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SEROPREVALENCE OF BANG'S DISEASE IN SOME BOVINES SLAUGHTERED INSIDE AND OUTSIDE ABATTOIRS IN GIZA GOVERNORATE, EGYPT

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Abstract

The aim of this study was to investigate and compare between the Seroprevalence of Bang's disease among the slaughtered bovines inside and outside abattoirs at Giza Governorate. A total of (4716) serum samples (2874 from cattle & 1843 from buffaloes) from nine abattoirs and outside surrounding localities in Giza from January 2017 till January 2019. Serosurvey depended on Buffer Acidified Plate Antigen Test (BAPAT) and Rose Bengal plate test (RBPT) as screening tests and (RBPT) and indirect Enzyme Linked Immunosorbent Assay (ELISA) as confirmatory test. In comparing results inside and outside abattoirs, the total seroprevalence of brucellosis in cattle slaughtered outside abattoirs using ELISA was (3.3%). on the other hand, inside abattoirs the total seroprevalence of brucellosis in cattle was (1.9%). The total seroprevalence of brucellosis in buffaloes slaughtered outside abattoirs using ELISA was (2%), while, inside the abattoirs, the total seroprevalence of Bang's disease in buffaloes was (0.8%). This illustrated higher seoprevalence in bovines slaughtered outside abattoirs than that slaughtered inside abattoirs. All of this caused increasing hazards of animal and zoonotic infection in these areas.
Keywords: Seroprevalence, Bang's disease, abattoirs, bovines, Giza, Egypt

Introduction

An infectious disease affects many animal species and humans names Brucellosis caused by the genus *Brucella* (Schelling, 2003). The disease is also known as contagious abortion or Bang's disease. (USDA, 2019). Losses due to reproductive disorders in animals and increasing human chronic morbidity make Bovine brucellosis as a highly significant economic and public health zoonoses. *(Gwida et al.*, 2016). Tremendous economic impacts in animal production and reproduction due to reduced milk yield, delayed conception, abortions in addition to its zoonotic and public health threat (Aznar *et al.*, 2015).

Brucellosis was recognized for the first time as a zoonotic disease on Island of Malta in the 19th and early 20th centuries. It was reported for the first time in Egypt in 1939, Brucellosis became endemic in most areas of Egypt. (Refai, 2002). Wherever herd concerns associated abortion happens in Egypt, brucellosis should be suspected, because the country is endemic with Bang's disease (Abdelbaset *et al.*, 2018).

Although the disease has a limited geographical distribution, it resembles a major challenge for livestock industry in the Africa, the Mediterranean regions, Asia, and Latin American (Gumi *et al.*, 2013). Bang's disease continues as a leading zoonosis as it causes real reduction of valuable animal protein which is important to human health (Junaidu *et al.*, 2011). The applied control measures are not effective enough to reduce ruminants' infection (Hegazy *et al.*, 2009). According to survey studies in Egypt published between 1948 and 2009, prevalence of brucellosis in bovines nearly was about 5.4 % by BPAT (Gwida *et al.*, 2010). A recent study revealed that the incidence of Bang's disease was 8 % in cattle, 1 % in buffaloes (Horton *et al.*, 2014).

Brucella infection is an occupational disease to veterinarians, animal keepers and slaughterhouse workers etc. Sufficient care should be taken during handling of infected animals or suspected to be infected (Gwida *et al.*, 2016). Abattoirs dedicated for slaughtering infected animal with brucellosis must have trained stuff, persona protective equipments, Chain mail guards to protect against accidental cuts and adequate precautions and preparations for destroying Tissues that are likely to be heavily infected, such as genitalia and udder (WHO, 2006). Wearing personal protective equipments especially protective glasses reduced the risk of brucellosis infection among cattle slaughterhouse workers (Acharya *et al.*, 2018). Recent reports found that the abattoir workers and butchers were the most occupationally at risk due to their close contacts with infected blood and tissues of infected animals. (Awah-Ndukum *et al.*, 2018). Eating of under cooked traditional food such as liver causes human infection, although a low bacterial load contained by animal muscle tissues (Tikare *et al.*, 2008).

