SEROPREVALENCE AND RISK FACTORS ASSOCIATED WITH HUMAN BRUCELLOSIS IN ALKAIDAH DISTRICT IBB CITY

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(Received on Date: 16 December 2017 Date of Acceptance:20 January 2018)

ABSTRACT

Brucellosis is one of the most important zoonotic diseases which represent a serious problem due to economic losses and its public health significance. Hence, this cross-sectional study was carried out to determine the seroprevalence of brucellosis among butcher shops, veterinary workers and sheep and goat keepers and risk factors. A total of 100 blood samples were collected during March and July 2017. Blood samples from the participants were collected and screened for Brucella using Serum Agglutination Test. A questionnaire was used to collect data on socio-demographic characteristics and human brucellosis related risk factors.Thirty two (32%) participants were tested positive for Brucella and 68 (68%) were tested negative. The most affected groups were found in the age group of 31-45 yr (47%) and 15-30(34%), sheep and goat keepers (38%) and vererinary workers (20%), as they were the groups that have intimate contact to animals.. During the study period, 9 (28.1%) suffered from active Brucellosis from the seropositive group. The most common clinical finding was fatigue that found in all active cases. Both headache and anorexia were detected in 8 and 6 cases respectively. Seropositivity to Brucella has a high prevalence among both sheep and goat keepers and butchers workers in alkaidah district. Thus, effective working guidelines for workers in the sheep and goat keepers and butcher shops must be developed in order to protect them from brucella infection.

Keywords:Seroprevalence and Risk Factors Associated with human Brucellosis

No: of Tables: 4 **No: of Figures:6** **No: of References: 31**

INTRODUCTION

Brucellosis is one of the most important bacterial zoonoses with a cosmopolitan distribution [1-4]. It is an infectious disease, almost invariably transmitted by direct or indirect contact with infected animals or their products [1]. The disease is caused by gram-negative coccobacillae bacteria which belong to the genus Brucella which includes Brucellamelitensis and B. ovis as well as many other species [3]. The natural reservoirs of the species B. melitensis are basically goats and sheep but also cattle and swine. However, B. ovis is primarily afflicting sheep [3]. Brucellosis is wide spread in many developing countries and poorly diagnosed in both human and animals due to poor health facilities, diagnostic facilities and limited awareness of the disease among medical practioners [5]. Its diagnosis is complicated by the fact that it shares symptoms with malaria, a common cause of fever and a leading cause of morbidity and mortality especially in children under 5 years [6]. Sharing of clinical features with malaria and other febrile conditions can likely lead to misdiagnosis and mismanagement of cases and hence perpetuating human vulnerabilities [7].The burden of brucellosis is mainly on the poor individuals as they are often forced to live in close contact with their animals and so are more likely to become infected [8]. The worldwide prevalence of brucellosis in human has been reported to be more than 500,000 new cases annually [6]. The disease result to prolong health problems which may cause permanent disabilities and is an important cause of travel-associated morbidity [9]. The global epidemiology of the disease has significantly evolved over the past decade [6].Transmission of brucellosis through consumption of contaminated dairy products like unpasteurized milk and processed dairy foods from infected animals have been considered a source of infection. Infected carcasses are also a source of infection for pastoralists. The incidence of the disease in humans, and which directly relates to that in animals, is highly dependent on animal husbandry practices, animal population density and inter-group interactions. According to [10], the disease in humans is related to the interaction between humans and animals, living standards, hygiene and food customs. Among the Maasai of Narok district, Kenya, brucellosis was found to be related to the fact that the Maasai keep large herds of cattle, sheep and goats which frequently mix with other herds as they roam in search of pasture and water.The presence of brucellosis has often remained unrecognized through lack of awareness of the disease and misconception of the disease for malaria and typhoid. The main source of brucellosis infection among the pastoralists population is the ingestion of fresh milk. Cow, sheep, goat or camel milk contaminated with B. melitensis is particularly hazardous as it is drunk in fairly large volumes and may contain large numbers of organisms. Fresh blood, raw meat either alone or mixed with fresh milk, may be drunk and present an obvious potential hazard. Among the Maasai these practices are common. The strong bond the Maasai have with their

cattle has necessitated them to stay in close proximities with the animals, this closeness enhances the contracting of brucellosis.

