
Seleman N. Masola, Innocent S. Bakengesa, Edwin P. Chang’a, and Fadhili S. Guni

ABSTRACT

Brucellosis is a zoonotic disease which is among the most widespread and neglected diseases in the world. Most affected parts of the world include the Mediterranean countries of Europe, North and East Africa, the Middle East, South and Central Asia as well as Central and South America. This paper reviews the prevalence of brucellosis in Tanzania as well as public awareness and knowledge on the disease in the past six decades, from 1962 to 2021. Literature searches were conducted in Google Scholar database. The criteria for literature inclusion or exclusion were the type of literature, year of publication and the country where the study was conducted. In livestock, the disease prevalence ranged from 2.16 to 48% in cattle, 0.2 to 13.79% in goats and 0 to 23% in sheep. A prevalence of 0.7% was reported in pigs. In humans, the prevalence ranged from 0 to 48.4%. The prevalence of brucellosis in wildlife was 0% in baboon, 25% in hyena, 30% in impala, 36.8% in lions, 4% in zebra, ranged from 7.9 to 24% in African buffalo and 3.8 to 17% in wildebeest. Generally, the public awareness and knowledge on the disease were low due to the lack of a well-established channel for sharing of research findings which is friendly to all stakeholders. In the past six decades more emphasis was on research which led to generation of data presented in this review. Although education campaigns to raise public awareness and knowledge on the disease transmission, its control, and socio-economic effects were recommended in many reports, no significant work was done during the period under review. In order to control and prevent brucellosis in the country, embarking on education campaigns to raise public awareness and knowledge on the disease is a recommended way forward, followed by implementation of other objectives outlined in the National Strategy for Prevention and Control of Brucellosis in Humans and Animals.

Keywords: Brucellosis, Education campaigns, Neglected, Widespread, Zoonotic.

I. INTRODUCTION

Brucellosis is a zoonotic disease which is among the most widespread and neglected diseases in the world. Most affected parts of the world include the Mediterranean countries of Europe, North and East Africa, the Middle East, South and Central Asia as well as Central and South America [1]. The disease is caused by bacteria of the genus Brucella of which species of great animal and public health importance include Brucella abortus, B. melitensis, B. ovis and B. suis. Livestock and wildlife get infected through direct contact with infected animals, aborted fetuses, fetal membranes, vaginal discharges and milk from infected animals; or infected environment. In these animals, the disease is mainly characterized by abortions, stillbirths, retained placenta and longer calving intervals [2].

The disease is zoonotic as it can be transmitted from livestock and wild animals to humans. Humans get infected when wounded parts of the skin come in contact with aborted fetuses, placental materials, vaginal discharges, urine and manure from infected animals [2]. Humans are also infected through consumption of unboiled or unpasteurized milk and milk products as well as improperly cooked meat from infected animals [2]. In humans, brucellosis causes a febrile illness characterized by intermittent fevers, sweats, chills, weakness, malaise, headache, insomnia, anorexia, joint and muscle pain, constipation, sexual impotence, nervousness and depression [2]-[6]. The disease may also cause abortion in pregnant women [2]. Brucellosis is of great socio-economic importance. For instance, at the end of the last century, economic losses due to brucellosis in livestock for Argentina were estimated at US$ 60 million per year, and in Nigeria, losses were estimated at US$ 575,605 per year [7]. In Western and Southern provinces of Zambia, total losses due to the disease were estimated at US$ 142,073.35 [8]. In humans brucellosis causes significant socio-economic losses although they are difficult to quantify because as with other
diseases the costs in terms of lives and suffering can’t be measured.

II. MATERIAL AND METHODS

A. Literature Search

Literatures were searched using Google Scholar database. It was conducted for all literature on brucellosis in Tanzania, a country located in East Africa (Fig. 1). Search terms used were “Human Brucellosis AND Tanzania”, “Animal Brucellosis AND Tanzania”, “Bovine Brucellosis AND Tanzania”, “Caprine brucellosis AND Tanzania”, “Ovine brucellosis AND Tanzania”, “Porcine brucellosis AND Tanzania” as well as Wildlife brucellosis AND Tanzania. Thereafter the obtained literatures were screened based on the criteria for inclusion or exclusion.