Low and delayed compensation for livestock owners in Egypt leads to slaughtering of only 0.2% of animals have Brucellosis seropositivity (Hegazy *et al.*, 2011).

Serological tests used mainly to detect seropositive animals during control plans of Bang's disease. there is no single serological test can find the positive animals in the different stages of Bang's disease, so a combination of serological tests must be used (Ramadan *et al.* 2019). The highest rate of sensitivity was recorded by BAPAT and RBPT serological tests, which recommends the use of these tests as screening tests on animal brucellosis (Montasser *et al.*, 2011). Using RBPT as a screening test for infected herd is an important step for detecting of many infected breeders. (Plumeriastuti and Zamri-Saad., 2012)

The present work aimed to identify and compare the frequency and seroprevalence of Bang's disease among different Bovines slaughtered inside and outside abattoirs in Giza Governorate through application of screening and confirmatory serological tests of Bang's disease on blood samples of the slaughtered cattle and buffalo. In a trial to detect why the transmission of the infection between animals and from animal to humans are increasing, in spite of test and slaughter control policy is used.

Materials and Methods

Study area: Giza governorate is one of the three governorates which consists the great Cairo (Cairo, Giza and Qalyubia) which is the capital of Egypt.

Samples Collection: A total of (4716) cattle and buffaloes blood samples were collected from the slaughtered animals (cattles & buffaloes) under strict hygienic condition from nine (9) abattoirs (El mounib, Kerdasa, Nahya, El Aiat, Oseem, Wardan, Sakara, El Badrashin, and Dahshur) and blood samples from bovines slaughtered outside abattoirs in the same localities as showed in table (1), samples were collected all over two years from January 2017 till January 2019. Study team visited every abattoir one day each week when the number of slaughtered animals was expected to be in the peak. On each visit, study team aimed to collect blood samples from cattle and buffaloes slaughtered during routine work hours of the abattoir. No measures were taken to target specific animals or subgroups of animals in order to exclude any bias. Study team in the same days was asking butchers slaughtering cattle and buffaloes out of abattoirs in the same localities to permit the study team to take blood samples for the purpose of a scientific study. Blood samples were drained from the carotid artery or jugular vein of each animal immediately after slaughtering. Blood samples were sent to the laboratory in the same day, were allowed to clot and the sera were obtained by centrifugation and stored at -20 C° until performing serological tests.

Table 1 : Samples allocation from different abattoirs and localities of Giza governorate.

Bovines slaughtered inside abattoirs				Bovines slaughtered outside abattoirs				Total samples
Abattoir	Cattle	Buffalo	Total samples	Locality	Cattle	Buffalo	Total samples	
El mounib	209	185	394	El mounib	215	76	291	685
Kerdasa	146	54	200	Kerdasa	137	47	184	384
Nahya	186	161	347	Nahya	196	52	248	595
El Aiat	207	122	329	El Aiat	223	105	328	657
Oseem	164	113	277	Oseem	171	114	285	562
Wardan	89	55	144	Wardan	92	45	137	281
Sakara	91	41	132	Sakara	72	29	101	233
El Badrashin	201	283	484	El Badrashin	309	277	586	1070
Dahshur	96	43	139	Dahshur	69	41	110	249
Total	1389	1057	2446	Total	1484	786	2270	4716

Serological Examination:

Buffered acidified plate antigen test (BAPAT) :

All the examined cows and buffaloes' serum samples were tested using buffered acidified plate antigen (BAPA) provided by Veterinary Serum and Vaccines Research Institute (VSVRI) (Abbasia Laboratories, Abbasia, Cairo, Egypt). Any degree of agglutination was considered positive results (OIE, 2015).