Human behavior plays a big role in disease transmission, management and control. This would mean a decreased disease burden, poverty reduction and increased food supply for large numbers of the rural poor worldwide. In the year 2000, the Millennium Declaration put health at the heart of the Millennium Development Goals, recognising that health is central to the global agenda of reducing poverty as well as an important measure of human wellbeing, integral part of development.

In yemen, few studies have been carried out to establish prevalence of human brucellosis. Therefore, the aim of this study was to establish the prevalence and associated risk factors for brucellosis among humans in Alkaidah province, one of the agricultural regionin Ibb city. Baseline information necessary in designing prevention and control strategies against human brucellosis in Uganda was obtained.

Material and methods

1-Study design:

This was a cross-sectional study. The study was approved by the Regional Ethics Committee, and all studied subjects gave their informed consent. A total of 100 samples were collected during April 1st, 2017 to June 29, 2017in which seropositivity for brucellosis was investigated in three groups sheep and goats keepers , butchers and veterinary workers in Alkaidah district. The samples have been collected randomly from sheep and goats keepers, butchers and veterinary workers. The participants were asked to complete a questionnaire consisted of questions about their demographic data, job experience and service time, past clinical disease that may have been brucellosis, and clinical manifestations pertinent to brucellosis. The research was performed at the Alrahma medical center.

2- Sample collection:

With the help of trained medical personnel, a blood sample (5–7 ml) was obtained from each participant following venipucture with the disposable needles and vacutainers. The blood samples were clearly labeled with a specific code, date of collection and location. The specimens were kept at room temperature for 30 min, then at 4 °C for 24 h. Later, they were transported on ice to the central diagnostic laboratory at the Medical Alrahma center, for further processing.

3-Serological test: In the laboratory, serum samples were extracted and screened for anti-Brucella antibodies using commercial kits of the standard Rose Bengal Plate Test (RBPT) for detection of antibodies to Brucellaabortus/melitensis. Positive sera were re-tested with using Serum Slow Agglutination Test (SSAT) according to manufacturer's instruction.

An open- and closed-ended questionnaire was developed and administered to collect information about factors hypothesized to influence the spread and persistence of brucellosis in humans. The questionnaire included socio-demographic factors (sex, age,

marital status, and occupation), knowledge of brucellosis, contact with animals and animal products, participant's involvement in milking, sharing water sources with animals.

Results:

The current investigation included 100 butchers, veterinary workers and sheep keepers their ages ranged between 15 and 90 years, with mean age of 37.23 + 5.211 years and all were males. The prevalence of brucella infection was defined according to the different demographic data of the patients, including age. In present study among the 100 participants who completed data, found that 32 (32%) patients were tested positive for Brucellaand 68 (68%) were tested negative (Table 1).Among 100 participant, the highest positive result was found in the age group of 31-45 yr (47%) and 15-30(34%), while the highest positive result was found in the age group of 61-75yr (2.%) and 76- 90(1%) which detected by Brucella specific serology test as shown table1 and figure 1.

Table 1: The seroprevalence of brucellosis according to age group

Age Group	NO. of Examine(%)	No. of positive (%)	Seroprevaleuce (%)
15-30	27 (27%)	11(34%)	41%
31-45	45 (45%)	15(47%)	33%
46-60	19 (19%)	3(10%)	16%
61-75	9 (9%)	2(6%	22%
76-90	3 (3%)	1(3%)	33.00%
Total	100 (100%)	32	32%

