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Prevalence of brucellosis in small ruminants at Ikpa and Obollor-Afor abattoirs in Nsukka, Enugu State, Nigeria, and evaluation of risk behaviours and possible brucellosis preventive measures among the abattoir workers

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Abstract

This study determined the prevalence of brucellosis in small ruminants at Ikpa and Obollor-Afor abattoirs in Nsukka, Enugu State, Nigeria and also evaluated risk behaviours and possible brucellosis preventive measures among the abattoir workers. Serum samples from 400 randomly selected small ruminants slaughtered at the abattoirs were collected and subjected to the Rose Bengal test. An interview schedule based on the health belief model was used to evaluate the risk behaviours and possible brucellosis preventive measures among 200 of the abattoir workers. Results showed a brucellosis prevalence of 2.75% in the small ruminants. While 36% of the respondents were aware of brucellosis, 15% believed that the disease is zoonotic, and 45% believed that hygroma fluid could be a source of contracting the disease. 35% of the respondents believed that they were at increased risk of contracting brucellosis as abattoir workers, 26.5% when they handle fetuses with bare hands, 34.5% when they kept livestock that has brucellosis, and 35% when they drank raw milk. 34.5% of the respondents believed that suffering from brucellosis could keep them away from work for long periods, 35% believed that it could reduce their income, and 32.5% stated that it scared them. Barriers to the use of personal protective equipment (PPE) were: it was uncomfortable (61.5%), expensive (38.5%), and peer pressure (46.0%). Self-efficacy in undertaking preventive measures against brucellosis were: wearing of boots – 69%; not touching fetuses – 50%, and not drinking unpasteurized milk – 71%. Prompts to adopting behavioral changes were educational programs, radio advertisements, and getting free PPEs. It was concluded that brucellosis prevalence in small ruminants at the abattoirs was 2.75%, and that knowledge of the disease was poor among the abattoir workers. Educational and enlightenment programs should be instituted and PPE should be made freely available to the abattoir workers.

Keywords: Brucellosis; Prevalence; Rose Bengal Plate Test; Small ruminants; Health belief model; Nsukka abattoirs.

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Introduction

Brucellosis is a zoonotic disease of major public health and economic significance (Schelling *et al*., 2003). In livestock, it results in high morbidity and considerable loss of productivity (Cutler *et al*., 2005). Its effect on humans may include loss of man hours due to ill health and complications that if left untreated could result in disability and possibly death. The disease is transmitted *in-vivo* through suckling, artificial insemination and by contact in cattle. Being zoonotic, its presence in livestock translates to infection of in-contact persons through inhalation, contact with abraded skin and ingestion of contaminated materials. Persons in regular contact with animals including livestock keepers, veterinarians and abattoir workers are mostly at risk.

The disease is caused by bacteria of the genus *Brucella*. Though *Brucella* species are host specific, trans-species infections occur. Given the predilection for certain species of animals, *Brucella abortus* is commonly found in the bovine, *B. suis* in the porcine, *B. canis* in the canine, *B. ovis* in the ovine and *B. melitensis* in sheep and goat. The latter (*B. melitensis*) is the most pathogenic and easily transmissible to humans (Falade, 2002). This species particularly, has been reported to be transmitted among humans originally regarded as dead-end hosts especially through venereal means (Li *et al*., 2020; Falade, 2002). This finding therefore necessitates throwing more light on brucellosis in goats, and determining the factors that affect the transmission and possible methods of controlling the disease in a society like Nigeria where the disease is prevalent but neglected, and household goat keeping is very common (Falade, 2002).

Although eradicated in many developed countries, brucellosis has been reported in animals and humans in many parts of Nigeria and Africa. A prevalence of 7.5% was reported in cattle in Oyo State (Ayinmode *et al*., 2017), 24.1% abattoir among workers in Abuja (Aworh *et al*., 2013), 10% among livestock workers in Nasarawa State (Agada *et al*., 2018a), 0.6% in pigs in South East (Onunkwo *et al*., 2011), 37% in cattle in northern Nigeria (Mai *et al*., 2012), 22.9% in goats in Sokoto (Junaidu *et al*., 2010), 3.8% in cattle in Ilorin (Olabode *et al*., 2012), 1.0% in cattle herds in Plateau State (Agada *et al*., 2017), 76% in a flock of 17 sheep in Bauchi (Onoja *et al*., 2008), 21% in small ruminants in Nasarawa (Agada *et al*., 2018b) and 1.9% in small ruminants in Ethiopia (Teshale *et al*., 2006).

