ISSN 1023-1072

PREVALENCE OF BOVINE TUBERCULOSIS IN SLAUGHTERING ANIMALS AT SELECTED MUNICIPAL SLAUGHTER HOUSES: ITS IMPACT ON PUBLIC HEALTH

M. R. Memon¹, A. L. Bhatti¹, M. I. Memon¹, P. Khatri² and J. A. Baloch³
¹Department of Veterinary Medicine, ²Department of Animal Reproduction, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam, Pakistan
³Pathology Section, Central Veterinary Diagnostic Laboratory, Tandojam, Pakistan

ABSTRACT

Bovine tuberculosis caused by Mycobacterium bovis is prevalent in animals in most of the developing countries, where surveillance and control activities are often inadequate or unavailable and pasteurization is rarely practiced. The objectives of the present study were to investigate the seroprevalence of bovine tuberculosis (bTB) in slaughtered cattle and buffaloes and to assess the health of abattoir workers for presence of Mycobacterium bovis causing as zoonotic disease. This cross-sectional study was conducted at two abattoirs of Karachi Metropolitan Corporation. Questionnaires were developed to collect data on: social demographics, medical information, work related exposure factors and preventive measures as well. The butchers and meat handlers were selected by simple random sampling. Cattle slaughtered at the abattoirs were also screened for bovine tuberculosis using lateral flow technique and Ziehl Neelsen test. Eight hundred serum and 300 lung tissue samples obtained from both abattoirs were screened for presence of Mycobacterium tuberculosis. Out of 800 serum samples 47 (5.8%) and 300 lung tissue samples, 38 (12.7%) were found positive by the rapid test lateral flow technique and Ziehl Neelsen stain, respectively. In this study 119 butchers and meat handlers were interviewed. The significant effect of knowledge and experience of both butchers and meat handlers on potential zoonotic risk of disease was observed. Multivariate analysis of risk factor showed highly significant effect (P<0.001) of work experience >6 years as calculated by odd ratio of 3.7 (1.9-7.7), followed by potential risk associated with job was significant (P<0.02) having odd ratio of 2.7 (1.3-5.3). Meat consumed with diseases lesions had significant (P<0.05) effect with odd ratio of 2.5 (1.4-5.0). Eating or drinking at place of work showed no significant difference (P>0.05). A significant difference (P<0.01) was observed between male and female cattle with highly significant in female as compared to male cattle. No significant difference (P>0.05) was observed between positive sputum samples of butchers, meat handlers and abattoir workers stained with AFB staining method and by microscopic examination. It was concluded from the results of present study that there is a potential risk for zoonotic transmission of Mycobacterium tuberculosis from infected animal’s slaughtered at abattoir to butchers and meat handlers. Knowledge and experience of work and refraining from use of infected meat may effectively reduce risk factors of transmission.

Keywords: abattoirs, bovine tuberculosis, butchers, TB prevalence

INTRODUCTION

Tuberculosis is a zoonotic disease caused by Mycobacterium tuberculosis in man and M. bovis in bovines (Smith et al., 2006; Pal, 2007; Malama et al., 2013). Disease can be transmitted through aerosol of infectious organism expelled in the exhaled air, in sputum, urine, milk, feaces, vaginal and uterine discharges, and liberations from exposed peripheral lymph nodes of clinically or sub-clinically infected individuals (Leghari et al., 2016). It adversely affects to reduce the production by about 10 to 25 percent; direct estimated losses in milk ranging from 10 to 18 percent and in meat about 15 percent (Radostits et al., 1994). In addition to economic losses, the tuberculosis also has an important public health importance (Müller et al., 2015). Presently, the human tuberculosis is getting increasing importance in rural areas of developing countries, where men and animals are sharing the same environment in houses and yard.