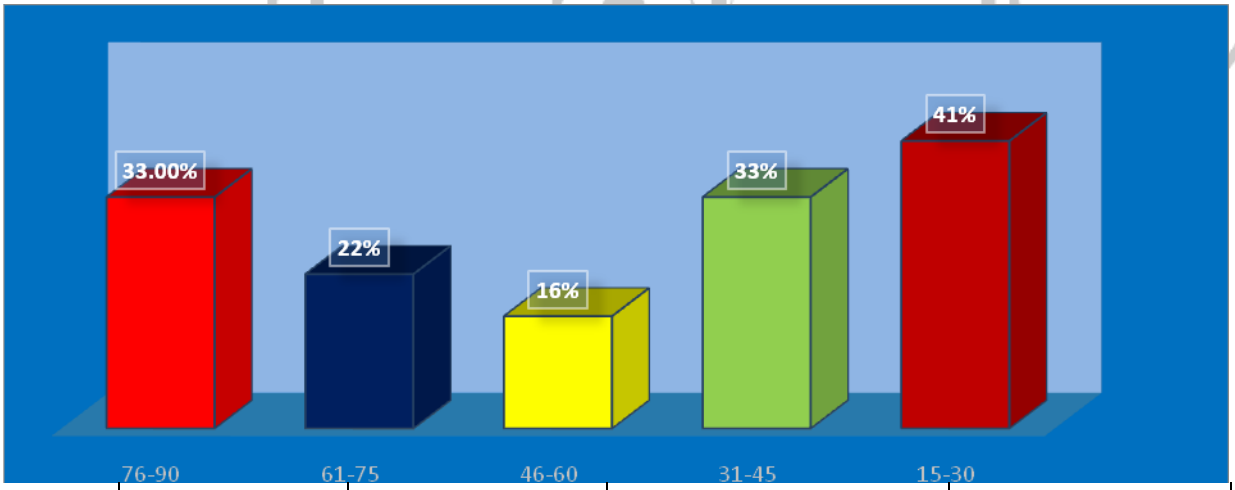

Figure 1: The seroprevalence of brucellosis according to age group

In present investigation the participants grouped according to their nature of occupation Table 2 and figure2. The most affected groups were the sheep and goat keepers (38%) and Veterinary workers (20%), the least affected groups were the Butcher shops workers group (17%), the result shown in table 2 and figure2.

Table 2: The seroprevalence of brucellosis according to occupation

Occupation	No. of examinee	No. of positive	Seroprevalence (%)
Butcher shops workers	24	4	17%
Sheep and Goat Keepers	71	27	38%
Veterinary workers	5	1	20%
Total	100	32	