B. Criteria for Literature Inclusion or Exclusion

The criteria for literature inclusion or exclusion were the type of literature, year of publication and the country where the study was conducted. In order to have a picture of brucellosis prevalence as well as public awareness and knowledge on the disease in Tanzania in the past six decades, original research papers published in peer-reviewed scientific journals from 1962 to 2021 were included. Papers published before 1962 or after 2021 were excluded. Original research papers on brucellosis in countries other than Tanzania were also excluded. Review papers on brucellosis were excluded too. Apart from original research papers published in peer-reviewed scientific journals, dissertations and theses reporting findings on brucellosis in Tanzania, that were accepted for MSc or PhD award by higher learning institutions from 1962 to 2021 after being reviewed by both internal and external examiners were also included.

III. RESULTS

A. Literature Search

Forty one papers published in peer-reviewed scientific journals, two MSc dissertations and a PhD thesis were accessed. Out of them 34 papers, the MSc dissertations and a PhD thesis were found to be relevant and were included in this review. Seven papers were excluded due to various reasons. Six papers were excluded because they reported findings on brucellosis in countries other than Tanzania as follows: One paper reported brucellosis in pigs in Kenya; four papers reported brucellosis in Uganda in pigs (one paper), humans (one paper), cattle (one paper) and marketed milk (one paper); and one paper reported findings on knowledge and practices related to bovine brucellosis transmission amongst livestock workers in South-western Nigeria. The seventh literature was excluded because it was a review paper.

B. Brucellosis Prevalence in Livestock

The prevalence of brucellosis in livestock ranged from 2.16 to 48% in cattle (Table I), 0.2 to 13.79% in goats (Table II) and 0 to 23% in sheep (Table III). Only one paper which reported the disease prevalence of 0.7% in pigs was accessed (Table IV).

Fig 1. Map showing the location of Tanzania in African context (top right, in brown colour) and regions of the country.
TABLE I: PREVALENCE OF BRUCELLOSIS IN CATTLE FROM 1962–2021