The continued occurrence of livestock brucellosis in Nigeria has been attributed to many factors including herd size, nomadism, common use of pasture, water and sourcing new herd inclusions from the markets; while some factors noted for infection of humans include consumption of fresh meat, lack of use of personal protective equipment among many others (Ducrotoy *et al.*, 2017; Agada *et al*., 2018a). In the abattoirs, incriminated factors include poor practices and attitudes occasioned by lack of laws or their poor implementation, as well as poor knowledge of the disease and its transmissibility (Agada *et al*., 2018a; Adesokan *et al*., 2016). Most abattoir studies on brucellosis in Nigeria have therefore recommended educating workers as key to instilling preventing behaviors among abattoir workers to reduce exposure to and transmission of the disease to and among humans.

Health education is a vital, low cost, and simple component of interventions for prevention and control of infectious diseases and the reduction/elimination of the possible consequent disabilities and death associated with them. Education in this case goes beyond raising knowledge alone but empowering the group involved to positive behavioral changes towards exposure to and contracting a disease such as brucellosis. Such empowerment therefore begins with the provision of

information and training which culminates in active participation in the process of decision-making about the disease and putting into practice the health promoting behaviors (Babazadeh *et al*., 2019).

Selection of a proper model and behavioral theories are important steps in achieving desired effective education. One such model designed to enhance the effectiveness of health education programs is the Health Belief Model (HBM). The HBM, which is based on motivating people to act on health behavior, has been reported to be a comprehensive model that is more effective in preventing disease (Tanner-Smith, 2009; Rahman *et al*., 2022; Sasanfar *et al*., 2022). This model is a positive step in educational planning and has been effective in determining health behavior changes towards prevention of brucellosis among students (Karimyan *et al*., 2020) and zoonotic diseases among animal owners (Wheeler, 2011). The HBM provides a framework to understanding individual differences in patterns of health behavior that are useful in designing effective change interventions. The model recognizes behavior as a function of knowledge and attitude of an individual, and provides a guide towards health behaviors. The likelihood of experiencing a health problem, the severity of its consequences, the perceived benefits of a preventive behavior, in combination with its potential costs are key beliefs that shape the health behavior patterns (Abraham and Sheeran, 2005). Therefore HBM structures can raise the perceived susceptibility and severity of individuals to brucellosis depending on the perceived barriers and benefits and provide guide to preventive behaviors. Based on the model, the behaviors that can prevent brucellosis will be implemented by an individual at risk depending on certain factors. These factors include: Perceived susceptibility – the perception and belief that a person is at risk of developing brucellosis; Perceived severity – understanding and believing that brucellosis is a serious health challenge and can lead to serious complications or death; Perceived barriers – physical, social, psychological or financial barriers that prevent the person from change of behaviors that could result to contracting brucellosis; and Perceived benefits – the individual's belief that there are tangible benefits in adopting behaviors or compliance with health recommendations that prevent contracting a disease (Taylor *et al.*, 2007). Self-efficacy: The individual's perception of having the ability to adopt and put into practice the recommended health behaviors (Hambolu *et al*., 2013). Cues to action: the individual embarking on preventive behaviors due to triggers, reminders or prompts such as individual perceptions of symptoms, social influence, health education campaigns, advertisements, personal communications, palliatives and mitigation (Abraham and Sheeran, 2005). In addition, demographic and socioeconomic variables also affect the individual's preventive behaviors (Taylor *et al.*, 2007).

Theory based research has shown that the correct use of a model and the impact of an educational program are associated with selecting the appropriate target group. Given that abattoir workers are in regular contact with animals, are processors of meat for public consumption, are at high risk of getting infected with brucellosis, and possibly transmit same to others, their actions could result to the contamination of meat and infection of themselves and consumers. They are also in the position to transfer information to other people such as their customers and family members. They are therefore a good target group for increasing the effectiveness of brucellosis education and establishing appropriate health behaviors to control brucellosis in the society. Understanding their health behavior will provide the key to interventions that would improve their health, that of the society; and the subsequent evaluations of such intervention strategies.