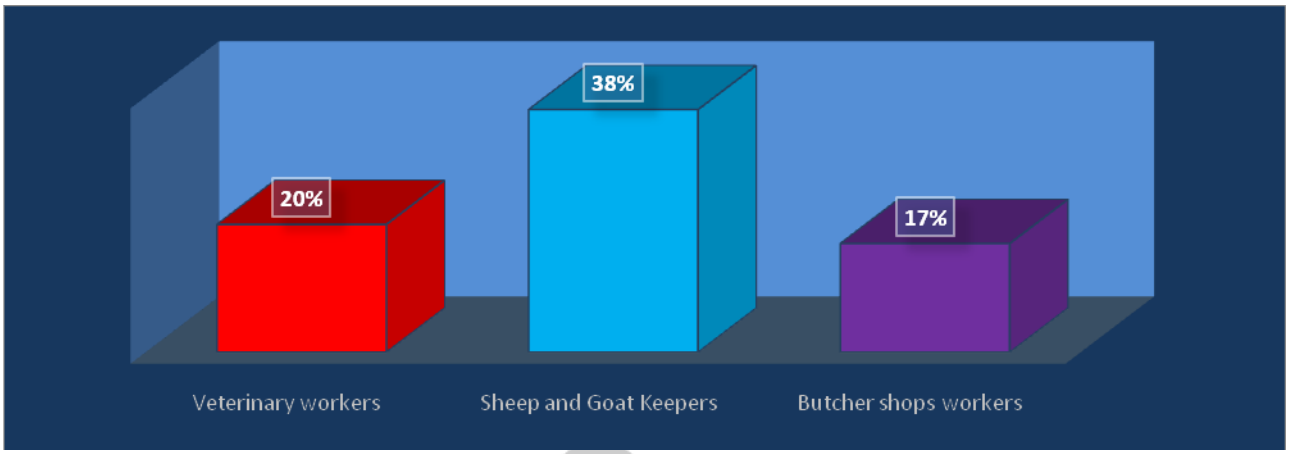

Figure 2: The seroprevalence of brucellosis according to occupation

The Patients were asked to state the animals they were most in contact with and the results are presented in table 3 and figure 3. Inpresent investigation found that out of 32 patients there were 17 (54.9) in contact with sheep follow 11 (44%) in contact with goats while 4 (33.3%) in contact with cattle as shown in table3 and figure3. Some of these animals if infected with Brucellosis are likely to transmit it to the residents in the study area. Moreover milk handling is an important risk factor in transmission of brucellosis hence milk handling practices were explored among the respondents and the results presented in figure 4.The study showed that 60% of patients consume milk without boiling, following by 43,9% consume Ferment without boiling and the last patients with 41,7% consume milk after boiling as shwon in table 3 figure 4. Meat preparation practices before consumption is an important risk factor in the infection of brucellosis and the results are presented in figure 5. The study showed that most patients who has seropositive brucella 58.8%, took roasted meat while 50% took raw meat, and 32% took Thoroughly Cooked a practice that is socially acceptable in the community as shownin table3 and figure5 .

Table 3: Relationship between proportion patients affected by various factors

Variable		
	Negative	**Positive**
Animals in direct contact		
Goats	25(56%)	11(44%)
Cattle	12(66.7%)	4(33.3%)
Sheep	31(45.1%)	17(54.9%
Total	68(68%)	32(32%)
Milk preparation before consuming		
Ferment without boiling	41(80%)	18(43.9%)
Consume without boiling	15(40%)	9(60%)
Thoroughly boiling	12(58.3%)	5(41.7%)
Total	68(68%)	32(32%)
(Preparation of meat before consuming		
Taken raw	12(50%)	6(50%)
Roasted	34(41.2%)	20(58.8%)
Thoroughly Cooked	22(72.8%)	6(27.2%)
Total	68(68%)	32(32%)

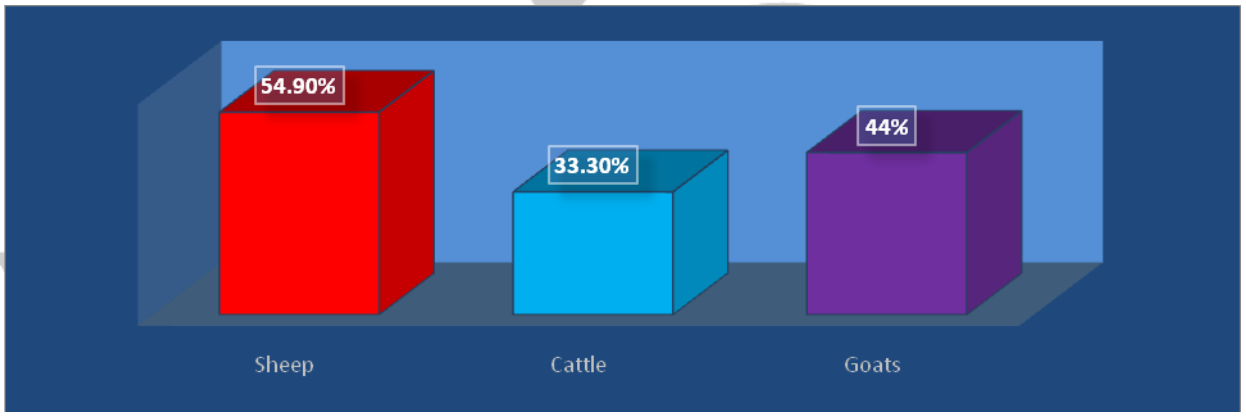

Figure 3: Proportion of patients who directly get into contact with various animals