<table>
<thead>
<tr>
<th>S/No</th>
<th>Study location (Districts/Cities/Zones)</th>
<th>Regions</th>
<th>Sample size</th>
<th>Diagnostic test(s)</th>
<th>Prevalence in % (95% confidence interval)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mwanza city</td>
<td>Mwanza</td>
<td>503</td>
<td>MRT</td>
<td>15*</td>
<td>[9]</td>
</tr>
<tr>
<td>2</td>
<td>Eastern, Northern, Lake, Southern Highlands, Western, Central and Southern zones of Tanzania mainland</td>
<td>All regions of Tanzania mainland</td>
<td>45,968</td>
<td>MRT, RBT &amp; SAT</td>
<td>9.9*</td>
<td>[10]</td>
</tr>
<tr>
<td>3</td>
<td>Eastern and Southern Highlands zones</td>
<td>Iringa, Coast and Tanga</td>
<td>2,187</td>
<td>RBPT</td>
<td>4.85*</td>
<td>[11]</td>
</tr>
<tr>
<td>4</td>
<td>Ngorgoro district</td>
<td>Arusha</td>
<td>200</td>
<td>RBPT &amp; MAT</td>
<td>7.5*</td>
<td>[12]</td>
</tr>
<tr>
<td>5</td>
<td>Tanga district</td>
<td>Tanga</td>
<td>655</td>
<td>RBPT &amp; c-ELISA</td>
<td>5.3 (3.1-7.8)</td>
<td>[13]</td>
</tr>
<tr>
<td>6</td>
<td>A government livestock farm in Mpwapwa district</td>
<td>Dodoma</td>
<td>487</td>
<td>RBPT &amp; c-ELISA</td>
<td>28.95*</td>
<td>[5]</td>
</tr>
<tr>
<td>7</td>
<td>Kibondo and Kakanoko districts</td>
<td>Kigoma</td>
<td>410</td>
<td>RBPT &amp; c-ELISA</td>
<td>5.6 (3.8-8.3)</td>
<td>[14]</td>
</tr>
<tr>
<td>8</td>
<td>A livestock farm in Mbarali district</td>
<td>Mbeya</td>
<td>200</td>
<td>RBT &amp; indirect ELISA</td>
<td>48 (41-55)</td>
<td>[15]</td>
</tr>
<tr>
<td>9</td>
<td>Mpanda, Mlele and Nsimbo districts</td>
<td>Katavi</td>
<td>1103</td>
<td>RBPT &amp; c-ELISA</td>
<td>6.8 (5.4-8.5)</td>
<td>[16]</td>
</tr>
<tr>
<td>10</td>
<td>Southern Highlands Zone, Eastern Zone and Northern Zone.</td>
<td>Ruvuma, Njombe, Iringa, Mbeya, Songwe, Rukwa, Katavi, Tanga, Dar es Salaam, Coast (Pwani), Morogoro, Kilimanjaro, Arusha and Manyara.</td>
<td>1376</td>
<td>RBPT &amp; c-ELISA</td>
<td>7.19*</td>
<td>[17]</td>
</tr>
<tr>
<td>11</td>
<td>Serengeti district</td>
<td>Mara</td>
<td>296</td>
<td>RBPT &amp; c-ELISA</td>
<td>7.77*</td>
<td>[18]</td>
</tr>
<tr>
<td>12</td>
<td>Morogoro municipality and Mvomero district</td>
<td>Morogoro</td>
<td>1340</td>
<td>RBPT &amp; c-ELISA</td>