Corresponding author: drmujeebsau@gmail.com

© 2018, Sindh Agriculture University, Tandojam (http://pjaaevs.sau.edu.pk/index.php/ojs)
premises that results the increasing transmission of tuberculosis organisms to susceptible individuals (Shitaye et al., 2007). In countries, where unpasteurized milk is used on routine basis, this disease is estimated as 10-15 percent in human population (Ashford et al., 2001; Berg et al., 2015). In countries where routine post-mortem examination is obligatory, bovine tuberculosis has been observed as a major cause of carcasses condemnation.

Karachi is considered as the world’s most populated city in Pakistan and people raise significant number of farm animals in its suburban areas. Regardless of the large number of livestock population, there is no data available on bTB, except for the fact that bTB emerges as a serious public health hazard and is also responsible for huge economic losses in dairy and meat industry. Therefore the present study was carried out to determine the prevalence of bovine tuberculosis in animals slaughtered at the abattoirs of Karachi Metropolitan Corporation (KMC) and to identify potential risk factors associated with zoonotic transmission of bTB from animals to human.

MATERIALS AND METHODS

Study area and population
The study was carried out in Karachi Metropolitan Corporation (KMC) abattoirs where approximately, 1200 large animals (cows and buffaloes) were slaughtered every day.

Study design (for slaughtered animals, butchers and meat handlers)

Study population

Data collection and analysis
A questionnaire was developed to collect data from butchers and meat handlers of age of about 18 years and above. Animals available for slaughtering at abattoir were physically examined for external body lesions before slaughter and their visceral organs were examined for presence of any pathological lesions. Prevalence of TB was calculated as the proportion of positive animals from the total number of animals visited (Thrusfield, 2005). Pre-slaughter examination data on sex, age, and body condition of animals were documented on a spreadsheet.

To evaluate the role of various possible risk factors involved in the incidence of TB in cattle, and its transmission to people who closely worked with those affected animals. A designed questionnaire form was distributed to 150 cattle owners, and slaughter house employees as to judge the insight of stakeholders on the incidence of bovine tuberculosis, socio economic status, livestock constraints, herd composition, awareness on the probable risk of zoonotic spread of bovine tuberculosis.

Animal samples and their analysis

Collection and analysis of blood samples for serological and molecular test
Blood samples (10 ml) were collected from each of 800 animals available for slaughter. Blood was poured into plain vaccutainer (BDH, UK) and kept for clotting. Then it was centrifuged at 10000 rpm for 10 minutes and serum was separated in 1.5 ml eppindorf tubes and stored in a refrigerator until serological test (ELISA) for bovine tuberculosis was performed. Whole blood sample (1ml) of each animal was preserved for DNA extraction and further molecular detection of organisms. Tests were performed as below:

Enzyme-linked Immunosorbent Assay (ELISA)
The optimal antigen (mammalian PPD) concentration, anti-body and conjugate dilutions were chosen after preliminary checker board titration. In the present study, the optimum conditions were 5 µg/100 µl coating buffer antigen concentration, 1:200 human and animal serum dilutions and 1:1000 Horse radish peroxidase-labeled anti-human-IgG and anti-bovine-IgG (Sigma Co.) as conjugate. The substrate used was OPD. All reaction mixture was set in duplicate, with the mean value being used for recording and calculations. Results were read on SOFT max PRO ELISA reader (Molecular Device Corporation, California) at a wave length of 405nm.

Detection of Bovine tuberculosis through molecular method

PCR for Mycobacterium bovis
The extracted DNA from all 100 blood samples were also subjected to PCR by using single set of primers containing forward JB21 (TCGTCGGCT GAT GCAAGTGC) and reverse JB22(CGTCGGCTGACCTCAAGAAAG) amplifying a 500 bp genomic fragment specific for M. bovis. The reaction was performed in a final volume of 50 µl containing 1x reaction buffer (Fermentas, USA), 2.5 U of Taq polymerase (Fermentas, USA), 0.2 mM each deoxynucleoside triphosphate, 1.5 mM magnesium chloride, 2 µg of each DNA and 100 pmol of each primer. Target DNA was denatured by initial incubation for 4 min at
94°C before amplification for 30 cycles of 94°C for 30 seconds, annealing at 50°C for 30 seconds and extension at 72°C for 30 seconds and final extension at 72°C for 7 minutes. All reactions were carried out in an automated thermal cycler (Eppendorf, USA). After amplification, the PCR mixture was subjected to 1.5% agarose gel electrophoresis.