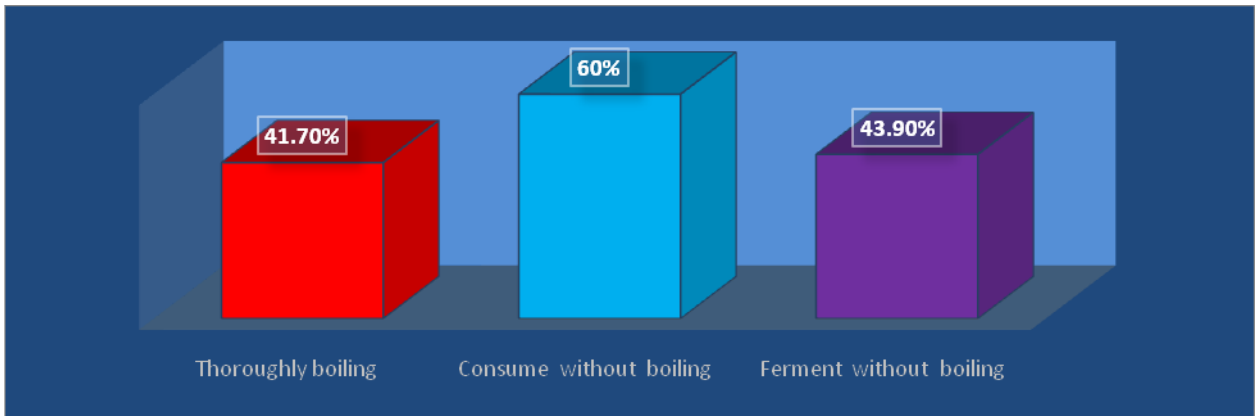

Figure 4: Milk handling and preparation practices

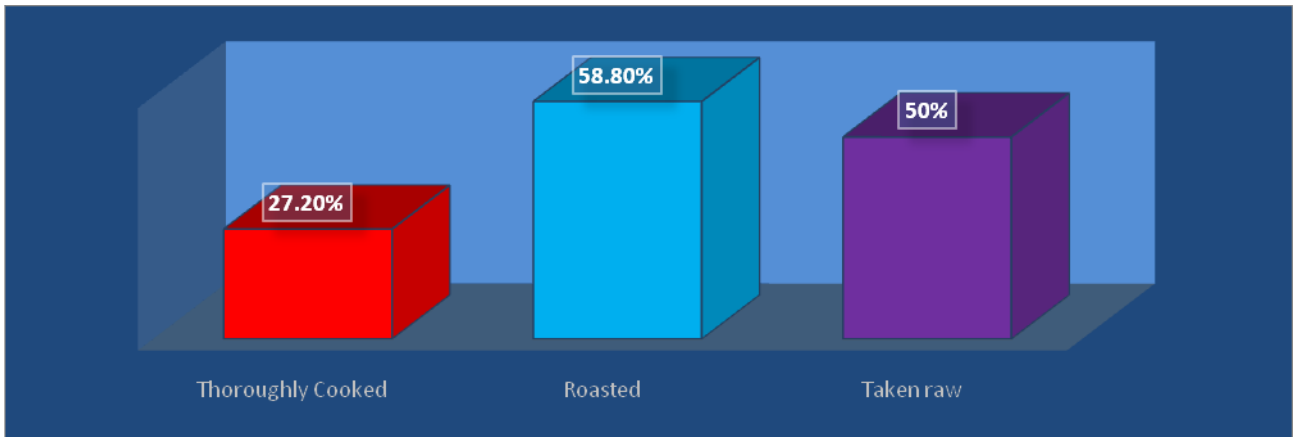

Figure 5: Proportion of respondents who prepared meat variously before consuming

During the study period, 9 (28.1%) suffered from clinical findings diagnostic for active Brucellosis Table4 . The most common clinical finding was fatigue that found in all active cases. Both headache and anorexia were detected in 8 and 6 cases respectively. The least common clinical findings were weight loss, chills, dizziness and cold sweat shown in table 4 and figure6.

Table 4: The incidence of brucellosis based on clinical findings of 9 patients (total investigated 100 persons) with brucellosis at the time of diagnosis

Clinical finding	Number (%)	Symptoms	Frequency (%)
Present	9 cases (28.1%)	Fatigue	9(100%)
		Fever	5 (55.5%)
		Headache	8(88.9%)
		Anorexia	6 (66.7%)
		Weight loss	2(22.2%)
		Chills	2(222%)
		Dizziness	3 (33.3%)
		Cold sweat	1 (11.1%)
Absent	23 cases (71.9%).	No clinical findings	