<td>2.16*</td>
<td>[19]</td>
</tr>
<tr>
<td>13</td>
<td>Ngara and Karagwe districts</td>
<td>Kagera</td>
<td>426</td>
<td>RBPT &amp; c-ELISA</td>
<td>5.9 (4.0-8.6)</td>
<td>[20]</td>
</tr>
<tr>
<td>14</td>
<td>Kasulu district</td>
<td>Kigoma</td>
<td>285</td>
<td>RBPT</td>
<td>30.8 (25.5-36.2)</td>
<td>[21]</td>
</tr>
<tr>
<td>15</td>
<td>Mvomero district</td>
<td>Morogoro</td>
<td>673</td>
<td>RBPT &amp; c-ELISA</td>
<td>7.0 (5.7-8.4)</td>
<td>[22]</td>
</tr>
</tbody>
</table>

Abbreviations: RBPT, Rose Bengal Plate Test; MAT, Microagglutinantion Test; ELISA, Competitive enzyme-linked immunosorbant assay; RBT, Rose Bengal Test; ELISA, enzyme-linked immunosorbant assay; MRT, Milk Ring Test; SAT, Serum Agglutination Test.

*Prevalence confidence interval not provided in the original article.

TABLE II: PREVALENCE OF BRUCELLOSIS IN GOATS FROM 1962–2021

<table>
<thead>
<tr>
<th>S/No</th>
<th>Study locations (Districts/Cities/Zones)</th>
<th>Regions</th>
<th>Sample size</th>
<th>Diagnostic test(s)</th>
<th>Prevalence in % (95% confidence interval)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mwanza city</td>
<td>Mwanza</td>
<td>75</td>
<td>MRT</td>
<td>1.3*</td>
<td>[9]</td>
</tr>
<tr>
<td>2</td>
<td>Eastern, Northern, Lake, Southern Highlands, Western, Central and Southern zones of Tanzania mainland</td>
<td>All regions of Tanzania mainland</td>
<td>2,243</td>
<td>MRT, RBT &amp; SAT</td>
<td>7*</td>
<td>[10]</td>
</tr>
<tr>
<td>3</td>
<td>Ngorgoro district</td>
<td>Arusha</td>
<td>87</td>
<td>RBPT &amp; MAT</td>
<td>13.79*</td>
<td>[12]</td>
</tr>
<tr>
<td>4</td>
<td>A livestock farm in Mbarali district</td>
<td>Mbeya</td>
<td>50</td>
<td>RBT &amp; iELISA</td>
<td>2 (0.7)</td>
<td>[15]</td>
</tr>
<tr>
<td>5</td>
<td>Mpanda, Mlele and Nsimbo districts</td>
<td>Katavi</td>
<td>248</td>
<td>RBPT &amp; iELISA</td>
<td>1.6 (0.4-4.1)</td>
<td>[16]</td>
</tr>
<tr>
<td>6</td>
<td>Morogoro Rural, Morogoro Urban and Mvomero districts</td>
<td>Morogoro</td>
<td>478</td>
<td>RBPT &amp; iELISA</td>
<td>0.2*</td>
<td>[23]</td>
</tr>
<tr>
<td>7</td>
<td>Ngara and Karagwe districts</td>
<td>Kagera</td>
<td>206</td>
<td>RBPT &amp; c-ELISA</td>
<td>2.5 (0.8-5.7)</td>
<td>[20]</td>
</tr>
</tbody>
</table>