However, there is paucity of data on brucellosis prevalence and the use of HBM in the study of brucellosis and possible ways of its control among abattoir workers in Nsukka, Enugu State, Nigeria. This study therefore aimed at determining the prevalence of brucellosis in sheep and goat as well as using HBM to assess the knowledge, existing practices, needs in brucellosis health education, health promotion and best method of educational intervention that could bring about behavioral changes that would prevent transmission of brucellosis to abattoir workers and other persons at risk of *Brucella* infection through slaughter of small ruminants in Nsukka, Enugu State, Nigeria.

Materials and Methods

Study area: This study was conducted in Nsukka, Enugu State Nigeria earlier described (Nwanta *et al*., 2010). Two abattoirs having the highest slaughter activities in the area (Obollo-Afor and Ikpa Abattoirs) were used for the study. The Obollo-Afor Abattoir is in Udenu LGA and is located between *Latitude 6.91624° and 6° 54' 58.464" North* and Longitude 7.51849° and 7° 31' 6.564" East. The Ikpa Abattoir is in Nsukka LGA which lies between latitudes 60^{o} 18' and 70^{o} 06' North, and longitudes 60^{o} 52' and 70^{o} 54' East. It covers a land area of approximately 3,961 square kilometers (Onunkwo et al., 2011)

Study design: The study adopted the cross-sectional study design.

Sampling method, Study population and Sample size determination: Simple random sampling by balloting was used to select Nsukka using the list of the three senatorial districts in Enugu State as the sampling frame. Two abattoirs (Obollo-Afor and Ikpa Abattoirs) having the highest slaughter activities in Nsukka senatorial district were purposively selected. In the abattoirs, systematic random sampling of one in every two small ruminants slaughtered was used. Only small ruminants slaughtered in Obollo-Affor and Ikpa Abattoirs from April to July, on Mondays, Wednesdays and Thursdays were included. Other livestock species, live small ruminants and small ruminants slaughtered outside the study period were excluded from the study. Sample size of 42 samples was calculated by adopting the sample size formula for cross-sectional studies: $n = Z\alpha^2 \times p \times (1\text{-}p)/d^2$ at 2.83% prevalence in small ruminants in Nigeria (Ogugua *et al*., 2014). However, to reduce sampling error and improve robustness, 400 samples were collected.

Collection and handling of samples: Collection of samples was done early in the morning of designated days. About 3 ml of blood was collected at the point of slaughter from blood flowing from severed jugular vein using centrifuge bottles, with the sex and breed of the animals noted. The ages of the animals were determined as previously described (Lasisi *et al*., 2002). The blood samples were kept in a slanted position, allowed to clot and transported in coolers containing ice packs to the Department of Veterinary Public Health and Preventive Medicine Laboratory, University of Nigeria Nsukka where they were centrifuged at 3000 g for 10 minutes. The sera were decanted into serum bottles and stored at -20°C until they were used for Rose Bengal test.

Rose Bengal test (RBT): The RBT was conducted using standard method. Briefly; 30 µl of *Brucella abortus* antigen (Animal and Plant Health Agency, New Haw, Addlestone, Surrey, KT15 3NB) was mixed with equal volume of the test serum on a white tile using stick applicator and rocked for 4 minutes. Occurrence of agglutination within 4 minutes was considered positive and the lack of it negative (EU Reference Laboratory for Brucellosis, 2021).

Interview Schedule: Participants in the survey were abattoir workers in both abattoirs. Two hundred participants were interviewed after

obtaining oral informed consent. The interview schedule was in seven sections including demographics, knowledge, susceptibility, severity, barriers, self-efficacy and cues to action. The HBM construct was based on 2-point scale of strongly agree/agree and strongly disagree/disagree.

Data analyses: Data generated were subjected to descriptive statistics. Chi-square was used to compare variables and p-values less than the critical value (α) of 0.05 were considered significant.

Results

Prevalence of brucellosis in the small ruminants: Eleven out of the 400 small ruminant blood samples tested were positive in the RBT, giving a brucellosis prevalence of 2.75%. Brucellosis prevalence was recorded only in the Kano Brown goats (3.01%). Seropositivity was slightly higher in the males (3.85%) than females (2.59%), and among the ones less than 3 years (4%) than the older ones (2%). There was no significant association ($p > 0.05$) between the occurrence of brucellosis and any of the variables (breed, sex and age) considered (Table 1).