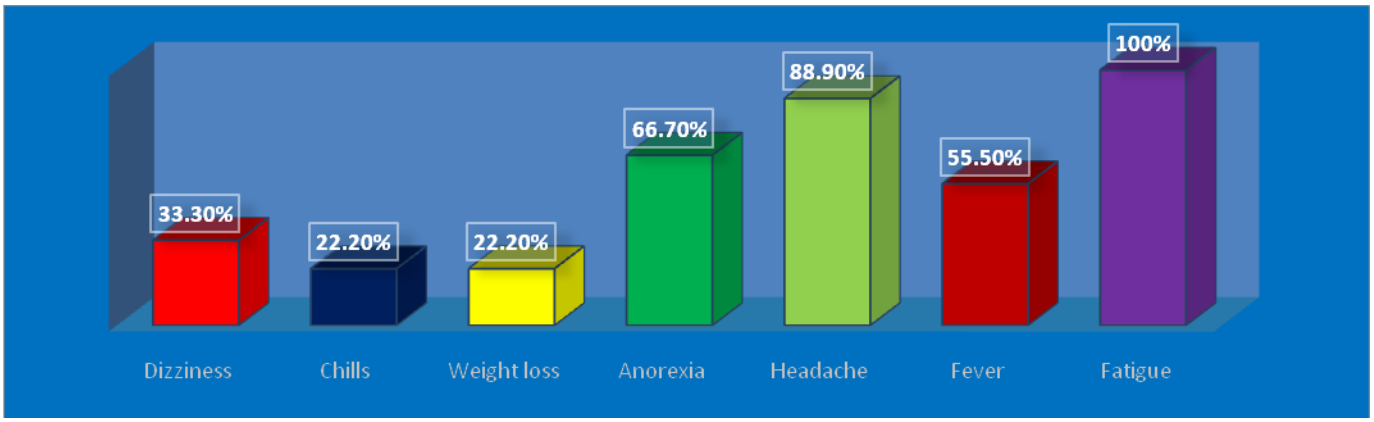

Figure 6: The incidence of brucellosis based on clinical findings of 9 patients (total investigated 100 persons) with brucellosis at the time of diagnosis

Discussion:

Brucellosis occurs naturally in animals, while humans get infected through contact with the infected animal and consumption of contaminated animal products [11-13]. Therefore its prevalence in humans tends to correspond to that in animals [12 & 14]. So there is important concern to establish surveillance and control system for these emerging and re-emerging zoonotic diseases. There is an increase in the incidence of human brucellosis especially in Middle Eastern countries [15]. The true rates of brucellosis in endemic countries are most probably higher than reported due to deficiencies in its diagnosis or recording [16].

The present study was conducted to determine the seroprevalence of brucellosis in Alkaida province Ibb city among butchers, veterinary workers and sheep and goat keepers. In this study found 32 (32%) participants were tested positive for Brucella and 68 (68%) were tested negative which comparable with previous studies such as [17] who found that the seroprevalence of brucellosis among abattoir house workers in Saudi Arabia reported to be 35%. Moreover A prevalence rates of 20%, 21.7%, and 25.5% were reported by Barbuddhe, Karimi and Mukhtar in Delhi, Pakistan, and Iran, respectively [18-20]. A lower prevalence rates of 8.2% and 9.8% have been reported by Abo-Shehada in Jordon and Nikokar in Iran, respectively [21 & 22]. On the other hand, higher prevalence rate of 58.6% was recorded by Khalili in Iran [23].

In this study showed that people of age between 15-45 years of age were affected more, this was consistent with report from northern Saudi Arabia which found that cases of brucellosis occurred mainly in individuals aged 13-40 years with younger than 13 years and less in those aged 40-60 years [24]. This age group plays an important role in livestock herding and birthing and have direct contact with animals and aborted materials. However that seropositives were found in all age groups, this may indicate ongoing exposure and transmission of brucellosis.

In this study found that the seropositivers were found higher among sheep and goat keepers and veterinary workers with 38% and 20% respectively. The high seroprevalence among sheep and goat keepers and veterinary workers compared to butcher shops is indicative of the importance of contact infections in case of brucellosis with the higher and frequent exposure to infected [25]. Moreover patients mostly had direct contact with goats, sheep, cows, camels and other non-food animals which increased probability of infection as indicated by [26 &27] where nearly every case of human brucellosis has an animal origin.Clinically, the brucellosis can be presented as a sudden or gradual febrile disease.It may progress to a chronically debilitating illness with grave complications. It presents with nonspecific symptoms including fever, sweating, lethargy, malaise, headache, low back pain, arthralgia and musculoskeletal pain [28 &29].