Collection and analysis of tissue samples
Tissue samples were collected from lymph node of respiratory tract, lung and liver tissue, lymph nodes from gastrointestinal from TB tested animals through tuberculin test for Lateral flow technique and Acid Fast Test. Acid fast stain (Ziehl Neelsen) test was performed by using Ziel Neelson Staining kit containing fixatives and stain solutions. Antibodies against Bovine Tuberculosis (BT) were detected by Lateral flow technique using Rapid Bovine TB Ab test kit.

Collection and analysis of pus and caseous material
Pus and caseous material from open tuberculous cavities were aseptically collected in a sterile collecting bottle and used for culture and microscopic examination for presence of TB organism.

Collection and examination of sputum
Sputum samples for smear microscopy and culture were collected from 190 butchers, workers, and meat handlers those who voluntarily participated in this study. Prior to sample collection they were instructed to properly rinse their mouth with water as to eliminate food particles and microorganisms present in their mouth. They took deep breath and hold for 5 seconds then slowly breathe out. After another deep breathe they coughed hard until some phlegm comes into their mouth. The phlegm was collected into a 50ml sterile screw-capped bottle provided to them. Three sputum samples (spot, early morning) were collected from each participant. The sputum specimen was kept at 4°C and transported to the Laboratory of Ojha Institute of Chest Diseases, Karachi for culture, and identification of isolates. Samples were processed within seven days of collection in order to minimize loss of viability of the mycobacteria.

Data analysis
Data collected was tabulated and analysed using SPSS Statistical Software. Significant differences were mentioned as $P<0.05$.

RESULTS
Prevalance of *Mycobacterium tuberculosis* in blood and tissues of cattle slaughtered at abattoir in Karachi determined by Rapid Bovine TB Ab test kit and Ziehl Nelson staining of tissues. Results of the presence of *Mycobacterium tuberculosis* antibodies in serum and tissue samples are mentioned in Table 1. Eight hundred animals were examined for the prevalence of *Mycobacterium bovis* in their blood and tissues using different techniques. The results of lateral flow techniques (Rapid Bovine TB Ab) test showed highest prevalence at City Abattoir Cattle Colony in Landhi i.e 6.33%, followed by New Karachi slaughter. i.e 4.5%. The overall prevalence was recorded as 5.87%. Acid Fast Ziehl Nelson staining showed 1% and 7.33% of tissues of each 150 necropsied animals from City Abattoir Cattle Colony in Landhi and 150 from the New Karachi slaughter house, respectively. A non-significant difference was recorded through lateral flow technique in the blood samples from two abattoirs having chi square value ($x^2=0.91$) whereas a significant difference was recorded through Ziehl Neelson test in tissue samples necropsied which has chi square value $x^2=7.71$.

Detection of Bovine tuberculosis by ELISA
Results of serum ELISA test of clinically suspected animals for prevalence of TB is shown in Figure 1. Out of one hundred tested blood serum samples 47% were found positive. The highest seroprevalence was recorded in animals of age 7 years i.e. 27% and lowest 22% was recorded in 4 years. However, there was no significant difference ($P<0.05$) in the results of different ages of animals.

Prevalance of TB by PCR assay
One hundred blood samples collected from clinically suspected cattle were analyzed for *M. bovis* and *M. tuberculosis* by PCR assay. Out of one hundred blood samples 55 were positive. The age wise percentage of prevalence of tuberculosis in cattle were 11%, 23%, 29% and 37% in age of 4, 5, 6 and 7 years, respectively (Figure 2). The results obtained through PCR method from blood samples indicate that older cattle were significantly more infected ($P<0.05$) with tuberculosis than younger cattle.