Abbreviations: RBPT, Rose Bengal Plate Test; MAT, Microagglutination Test; RBT, Rose Bengal Test; ELISA, enzyme-linked immunosorbant assay; iELISA, indirect enzyme-linked immunosorbant assay; MRT, Milk Ring Test; SAT, Serum Agglutination Test.

*Prevalence confidence interval not provided in the original article.

TABLE III: PREVALENCE OF BRUCELLOSIS IN SHEEP FROM 1962–2021

<table>
<thead>
<tr>
<th>S/No</th>
<th>Study location (Districts/Cities)</th>
<th>Regions</th>
<th>Sample size</th>
<th>Diagnostic test(s)</th>
<th>Prevalence in % (95% confidence interval)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mwanza city</td>
<td>Mwanza</td>
<td>73</td>
<td>MRT</td>
<td>0*</td>
<td>[9]</td>
</tr>
<tr>
<td>2</td>
<td>Ngorgoro district</td>
<td>Arusha</td>
<td>13</td>
<td>RBPT &amp; MAT</td>
<td>23*</td>
<td>[12]</td>
</tr>
<tr>
<td>3</td>
<td>A livestock farm in Mbarali district</td>
<td>Mbeya</td>
<td>35</td>
<td>RBT &amp; indirect ELISA</td>
<td>5.7 (0.17)</td>
<td>[15]</td>
</tr>
<tr>
<td>4</td>
<td>Ngara and Karagwe districts</td>
<td>Kagera</td>
<td>197</td>
<td>RBPT &amp; c-ELISA</td>
<td>0.5 (0.01-2.8)</td>
<td>[20]</td>
</tr>
</tbody>
</table>

Abbreviations: RBPT, Rose Bengal Plate Test; MAT, Microagglutination Test; RBT, Rose Bengal Test; ELISA, enzyme-linked immunosorbant assay; MRT, Milk Ring Test.

*Prevalence confidence interval not provided in the original article.
C. Brucellosis Prevalence in Humans

The prevalence of brucellosis in humans ranged from 0 to 48.4% (Table V).

D. Brucellosis Prevalence in Wildlife

The prevalence of brucellosis in wildlife was 0% in baboon, 25% in hyena, 30% in impala, 36.8% in lions, 4% in zebra, ranging from 7.9 to 24% in African buffalo and 3.8 to 17% in wildebeest (Table VI).

E. Awareness and Knowledge of Pastoralists, Agro-Pastoralists and Other Stakeholders on Brucellosis

Studies conducted in different parts of the country show that the level of community awareness on the occurrence, zoonotic nature, socio-economic effects and control of brucellosis is low. For instance, Shirima et al. [40] and Shirima [41] reported low awareness and poor knowledge of brucellosis. For instance, Shirima [41] reported low awareness and poor knowledge of brucellosis is low. For instance, Shirima [41] reported that the level of community awareness on the occurrence, zoonotic nature, socio-economic effects and control of brucellosis is low. For instance, Shirima [41] reported that the level of community awareness on the occurrence, zoonotic nature, socio-economic effects and control of brucellosis is low. For instance, Shirima [41] reported that the level of community awareness on the occurrence, zoonotic nature, socio-economic effects and control of brucellosis is low.