In present study Out of 32 seropositive subjects for brucellosis 9 individuals complained of symptoms of active brucellosis. The distribution of all symptoms but fatigue and headache were dominant symptoms with 100% and 88.8% respectivily. However, presence of

sweating, dizziness and weakness were highly predictive for having a positive test result. In a previous report, the most common symptoms were fever and sweating [30]. Brucellosis is usually presented with mild symptoms in those who are at high risk of exposure and in close contact with animals compared to other patients who are not exposed to the infectious agent [31].

Conclusion:

Brucella infection among butcher shops, veterinary workers and sheep and goat keepers is an important public health problem in Alkaidah district. This study revealed drink of raw unpasteurized milk undercooked or raw meat were the foodstuffs that constituted a major threat of brucellosis to the community in the study area. Findings of this study show that brucellosis is a problem and the prevalence is high necessitating prompt control measures. Control of brucellosis in animal populations, public health education and creation of awareness on dangers posed by handling animal placenta during abortion and consumption of improperly cooked foods of animal origin will be necessary measures for prevention of the disease in human.

REFERENCES

[1] **S., Teshale, Muhie Y., Dagine A. and Kidanemariam A**. 2006. Seroporevalence of small ruminant brucellosis in selected districts of Afar and Somali pastoral area of Eastern Ethiopia: the impact of husbandry practice. Revue med. Vet., 157(11), 557-563.

[2] **E. J. Young**, 1995. An overview of human brucellosis. Clini. Infect. Dis., 21, 283-289

[3] **L.B., Lopes R. Nicolino and J.P.A. Haddad** (2010): Brucellosis - Risk Factors and Prevalence: A Review. The Open Veterinary Science Journal, 4, 72-84.

[4] **T.E. A. Angara and A. A. Ali** 2014. Socioeconomic Aspects of Brucellosis in Kuku Dairy Scheme, Khartoum State, Sudan. Indian Journal of Applied Research, 4(8), 685 – 687

[5] **Kunda, J.** (2004).Human brucellosis. 19th Annual Scientific Conference of the National Institute for Medical Research, Arusha, Tanzania

[6] **Pappas, G., Papadimitriou, P., Akritidis, N., Christou, L., Tsianos, E.V**. (2006)."The new global map of human brucellosis". Lancet Infect Dis. Feb.; 6(2):91-9.

[7] **Matika, K., Fèvre, E. M., Waiswa, C., Kaboyo, W., De Clare Bronsvoort, M. B., Eisler, C. M., Welburn, S, C**., (2010)Human Brucellosis in Urban and Peri-Urban Areas of Kampala, Uganda , Annals of Animal Biodiversity and Emerging Diseases Prediction and Prevention, New York Academy of Science

[8] **Lecaroz, C., Blanco-Prieto, M.J., Burrell, M.A.,** et al.(2006) "Intracellular killing of Brucellamelitensis in human macrophages with microsphere-encapsulated gentamicin". J AntimicrobChemother. Sep 2006;58(3):549-56.

[9] **Zinsstag J, Schelling E, Roth F, Bonfoh B, de Savigny D, Tanner M**.(2007). Human benefits of animal interventions for zoonosis control. Emerging Infectious Diseases, 13:527-31.

[10] **Maudlin, I., Eisler, M. C. and Welburn, S. C.** (2007). Neglected and endemic zoonoses. Interventions for Zoonosis Control Emerging Infectious Diseases. Philosophical Transactions of Royal Society B, 364: 2777–2787.

[11] **Corbell JM**. Brucellosis: an overview. Emerg Infect Dis. 1997;2:213–21.

[12] **Corbel MJ**. Brucellosis in Humans and Animals. World Organization in collaboration with the Food and Agriculture Organization of the United Nations and the World Organization for Animal Health; 2006. http:// www.who.int/csr/resources/publications/ Brucellosis.pdf.

[13] **Abdussalam M, Fein DA**. Brucellosis as a world problem. DevBiol Stand. 1976;31:9–23.