Prevalence of bovine tuberculosis in serum of male and female cattle slaughtered
Prevalence percent was recorded of bovine tuberculosis in serum of male and female cattle
and buffaloes slaughtered in both abattoirs. Out of 800 serum samples 244 were from female and 556 were from males. Twenty four (24) of the 244 were positive for lateral flow technique giving a prevalence of 9.83 percent in the female while (28) of the 546 were positive for lateral flow technique giving a prevalence of 5.03 percent in male. Nine tissue samples out of 150 were positive for Ziehl Neelsen giving a prevalence of (6.00 percent) from female and only 1 (0.67 percent) from the male was positive for Ziehl Neelsen staining test from both abattoirs (Table 2). A significant difference was recorded through lateral flow technique in the blood samples from male and female gender having chi square value \(x^2=5.24\) where as a significant difference was also recorded through Ziehl Neelson test in tissue samples necropsed which has chi square value of \(x^2=6.62\).

**Table 1.** Prevalence of bovine tuberculosis in cattle slaughtered at two abattoirs in Karachi

<table>
<thead>
<tr>
<th>Study site</th>
<th>No of blood samples</th>
<th>Lateral flow technique positive</th>
<th>Lateral flow technique negative</th>
<th>Prevalence %</th>
<th>(x^2)</th>
<th>(p) value</th>
<th>No of tissue samples necropsed</th>
<th>Ziehl Neelsen positive</th>
<th>Ziehl Neelsen negative</th>
<th>Prevalence %</th>
<th>(x^2)</th>
<th>(p) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Abattoir</td>
<td>600</td>
<td>38</td>
<td>562</td>
<td>6.33</td>
<td>0.91</td>
<td>0.3397</td>
<td>150</td>
<td>27</td>
<td>123</td>
<td>1.00</td>
<td>7.71</td>
<td>0.0055</td>
</tr>
<tr>
<td>Cattle Colony in Landhi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Karachi slaughter house</td>
<td>200</td>
<td>9</td>
<td>191</td>
<td>4.50</td>
<td>-</td>
<td>-</td>
<td>150</td>
<td>11</td>
<td>139</td>
<td>7.33</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(kamailas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>800</td>
<td>47</td>
<td>753</td>
<td>5.87</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>38</td>
<td>262</td>
<td>12.67</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Figure 1.** Age wise prevalence of mycobacterium in blood of clinically suspected cattle with ELISA

**Figure 2.** A 500 bp PCR product (L1, L3, L4) of *M. bovis*, obtained by using JB21 and JB22 primers in a single PCR. L2: no amplification. M, DNA marker
Figure 3. Age wise prevalence of mycobacterium in blood of clinically suspected cattle with PCR

Table 2. Prevalence of bovine tuberculosis in male and female cattle slaughtered at the two abattoirs in Karachi

<table>
<thead>
<tr>
<th>Sex</th>
<th>No of samples</th>
<th>Lateral flow technique positive</th>
<th>Lateral flow technique negative</th>
<th>Prevalence % age</th>
<th>$X^2$</th>
<th>$p$ value</th>
<th>No of tissue samples necropsed</th>
<th>Ziehl Neelsen positive</th>
<th>Ziehl Neelsen negative</th>
<th>Prevalence % age</th>
<th>$X^2$</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>244</td>
<td>24</td>
<td>220</td>
<td>8.83</td>
<td>5.2</td>
<td>0.0</td>
<td>150</td>
<td>9</td>
<td>141</td>
<td>6.00</td>
<td>6.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Male</td>
<td>556</td>
<td>28</td>
<td>529</td>
<td>5.03</td>
<td>4</td>
<td>22</td>
<td>150</td>
<td>1</td>
<td>149</td>
<td>0.67</td>
<td>2</td>
<td>0.01</td>
</tr>
<tr>
<td>Total</td>
<td>800</td>
<td>52</td>
<td>748</td>
<td>6.50</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>10</td>
<td>290</td>
<td>3.33</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3. Microscopic results of sputum sample on Acid Fast Bacillus (AFB)