TABLE IV: Prevalence Of Brucellosis In Pigs From 1962 – 2021

<table>
<thead>
<tr>
<th>S/No</th>
<th>Study location (District)</th>
<th>Region</th>
<th>Sample size</th>
<th>Diagnostic tests</th>
<th>Prevalence in % (95% confidence interval)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temeke</td>
<td>Dar es Salaam</td>
<td>414</td>
<td>BPAT, SPT &amp; Riv. T</td>
<td>0.7 (0.2–2.1)</td>
<td>[24]</td>
</tr>
</tbody>
</table>

Abbreviations: BPAT, Buffered Plate Agglutination Test; SPT, Standard Plate Test; Riv. T, Rivanol Precipitation Test.

TABLE V: PREVALENCE OF BRUCELLOSIS IN HUMANS FROM 1962–2021

<table>
<thead>
<tr>
<th>S/No</th>
<th>Study location (Health Facilities/Districts/Municipalities/Zones)</th>
<th>Regions</th>
<th>Sample size</th>
<th>Diagnostic tests</th>
<th>Prevalence in % (95% confidence interval)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tanga municipality</td>
<td>Tanga</td>
<td>199</td>
<td>RBPAT &amp; c-ELISA</td>
<td>5.52 (2.79–9.77)</td>
<td>[25]</td>
</tr>
<tr>
<td>2</td>
<td>Karatu, Ngorongoro, Babati, Hanang and Mbuluzi districts</td>
<td>Arusha and Manyara</td>
<td>460</td>
<td>c-ELISA</td>
<td>8.26*</td>
<td>[26]</td>
</tr>
<tr>
<td>3</td>
<td>Kilimanjaro Christian Medical Centre (KCMM) and Mawenzi Regional Hospital (MRH) in Moshi municipality</td>
<td>Kilimanjaro</td>
<td>455</td>
<td>MAT</td>
<td>3.5*</td>
<td>[27]</td>
</tr>
<tr>
<td>4</td>
<td>KCMM and MRH in Moshi municipality</td>
<td>Kilimanjaro</td>
<td>453</td>
<td>MAT</td>
<td>3.5*</td>
<td>[28]</td>
</tr>
<tr>
<td>5</td>
<td>Morogoro Regional hospital and Shalom Medical centre in Morogoro Municipality; Bwagala hospital in Mvomero district; St. Francis hospital in Kilombero district; Mtimbira health centre, Lugala hospital and Ulanga district hospital in Ulanga district; St. Kizito hospital, Ulaya health centre, and Kilosa district hospital in Kilosa district.</td>
<td>Morogoro</td>
<td>1807</td>
<td>RBPAT</td>
<td>20.5 (17.8–22.5 )</td>
<td>[4]</td>
</tr>
<tr>
<td>6</td>
<td>A government livestock farm in Mpwapwa district</td>
<td>Dodoma</td>
<td>120</td>
<td>RBPAT &amp; c-ELISA</td>
<td>10*</td>
<td>[5]</td>
</tr>
<tr>
<td>7</td>
<td>Mpanda, Mlele and Nsimbo districts</td>
<td>Katavi</td>
<td>340</td>
<td>RBPT, BAPA &amp; Riv. T</td>
<td>0.6 (0.1–2.1)</td>
<td>[16]</td>
</tr>
<tr>
<td>8</td>
<td>Kilosa District Hospital in Kilosa district</td>
<td>Morogoro</td>
<td>370</td>
<td>ELISA</td>
<td>22.4*</td>
<td>[29]</td>
</tr>
<tr>
<td>9</td>
<td>Health centres in Korogwe district</td>
<td>Tanga</td>
<td>578</td>
<td>RBPT &amp; c-ELISA</td>
<td>28.2*</td>
<td>[17]</td>
</tr>
<tr>
<td>10</td>
<td>Sengerema district</td>
<td>Mwanza</td>
<td>382</td>
<td>SAT²</td>
<td>14.1 (10.6–17.5)</td>
<td>[30]</td>
</tr>
<tr>
<td>11</td>
<td>Serengeti district</td>
<td>Mara</td>
<td>82</td>
<td>RBPAT &amp; c-ELISA</td>
<td>0</td>
<td>[18]</td>
</tr>
<tr>
<td>12</td>
<td>KCMM and MRH in Moshi municipality</td>
<td>Kilimanjaro</td>
<td>585</td>
<td>MAT</td>
<td>2.2*</td>
<td>[31]</td>
</tr>
<tr>
<td>13</td>
<td>KCMM and MRH in Moshi municipality</td>
<td>Kilimanjaro</td>
<td>1095</td>
<td>MAT</td>
<td>2.9*</td>
<td>[31]</td>
</tr>
<tr>
<td>14</td>
<td>Mwanza city</td>
<td>Mwanza</td>
<td>250</td>
<td>MAT</td>
<td>48.4 (42–54)</td>
<td>[32]</td>
</tr>
<tr>
<td>15</td>
<td>Wasso district hospital; Sakala and Loliondo health centers; Maholo, Sale, and Samunge dispensaries in Ngorongoro district</td>
<td>Arusha</td>
<td>313</td>
<td>RBPAT &amp; ELISA</td>
<td>10.9 (7.9–14.8)</td>
<td>[33]</td>
</tr>
<tr>
<td>16</td>
<td>Endulen Hospital in the Ngorongoro Conservation Area (NCA); Ngorongoro district</td>
<td>Arusha</td>
<td>230</td>
<td>SAT²</td>
<td>3.9*</td>
<td>[6]</td>
</tr>
<tr>
<td>17</td>
<td>Mbarali, Mbeya and Momba districts</td>
<td>Mbeya</td>
<td>425</td>
<td>RBPAT &amp; c-ELISA</td>
<td>1.41 (0.64–3.12)</td>
<td>[34]</td>
</tr>
<tr>
<td>18</td>
<td>Mahawe Health Centre, Nyamagia District Hospital, Kabanga Dispensary and Murukukumbo Village in Ngara district; Kibondo District Hospital, Mnyinya Dispensary, Kifura Dispensary, Kitahana Dispensary and Twabagondo Dispensary in Kibondo district</td>
<td>Kagera and Kigoma</td>
<td>450</td>
<td>RBPAT &amp; SAT²</td>
<td>6.22*</td>
<td>[35]</td>
</tr>
<tr>
<td>19</td>
<td>14 health centers and 5 hospitals in Ngara and Karagwe districts</td>
<td>Kagera</td>
<td>156</td>
<td>SAT &amp; FPA</td>
<td>7.7 (3.8–12.2)</td>
<td>[20]</td>
</tr>
</tbody>
</table>