[14] **Kohei M, Eric FM, Charles W, Mark EC, Susan WC**. How human brucellosis incidence in urban Kampala can be reduced most efficiently? A stochastic risk assessment of informally-marketed milk. PLoS ONE. 2010;5(12):1–10.

[15] **Hegazy YM, Ridler AL, and Guitian FJ** (2009): Assessment and simulation of the implementation of brucellosis control programme in an endemic area of the Middle East. Epidemiol Infect.;137(10):1436-1448.

[16] **Garin-Bastuji B, and Letesson JJ** (2005): From the discovery of the Malta fever's agent to the discovery of a marine mammal reservoir, brucellosis has continuously been a reemerging zoonosis. Vet Res. ;36:313–326. Trop Med Hyg. ;101(9): 923–928

[17] **Elsheikh AA, Masoud EE, Mostafa MF, and Elkhawanky MM** (2011): Seroprevalence of 2 zoonotic diseases in Southwestern Saudi Arabia. Rift Valley fever and brucellosis. Saudi Med J.;32(7):740-741.

[18] **Barbuddhe SB, Kumar P, Malika SV, Singh DK, and Gupta LK** (2000): Seropositivity for intracellular bacterial infections among abattoir associated personnels. J Commun Dis.;32(4):295-299.

[19] **Karimi A, Alborzi A, Rasooli M, Kadivar MR, and Nateghian AR** (2003): Prevalence of antibody to Brucella species in butchers, slaughterers and others. East Mediterr Health J.;9 (1-2):178-184.

[20**] Mukhtar F** (2010): Brucellosis in a high risk occupational group: seroprevalence and analysis of risk factors. J Pak Med Assoc. ;60(12):1031-1034.

[21] **Abo-Shehada MN, Odeh JS, Abu-Essud M, and Abuharfeil N** (1996): Seroprevalence of brucellosis among high risk people in northern Jordan. Int J Epidemiol.;25(2): 450-454.

[22] **Nikokar I, Hosseinpour M, Asmar M, Pirmohbatei S, Hakeimei F, and Razavei MT** (2011): Seroprevalence of Brucellosis among high risk individuals in Guilan, Iran. J Res Med Sci. ;16(10):1366-1371.

[23] **Khalili M, Sami M, Aflatoonian MR, and Shahabi-Nejad N** (2012): Seroprevalence of brucellosis in slaughterhouse workers in Kerman city, Iran. Asian Pacific J Trop Dis. ;448-450.

[24] **Fallatah, S.M., Oduloju, A.J., Al-Dusari, S.N., Fakunle, Y.M.** "Human brucellosis in Northern Saudi Arabia".Saudi Med J. Oct 2005;26(10):1562-6.

[25] **Kumar P, Singh DK, and Barbuddhe SB** (1997): Sero-prevalence of brucellosis among abattoir personnel of Delhi. J CommunDis ; 29:131-137.

[26] **Dean, A.S., Crump, L., Greter, H., Hattendorf, J., Schelling, E., Zinsstag, J.** (2012)"Clinical manifestations of human brucellosis: a systematic review and meta-analysis".PLoSNegl Trop Dis. Dec 2012;6(12):e1929.

[27] **Doncho, D., Gordana, K., Violeta, K., Sandra, P.** (2010) "Health Promotion and Prevention of Human Brucellosis inthe Republic of MacedoniaMacedonian Journal of Medical Sciences". 2010 Sep 15 Institute for Public Health, Skopje, Republic of Macedonia;

[28] **Smits HL, Kadri SM.** Brucellosis in India: a deceptive infectious disease. Indian J Med Res 2005;122(5):375-84.

[29] **Corbel MJ.** Brucellosis: an overview. Emerg Infect Dis 1997;3(2):213-21.

[30] **Beheshti S, Rezaian GR, Aghasadeghi K, Faghiri Z, AghajanShakeri M.** Brucellosis in Iran: the Fars province experience. Med J IR Iran 2001;15(2):67- 71.

[31] **Minas M, Minas A, Gourgulianis K, Stournara A.** Epidemiological and clinical aspects of human brucellosis in Central Greece. Jpn J Infect Dis 2007;60(6):362-6.