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Sputum examined</th>
<th>Sputum positive by AFB</th>
<th>Sputum negative by AFB</th>
<th>Prevalence (%)</th>
<th>$X^2$</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butchers</td>
<td>35</td>
<td>5</td>
<td>30</td>
<td>14.28</td>
<td>6.6</td>
<td>0.7194</td>
</tr>
<tr>
<td>Meat handlers</td>
<td>20</td>
<td>2</td>
<td>18</td>
<td>10.00</td>
<td>6.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Workers</td>
<td>15</td>
<td>1</td>
<td>14</td>
<td>6.67</td>
<td>11.43</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>8</td>
<td>62</td>
<td>11.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Body condition data of sero-positive cattle and buffaloes slaughtered at the two abattoirs in Karachi

<table>
<thead>
<tr>
<th>Body Condition of Cattle</th>
<th>No. of animals examined</th>
<th>Rapid test positive</th>
<th>Rapid test negative</th>
<th>Prevalence (%)</th>
<th>$X^2$</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>95</td>
<td>55</td>
<td>40</td>
<td>57.89</td>
<td>75.01</td>
<td>0.0000</td>
</tr>
<tr>
<td>Fair</td>
<td>109</td>
<td>41</td>
<td>68</td>
<td>37.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>141</td>
<td>9</td>
<td>132</td>
<td>6.38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Assessment of questionnaire

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean score</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>No knowledge of the Disease</td>
<td>105</td>
<td>5.6</td>
<td>88.24</td>
</tr>
<tr>
<td>Work related exposure factors</td>
<td>9</td>
<td>9.7</td>
<td>7.56</td>
</tr>
<tr>
<td>Medical history</td>
<td>2</td>
<td>2.36</td>
<td>1.68</td>
</tr>
<tr>
<td>Preventive practices</td>
<td>3</td>
<td>1.9</td>
<td>2.52</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>19.56</td>
<td>100.09</td>
</tr>
</tbody>
</table>

Table 6. Multivariate analysis of risk factor for bovine tuberculosis in butchers and meat handlers in Karachi abattoirs

<table>
<thead>
<tr>
<th>Variable Exposure</th>
<th>Odds Ratio</th>
<th>Confidence interval [CI 95%]</th>
<th>$p$ - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length worked at the abattoir &gt;6 / &lt;6 years</td>
<td>3.7</td>
<td>[1.9 - 7.7]</td>
<td>p&lt;0.001*</td>
</tr>
<tr>
<td>Do you know the mode of transmission- Yes/ No</td>
<td>2.6</td>
<td>[1.3 - 5.3]</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Do you keep animals at home- Yes/ No</td>
<td>1.9</td>
<td>[0.9 - 4.7]</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Are you aware of BTB in wild animals- Yes/No</td>
<td>1.6</td>
<td>[0.9 - 3.3]</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Potential risk associated With your job- Yes/No</td>
<td>2.7</td>
<td>[1.3 - 5.3]</td>
<td>0.02*</td>
</tr>
<tr>
<td>Do you eat or drink at workplace- Yes/No</td>
<td>0.9</td>
<td>[0.5 - 1.7]</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Seen a BTB lesion in slaughtered animal - Yes/No</td>
<td>0.4</td>
<td>[0.3 - 0.7]</td>
<td>0.0001*</td>
</tr>
<tr>
<td>What's done to lesion-call meat inspector/ Ignore</td>
<td>2.4</td>
<td>[1.2 - 5.0]</td>
<td>*p&lt;0.05</td>
</tr>
<tr>
<td>Do you consume meat with these lesions- Yes/No</td>
<td>2.5</td>
<td>[1.4 - 5.0]</td>
<td>*p&lt;0.05</td>
</tr>
<tr>
<td>Have/had persistent cough- Yes/No</td>
<td>1.9</td>
<td>[0.8 - 4.3]</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Vaccinated with BCG- Yes/No</td>
<td>0.7</td>
<td>[0.3 - 1.4]</td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>Received any training on BTB- Yes/No</td>
<td>0.8</td>
<td>[0.3 - 1.7]</td>
<td>p&gt;0.05</td>
</tr>
</tbody>
</table>