Demographic characteristics of the respondents: Most of the respondents to the interview schedule were 30 – 50 years of age (73%), and were married (69%). Respondents that attained secondary education and above constituted half of the interviewed (50%) and almost half (52%) of the respondents had been in the abattoir business for 3 – 5 years (Figure 1).

Knowledge of brucellosis among Ikpa and Obollo abattoir workers in Nsukka Area: High proportion (70%) of the respondents knew that some diseases were zoonotic. Although 36% of the respondents were aware of brucellosis, only 15% believed that the disease could be transmitted to humans. While 22% could tell if a cow/bull had brucellosis by its history or appearance, 13% knew what causes hygroma. Although 45% believed that hygroma fluid could be a source of *Brucella* species infection, a good proportion (56%) of them had idea of possible transmission to humans by the handling of fetuses (Table 2).

Table 1. Prevalence of brucellosis as measured with Rose Bengal test (RBT) in sheep and goat slaughtered in Ikpa and Obollo abattoirs, in Nsukka Area, Enugu State, Nigeria.

Characteristics	Variable	Number Positive (%)	Number Negative (%)	Chi-square	P-value
Breed	Kano Brown	11 (3.01)	355 (96.99)	1.0508	0.789
	Balami	0 (0.00)	11 (100.00)		
	Yankasa	0 (0.00)	13 (100.00)		
	WAD	0 (0.00)	10 (100.00)		
Sex	Male	2 (3.85)	50 (96.15)	0.2685	0.604
	Female	9 (2.59)	339 (97.25)		
Age	< 3yrs	6 (4.00)	144 (96.00)	1.4022	0.236
	> 3yrs	5 (2.00)	245 (98.00)		
All	Seropositivity with RBT	11 (2.75%)	389 (97.25%)	NA	NA

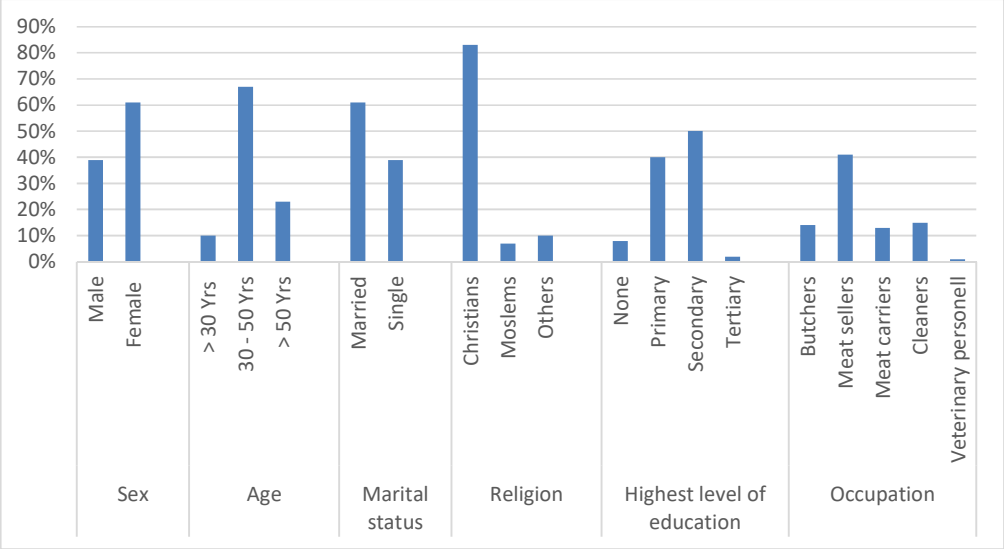

Figure 1. Demographic characteristics of the questionnaire respondents at Ikpa and Obollo abattoir workers in Nsukka Area of Enugu State, Nigeria.

Table 2. Knowledge of brucellosis among Ikpa and Obollo abattoir workers in Nsukka Area of Enugu State, Nigeria.