Abbreviations: RBPAT, Rose Bengal Plate Test; SAT, Microagglutination Test; c-ELISA, Competitive enzyme-linked immunosorbent assay; ELISA, enzyme-linked immunosorbent assay; BAPA, Buffered Acidified Plate Antigen Test; Riv.T, Rivanol Precipitation Test; SAT, Serum Agglutination Test; RBPAT Rose Bengal Plate Agglutination Test; FPA, Fluorescence Polarization Assay.

*Prevalence confidence interval not provided in the original article.
These risky behaviours were also re

e (11%) used to consume raw

only 3.5% of

evel of public awareness

such as obstetrical gloves

behaviours included drinking raw milk and blood as well as

vaccine. Generally, agro

Morogoro municipality and Mvomero district, Asakura

consumers of raw milk, f

experienced several abortions in their cows, 57 (78%) were

Mengele

in goats in their herds, 13 (28.3%) observed cases of

brucellosis and seven (15.2%) were aware of brucellosis in

Mvomero districts,

the protective measures to be taken.

Moreover, 52.2% of pig traders who mentioned

protective

polymerase chain reaction

enzyme

linked immunoassay; ELISA, Competitive enzyme-linked immunosorbent assay; ELISA;

AMOS PCR & qPCR

46

24*

15.22*

[36]

African buffalo
(Synceruscaffer)

103

RBPT & c-ELISA

17*

[38]

African buffalo
(Synceruscaffer)

38

RBPT, BAPA & Riv.T

7.9 (1.7–

21.4)

[16]

African buffalo
(Synceruscaffer)

46

AMOS PCR & qPCR

15.2*

[20]

Wildbeest
(Connochaetestaurinus)

80

AMOS PCR & qPCR

3.8*

[39]

Zebra
(Equusquaggauburchelli)

25

AMOS PCR & qPCR

4.0*

[20]

Lion
(Panthera)

19

AMOS PCR & qPCR

36.8*

[20]

Baboon
(Papio)

5

AMOS PCR & qPCR

0.0*

[20]

Impala
(Aepyceros melampus)

10

AMOS PCR & qPCR

30.0*

[20]

Hyena

4

AMOS PCR & qPCR

25.0*

[20]

Abbreviations: RBPT, Rose Bengal Plate Test; MAT, Microagglutination Test; c-ELISA, Competitive enzyme-linked immunosorbent assay; ELISA, enzyme-linked immunosorbent assay; BAPA, Buffered Acidified Plate Antigen Test; Riv.T, Rivaran Precipitation Test; SAT, Slide Agglutination Test; SAT², Serum Agglutination Test; CFT, Complement Fixation Test; AMOS PCR, Multiplex polymerase chain reaction; qPCR, Quantitative real-time polymerase chain reaction.

*Prevalence confidence interval not provided in the original article.

protective measure to be taken. Fourteen (66.7%) out of 21 pig traders were not aware of diseases they could contract from pigs. Moreover, 52.2% of pig traders who mentioned to ever heard of swine brucellosis (n=11), were not aware if the disease affects humans and nine (81.8%) didn’t know the protective measures to be taken.

Kassuku [23] reported that out of 46 respondents interviewed in Morogoro Urban, Morogoro Rural and Mvomero districts, only one (2.2%) was aware of human brucellosis and seven (15.2%) were aware of brucellosis in livestock. Twelve respondents (26%) admitted to be consumers of raw milk, five (11%) used to consume raw blood, 37 (80.4%) admitted to have observed abortion cases in goats in their herds, 13 (28.3%) observed cases of retained fetal membranes, and 19 (41.3%) had no proper means of disposing aborted animal fetal membranes. Mengele et al. [42] found that out of 73 livestock farmers interviewed in 12 wards of Mpwawpa district; 33 (45%) had experienced several abortions in their cows, 57 (78%) were not aware of milk-borne zoonoses, 31 (43%) used to drink raw milk and 66 (91%) were not aware of the zoonotic potential of raw milk consumption. In a study conducted in Morogoro municipality and Mvomero district, Asakura et al. [19] found that no agro-pastoralist knew about Brucella vaccine. Generally, agro-pastoralists had poorer knowledge on brucellosis and practiced significantly more risky behaviours for human brucellosis than urban farmers. The behaviours included drinking raw milk and blood as well as helping cows during calving without wearing protective gear such as obstetrical gloves. These risky behaviours were also recently reported by Mburu et al. [43] in Kilombero district, Morogoro region. The authors reported that out of 333 interviewees, 300 (90%) assisted their cows during calving with bare hands, 263 (78.9%) drank raw milk and 258 (77.4%) had consumed meat from dead animals. A report by Ntirandekura et al. [20] revealed low knowledge, poor perception and practices regarding brucellosis in pastoral communities of Kagera Region, North-western Tanzania. Katandukila et al. [35] reported that only 3.5% of respondents in Ngara and Kibondo districts (n=600) were aware of brucellosis as a zoonotic disease. Four percent only of the respondents were aware of the preventive measures against the disease. Mburu et al. [43] reported that out of 333 agro-pastoralists interviewed in Kilombero district only 24 (7.2%) had heard of brucellosis as a disease in livestock. People had no knowledge of transmission routes and symptoms of brucellosis in humans and livestock. They attributed symptoms and transmission of the disease in livestock to infection with trypanosomosis and to supernatural reasons.