* Values that remained significant in the unconditional logistic regression model
Prevalence of tuberculosis in sputum of workers of slaughter-house
Sputum samples collected from butchers, meat handlers and workers at abattoirs were tested for TB under Acid Fast Bacillus technique (AFB). The high number of AFB positive samples were observed in butchers (14.28%), followed by meat handlers (10%) and workers (6.7%) (Table 3). A non-significant difference was recorded in the sputum samples examined from abattoirs respondents having chi square value of $x^2=0.66$.

Comparison of Sero prevalence with BCS of cattle and buffaloes
Table 4 shows body condition data of sero-positive cattle and buffaloes. Fifty five out of 95 cattle with the poor body condition were positive for rapid test giving a prevalence of 57.89%, (41) out of 109 cattle with fair body condition were positive, giving a prevalence of 37.61% and (9) out of 141 cattle with good body condition were positive giving a prevalence of 6.38%. A highly significant difference was recorded through rapid test in the blood samples from animals possessed different body conditions having chi square value $x^2=75.01$.

Analysis of questionnaire
Response of 119 out of 150 butchers and meat handlers on questionnaire was analyzed. Result revealed that majority of the butchers had no knowledge of disease i.e 88.24, followed by 7.56th work related exposure factors (Table 5).

Multivariate analysis of risk factor for prevalence of TB in butchers and meat handlers
Multivariate analysis of risk factors revealed that those workers who stayed more than 6 years at the abattoirs were 3.7 times more susceptible ($P<0.001$) to TB disease compared to those stayed less than 6 years (Table 6). Similarly, those workers who were not know houses of the mode of transmission of TB and its potential risk associated with their job were 2.6 and 2.7 times more than those who were aware. Animals raised at home were associated with low risk of disease ($P>0.05$) compared to those did not raise animals at home. Similarly, lower chances of disease ($P>0.05$) among the workers who were not aware of bTB in wild animals (OR=1.6) and eat or drink (OR=0.9) at work place Table 6. Those workers who observed lesion in slaughtered animals, reported lesion to Meat Inspector and consumed meat of affected animals were: 0.4, 2.4 and 2.5 times more at risk. Those abattoir workers having or had persistent cough (OR=1.9), not immunized with BCG (OR=0.7) and not received bTB training (OR=0.8) were at lower risk of disease.

DISCUSSION
Risk of increased or decreased prevalence of zoonotic disease mainly depends on the population of infected animals intact with healthy animals. Thicken the population more will be the chance of transmission of infection from animal to animal. Human zoonosis of animal disease depends on number and frequency of the farmers with animals. Moreover, peoples involve in slaughtering animals are more prone to infections of zoonotic importance such as bovine tuberculosis. In present study blood and tissue samples of suspected animals slaughtered at abattoir in Karachi were analysed by different techniques and the results were correlated with their risk of transmission to people working with suspected animals. Serum analysis with lateral flow technique revealed a prevalence of 5.87% as shown in Table 1. This is lower than the prevalence value of 12.5% using the same lateral flow technique reported by Dan Birnin et al. (2010), the difference may be due to number of animals and location. The prevalence of 12.67% was revealed based on the visual identification of lesions in tissues of cattle slaughtered as shown in Table 1, is higher to prevalence of 2.8% reported by Igbokwe et al. (2001). The difference may be due to the number of animals used for the study and for recognition of bovine tuberculous lesions in particular depend on the workload and time. Despite this, recognition of tuberculous lesions in slaughter houses can be affected due to early infection or parasites, non-specific reactions and due to the infection other than M. bovis as reported by Corner (1994) and other irregularities of abattoir meat inspections as was documented by Edwards et al., (1997).The tissue stained with Ziehl Neelsen revealed a prevalence of 12.67% as 38/300 tissue samples were positive as shown in Table 1. This is lower than a prevalence value of 31% reported by Awah Ndukum et al. (2010). The difference could be due to the proportion of the tissues with lesions detected. The prevalence from this study suggests that meat being sold for public consumption is either diseased or exposed to several levels of contamination which could not danger the public health. The risk of disease transmission from abattoir to the public at large is very high.
The seroprevalence was more in female 9.83% than in males 5.13%, prevalence due to visual identification lesion on tissues 3.69% in females and 0.18% in males as well as in the Ziehl Neelsen as shown in Table 2. This is consistent with the herd prevalence of 50% reported by Firdessa et al. (2012) where 94% of the positives were females. This demonstrates husbandry conditions as a major impact on the prevalence of bTB as reported by Ameni et al. (2006). Intensification, stress and over crowding are possible clarifications for such association. The same report of higher prevalence in female than male was revealed in a study by Maxwell et al. (2012). Cows with minimal lung lesions may spread the disease in the entire herd. Adults’ cattle are usually infected through the feces, inhaling invisible droplets containing bacteria in to their lungs, and close contact while calves are infected by drinking milk from affected mother.