Questions	Yes (%)	No (%)
B1 Can diseases be transmitted from animals to humans?	140 (70)	60 (30)
B3: Have you heard of Brucellosis?	72 (36)	128 (64)
B4: Can the disease be transmitted to humans?	30 (15)	170 (85)
B5: How do you think human beings can be infected?	128 (64)	72 (36)
B6: Can you tell if a cow/bull has brucellosis by its history or appearance?	44 (22)	156 (78)
B7: Have you ever seen hygroma in an animal before?	35 (17.5)	165 (82.5)
B8: Do you know what causes hygroma?	26 (13)	174 (87)
B9: Can contact with fluid content of hygroma cause brucellosis?	90 (45)	110 (55)
B10: Do you know that brucellosis causes abortion and/or retained placenta?	64 (32)	136 (68)
B11: Can handling wasted foetus expose you to *Brucella* infection?	112 (56)	88 (44)

Perceived susceptibility of Ikpa and Obollo abattoir workers to brucellosis: Only 35% of the respondents believed themselves to be at an increased risk of contracting brucellosis due to their occupation. Moreover, 54.5% felt that they could contract the disease by the use of bare hands during slaughter of livestock; 62.5% when they cut open or come in contact with hygroma fluid; 26.5% when they handle fetuses or female reproductive discharges in the abattoir, 34.5% when they kept infected livestock; and 35% by drinking milk without boiling it (Table 3).

Perceived Severity of Brucellosis among Ikpa and Obollo Abattoir workers: Among the respondents, those that believed that contracting brucellosis could prevent them from coming to work for a long time were 34.5%, those who felt that contracting brucellosis could keep them in bed for an extended period were 35.5%, and about nearly the same proportion (35%) were of the opinion that contracting brucellosis could reduce their daily income. In the same vein, 32.5% believed that contracting brucellosis scared them (Table 4).

Perceived barriers to usage of personal protective equipment (PPE) among Ikpa and Obollo Abattoir workers: Not being comfortable seemed to be a major impediment to wearing coverall among 61.5% of the respondents, while 38.5% believed that protective coveralls were too expensive. Of the respondents, 46% asserted that they did not wear protective cover-all because their colleagues did not, while 46% were of the opinion that wearing boots was not conducive for work (Figure 2).

Table 3. Perceived susceptibility to Brucellosis among Ikpa and Obollo abattoir workers in Nsukka Area of Enugu State, Nigeria.

QN	Questions and filters	Strongly Agree or Agree (%)	Strongly Disagree or Disagree (%)
C1	I have an increased chance of contracting brucellosis because of my work	70 (35)	130 (65)
C2	I am at increased risk of contracting brucellosis when i use bare hands to slaughter or butcher livestock	109 (54.5)	91 (45.5)
C3	I am at increased risk of contracting brucellosis when I cut open or come in contact with hygroma fluid.	125 (62.5)	75 (37.5)
C4	I am at increased risk of contracting brucellosis after handling wasted fetus	53 (26.5)	157 (73.5)
C5	I am at increased risk of contracting brucellosis when I keep livestock that has brucellosis	69 (34.5)	131 (65.5)
C6	I am at increased risk of contracting brucellosis when I do not wash my hand after handling aborted fetus/butchering livestock	71 (36.5)	129 (64.5)
C7	I am at increased risk of contracting brucellosis when I drink raw milk	70 (35)	130 (65)

Table 4. Perceived severity of brucellosis among Ikpa and Obollo abattoir workers in Nsukka Area of Enugu State, Nigeria.

QN	Questions and filters	Number that Agree or Strongly Agree (%)	Number that Disagree or Strongly Disagree (%)
D1	Contracting brucellosis can prevent me from coming to work for a long time.	69 (34.5)	131 (65.5)
D2	Contracting brucellosis can keep me in bed for an extended period of time.	71 (35.5)	129 (64.5)
D3	Contracting brucellosis can reduce my daily income	70 (35)	130 (65)
D4	Contracting brucellosis scares me.	65 (32.5)	135 (67.5)
D5	Brucellosis can cause death.	68 (34)	132 (66)

