero positive animals	NHHS with sero positive animals
Yes	41	39	2(5%)
No	136	131	4 (3%)
Total	176	170	5(2.8%)

NHHS = Number of households, HHS = Households

OR = 1.30, p-value = 0.492

Conclussions

- The overall sero-prevalence of *Bovine brucellosis* in the study area is low
- Highest in the lowland and the highland the lowest prevalence was recorded in the mid highland agro ecology.

Conclussions… cont

- Breed and management were found to be the most important risk factor associated with Bovine brucellosis in the study area.

Conclssion…contd

- Zoonotic importance of *Bovine brucellosis* was appreciated through association of prolonged fever in the animal breeding households and presence of sero positive animals under their management.

Conclussions… contd

- Awareness of the households(farmers)

on Brucellosis and abortion causing diseases was low; management of the animals, cleaning of the housings and the surroundings as well as the method of disposal of aborted materials and after birth is poor; hence Brucellosis can easily be transmitted within the herd or to the other healthy herds in the area.

Recommendation

- Comprehensive and coordinated epidemiological study throughout Ethiopia is needed to formulate appropriate policy to control the disease.
- Regular testing of animals specially the breeding animals before transporting them to other areas.
- Test and culling of positive animals
- Awareness creation for the stakeholders about the severity of the disease both on animal production and human health.