The seroprevalence of bTB according to the body score of the cattle was 57.89%, 37.61% and 6.38% for Poor, Fair, and Good body conditions, respectively. This is similar to a study reported by Firdessa et al. (2012) where the body condition scoring of the approximately 3,000 animals proposed no significant differences between tuberculin reactors and non-reactors and a poor association was also perceived among the 36 slaughtered animals.

This is consistent with findings from the few studies that evaluated knowledge and behavior among the risk groups in parallel settings in other African countries (Swai et al., 2010) who measured the knowledge and practice of animal health employees and livestock owners in Tanzania. They determined that, insufficient awareness (53.2%) and lack of knowledge of zoonoses (46.8%) combined with food consumption habits and poor animal husbandry are likely to expose respondents to an increased risk of contracting zoonoses. Amenu et al. (2010) also documented the lack of accurate knowledge on transmission of zoonoses and the prevalence of risky behaviour, as consumption of raw animal products and unsafe defeating performs in a rural district in Ethiopia.

Similarly, Minanga et al. (2003) investigated the level of knowledge and prevailing practices in rural Tanzania and showed that about 40% of respondents practice habits deemed to be high risk for exposure to bTB, while 75% showed deprived knowledge of TB.

Diagnosis of TB is a great challenge in developing countries. Signs and symptoms like fever, cough, weight loss, abdominal pain and loose motion are important features for diagnosis of TB (Chesnutt and Prendergast, 2007). History of TB contact, overcrowding in houses, younger age group, and comorbid diseases, animal handling along with poor economical conditions are important factors in spread of the disease. Sputum for AFB, X-ray chest, Monteux test, changes in blood CPC, ESR and histopathology of specimens are considered to be important diagnostic tests (OIE, 2004). However, the staining of the Sputum smear is believed to be the most significant diagnostic tool for TB but it has very low sensitivity. In Pakistan only 34% chest TB cases are sputum smear positive (WHO, 2003). To visualize the TB bacilli with a 100x microscope objective, there is need of >10,000 organism per ml of sputum. There are always chances of getting false negative results due to presence of dead organisms that do not take staining. (Harries et al., 1996).

CONCLUSION
Results of the present study concluded that there is a potential risk of zoonotic transmission of tuberculosis of animal origin to the human population working with live animals or at slaughter houses. Females and old age animals are more prone to bovine TB. The risk factor is directly proportion to the time and duration of exposure. Molecular detection method is more sensitive and specific for the diagnosis of bovine tuberculosis.

REFERENCES
tuberculosis in abattoirs of the littoral and western highland regions of Cameroon: A cause for public health concern. Veterinary Medicine International.


(Accepted: December 05, 2018)