IV. DISCUSSION

This review shows that from 1962 to 2021 a good number of studies aiming at establishing the prevalence of brucellosis in livestock, humans and wildlife were conducted in different regions of Tanzania. It also indicates that many studies to establish the level of public awareness and knowledge on the disease were carried out in various geographical locations of the country. The data presented in this review provide evidence that brucellosis is endemic in Tanzania. Although these data cannot be compared due to variation in sampling techniques and diagnostic tests used; generally, they indicate that the prevalence of brucellosis in
livestock, humans and wildlife was high throughout that period. Furthermore, the data show that the level of public awareness and knowledge on the disease transmission, control and socio-economic effects is low. Low level of public awareness on the magnitude (prevalence) of brucellosis in livestock, humans and wildlife in the country could be attributed to lack of a well established channel for sharing of research findings which is friendly to all stakeholders. Most of the findings on the disease prevalence presented in this review were published in peer reviewed scientific journals; others were sourced from MSc dissertations and a PhD thesis. These could only be accessed by a small proportion of the Tanzanian population including academicians, researchers and university students with keen interest in brucellosis. Consequently, the findings were not shared with a large proportion of the Tanzanian population including pastoralists, agro-pastoralists, animal attendants, animal health service providers, public health officers, medical officers, consumers of animal products (meat and milk in particular). The findings were also not shared with other key stakeholders such as the Ministry of Health, Ministry of Livestock and Fisheries, Ministry of Natural Resources and Tourism, Ministry of Finance and Planning, President’s Office – Regional Administration and Local Government, Prime Minister’s Office, Regional Secretariats and Local Government Authorities. This caused the stakeholders to be unaware of the level of brucellosis prevalence in livestock, wildlife and humans, and socio-economic effects caused by the disease. As a result, limited information was used to guide the allocation of resources for public awareness creation on brucellosis and control interventions; leading to allocation of insufficient funds for control of the disease in livestock and diagnosis of the disease in the health facilities. Consequently, for all these years the disease has been underdiagnosed, misdiagnosed with other diseases with similar symptoms like malaria, and untreated among hospitalized patients in the country [27].

Low level of public awareness and knowledge on brucellosis transmission in animals and from animals or animal products to humans, its control and socio-economic effects could be attributed to lack of education on the disease. Although in many reports [3-6],[11],[14],[20],[23-24],[26],[34,35],[38],[40-43] education campaigns to raise public awareness and knowledge on the disease transmission, its control and socio-economic effects were recommended, no significant work was done during the period under review. Consequently, because key stakeholders of animal and public health in the country and the public at large were unaware of the socio-economic importance of brucellosis, the disease was neglected despite the fact that it caused great socio-economic losses at an individual level and the nation at large. In livestock economic losses were due to abortions, stillbirths, reduction in milk yield, infertility and decreased work output of draught animals. In humans socio-economic losses were due to abortions, long illness in cases of misdiagnosis leading to mistreatment of febrile patients and reduced ability to participate in economic activities.

In the recent past, the government of the United Republic of Tanzania (URT) prepared a comprehensive National Strategy for Prevention and Control of Brucellosis in Humans and Animals (NSPCBHA) [44]. The objectives of the strategy are to enhance awareness and knowledge on brucellosis for professionals, policy makers, community and the public; to initiate a national vaccination programme for livestock using public-private partnership; to institutionalize brucellosis testing among febrile human cases in public and private health facilities; to support the implementation of functional and quality integrated surveillance and diagnostic activities using one health approach; to streamline and harmonize appropriate legal and policy framework and institutional arrangement in the implementation of the plan; to promote and coordinate research and innovation on brucellosis interventions; to facilitate and support application of biosecurity and biosafety targeting risk groups; and to advocate and mobilize resources for supporting implementation of the plan [44]. Key stakeholders and responsibilities of each stakeholder in the implementation of the plan are clearly described. It is anticipated that each stakeholder will play his part to make sure that the plan is implemented.

V. CONCLUSION

Data presented in this review indicate that the prevalence of brucellosis in Tanzania is still high while most of people in the country are unaware of the disease and have no knowledge about it.

VI. THE WAY FORWARD

In Tanzania, as far as brucellosis is concerned, for the past six decades more emphasis was on research which led to generation of data presented in this review. Embarking on education campaigns to raise public awareness and knowledge on the disease is a recommended way forward, followed by implementation of other objectives outlined in the NSPCBHA.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES