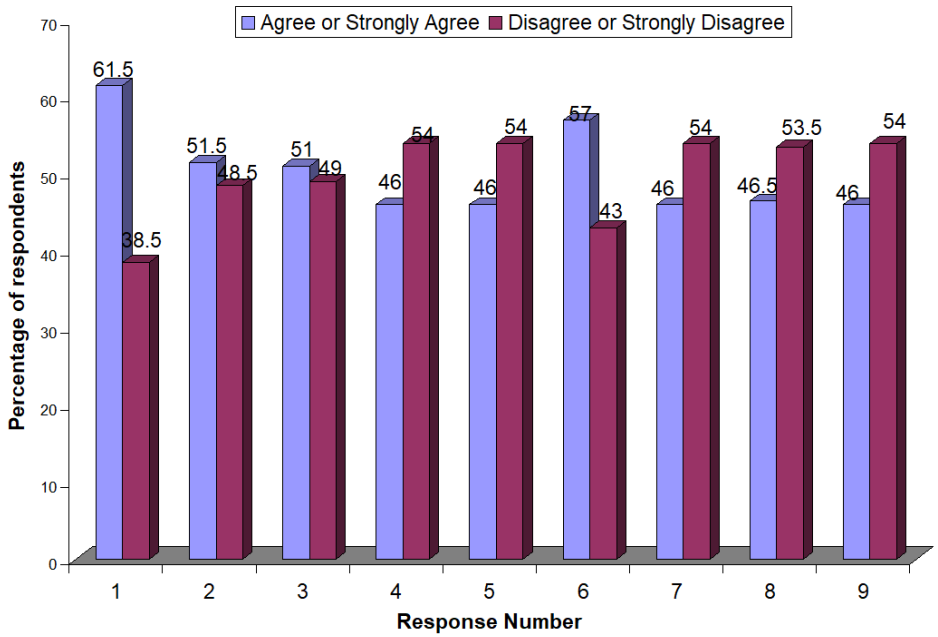

Figure 2: Perceived barriers to use of PPE against exposure to brucellosis among Ikpa and Obollo abattoir workers in Nsukka Area of Enugu State, Nigeria

1 = I can't wear protective overall because they are not conducive for work.
2 = I can't wear protective overall because they are expensive.
3 = I don't wear protective overall because my colleagues do not.
4 = I don't wear boots because they are not conducive for work.
5 = I can't wear boots because it is not the custom where I work.
6 = I can't wear boots because they are expensive.
7 = I don't wear boots because my colleagues do not.
8 = I can't wear hand-gloves during because it is not the custom where I work.
9 = I can't wear hand-gloves because they are expensive.

Self-efficacy in the use of PPE for prevention of exposure to Brucellosis among Ikpa and Obollo abattoir workers: Among the respondents, 69% claimed that they would wear protective booth even if their colleagues did not, however less than 5% were actually observed to be wearing boots. Although 50% claimed not to touch waste fetuses with bare hands, none of them was observed to be wearing gloves. Drinking unpasteurized milk seemed not to be popular among them as 71.5% reported that they could do without drinking milk that was not boiled (Table 5).

Cues to Action in Ikpa and Obollo Abattoirs: Nearly all the respondents agreed that educational programs, radio advertisements and free protective wears would be effective in making the abattoir workers adopt measures that prevent exposure to brucellosis (Table 6).

Table 5. Self-efficacy in the use of PPE for prevention of exposure to brucellosis among Ikpa and Obollo abattoirs workers in Nsukka, Area of Enugu State, Nigeria.

QN	Questions and Filters	Number that Agree or Strongly Agree (%)	Number that Disagree or Strongly Disagree (%)
F1	I can wear protective wear booth always if my colleagues don't	138 (69)	62 (31.0)
F2	I can wear nose masks even if my colleagues don't	107 (54.5)	93 (46.5)
F3	I can wear protective wear even if my colleagues are not	107 (54.5)	93 (46.5)
F4	I can stop touching wasted fetuses even if my colleagues don't	100 (50.0)	100 (50.0)
F5	I can stop buying and slaughtering animals with hygroma even if my colleagues don't.	104 (52.0)	96 (48.0)
F6	I can do without drinking raw milk	143 (71.5)	57(28.5)

Table 6. Cues to actions that can bring about behavioural changes among workers in Obollo-Affor and Ikpa Abattoirs in Nsukka, Area of Enugu State, Nigeria.

QN	Questions and Filters	Number that agree or strongly agree (%)	Number that disagree or strongly disagree (%)
G1	Educational programs would help.	186 (93)	14 (7)
G2	Free protective PPE would help.	200 (100)	0 (0)
G3	Radio advertisements would work.	198 (99)	2 (1)

PPE = personal protective equipment

Discussion

The brucellosis prevalence of 2.75% recorded in this present study concur with earlier reports of the prevalence of brucellosis in indigenous herds in Nsukka (Ogugua and Onunkwo, 2023) and herds from northern parts of Nigeria where the small ruminants slaughtered in the Nsukka Abattoirs originate from (Junaidu *et al.,* 2010; Kaltungo *et al.,* 2015). The prevalence recorded (2.75%) is comparable to 2.83% reported in small ruminants in Nigeria (Ogugua *et al*., 2014), 4.1% reported in Nsukka area by Ekere *et al*. (2018), and 2.5% reported in Sudan by Abdallah *et al*. (2015). The 2.75% prevalence recorded in this present study is however lower than the 11.9% reported in goats in Benue by Shima *et al*. (2015), 19.8% reported in small ruminants in Nasarawa State by Agada *et al*. (2018b), 22.9% reported in goats in Sokoto State by Junaidu *et al*. (2010), and the 16.1% reported in small ruminants in Plateau State by Bertu *et al*. (2010).

The finding in the present study of poor knowledge of brucellosis among the Ikpa and Obollor-Afor abattoir workers (respondents) is in agreement with earlier reports of poor knowledge of brucellosis among abattoir workers in Nigeria (Ayoola *et al*., 2017) and other countries (Kansiime *et al*., 2014; Tschopp *et al*., 2022). Such poor knowledge has been observed to contribute to high risk behaviors among abattoir workers in Nigeria (Hambolu *et al*., 2013). This could contribute to the finding of this study which showed that most of the participants believed in their non-susceptibility to the disease. It is a known fact that individuals with higher levels of threat perception have higher likelihood to comply with recommended public health measures (Park *et al*., 2010), unlike when there is belief in non-susceptibility which inhibits acceptance of recommended behavioral changes to prevent exposure and infection with infectious agents.

In addition, most of the participants believed in the non-severity of the disease. Severity has been identified as one of the predictors of adherence to prescribed behavioral changes that control exposure to diseases such as COVID-19 (Magnan *et al*., 2021; DeDonno *et al*., 2022). It is therefore not surprising that most of the participants engaged in behavioral patterns that exposed them to brucellosis. In the same vein, most participants felt that the inconveniences in wearing PPE and costs of purchasing them outweighed the benefits. All these could be tied to ignorance of the disease and its effects. This lack of belief in non-severity may be due mainly to the fact that in sub-Sahara Africa, most disease diagnosis is based on the observation of clinical signs and not laboratory diagnosis leaving the causes of most obscure diseases to be blamed mostly on the endemic ones (Petti *et al*., 2006), witchcraft (Adegoke, 2008; Jayeola-Omoyeni *et al*., 2015) or other non-verifiable causes (Okechi, 2017). Although suspicion of endemic diseases could lead to further tests, there is the fact that hospitals in Nigeria rarely consider testing for brucellosis (Agada *et al*., 2018a) and thus misdiagnosis and wrong treatment are common (Ducrotoy *et al*., 2014; Ipadeola, 2022). Being characterized by persistent fever, brucellosis may be blamed on a variety of non-verifiable unscientific causes which may lead patient to seek for alternative 'treatments' in prayer houses or from traditional healers (Ng'ang'a, 2022). This poses a major public health problem given that untreated brucellosis results to dangerous complications that may lead to heavy economic costs, reduced quality of life and possibly death.

It was heartwarming to note that nearly all the abattoir workers/respondents in the present study agree that educational programs, provision of free PPE and radio advertisements are valuable cues that can help them make behavioral changes that will minimize the risk of their being infected and transmitting the

disease. This gives hope and opportunity for intervention by government and non-governmental bodies interested in prevention and control of the disease, to institute educational and public enlightenment programs and provide PPE freely to abattoir workers.

Limitations of the study: The Rose Bengal test used in this study to diagnose the disease was not supported by a second test. Also, isolation which is the only method of confirming the disease was not done. However, it has been shown that in areas like Nigeria where routine vaccination is not practiced, the RBT is perfect test for screening for brucellosis (Ducrotoy, 2014).

Conclusion: The study found a brucellosis prevalence of 2.75% in small ruminants slaughtered at Obollo-Affor and Ikpa Abattoirs in Nsukka, Area of Enugu State, Nigeria. The abattoir workers' knowledge of brucellosis was poor, which was translated to their belief in their non-susceptibility to the disease. In addition, only a small percentage of them believed that the disease could be severe. The barriers to the use PPEs were being uncomfortable, expensive among other reasons, although most of the participants believed in their capability to use them. Prompts that could elicit behavioral changes among the participants include education and enlightenment programs through electronic and print media. Educational and enlightenment programs should be instituted, and PPE should be made freely available. Government should make and enforce policies geared towards the prevention and control of brucellosis in Nigeria.

Conflict of interest: The authors declare no conflict of interest.

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