Rose Bengal Plate Test (RBPT):

All tested serum samples were examined using antigen stained with rose Bengal and buffered to a low pH, 3.65 ± 0.05 (IDEXX Laboratories, Pourquier, Hoofddorp, the Netherlands) any degree of agglutination was considered as positive results. The serum samples and antigen were carried at room temperature (22°C ± 4°C) (OIE, 2016).

ELISA Test:

ELISA antigen was supplied from Synbiotics Europe 2, rue Alexander Fleming 69007 Lyon – France. Serum samples were performed by ELISA as mentioned by Jimenez *et al.* (1992).

Statistical analysis:

Chi-square statistic was used and ($p<0.05$) using IBM® SPSS statistic version 20 (SPSS Inc., Chicago, Illinois, USA).

NS: Non-significant ($P > 0.05$).

OR = Odds Ratio, which is considered as a measure of association used to quantify the relative risk of one category to another.

Interpretation of the Odds Ratio (OR): The higher the odds, the higher the risk of such category to disease occurrence.

OR = 1: The exposure (risk factor) is not associated with outcome or disease.

(Or, No association between the disease and risk factor).

OR > 1: Increased exposure (risk factor) accompanies increased outcome or disease.

(Or, a positive association between the disease and risk factor).

OR < 1: Increased exposure (risk factor) accompanies decreased outcome or disease. (Or, a negative association between the disease and risk factor).

Results and Discussion

A total (4716) cattle and buffaloes blood samples were collected from the slaughtered bovines (cattle & buffaloes) as showed in table (1) and examined serologically.

Fig (1) and Fig (1) as Table (2) and Table (3) illustrated seroprevalence of Bang's disease in bovines slaughtered inside versus outside abattoirs.

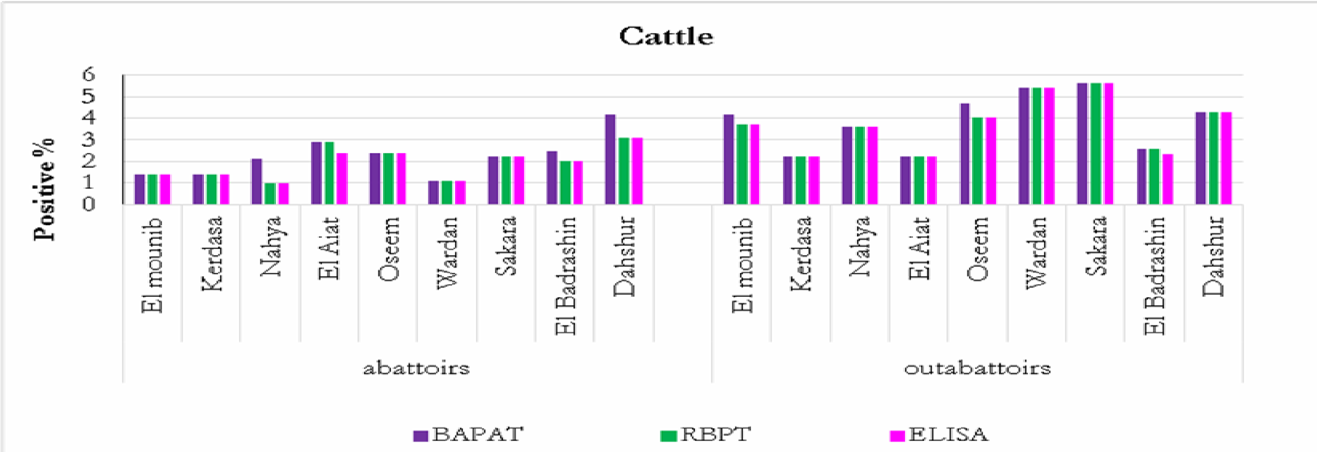

Fig. 1 : Seroprevalence of Bang's disease in cattle slaughtered inside versus outside abattoirs

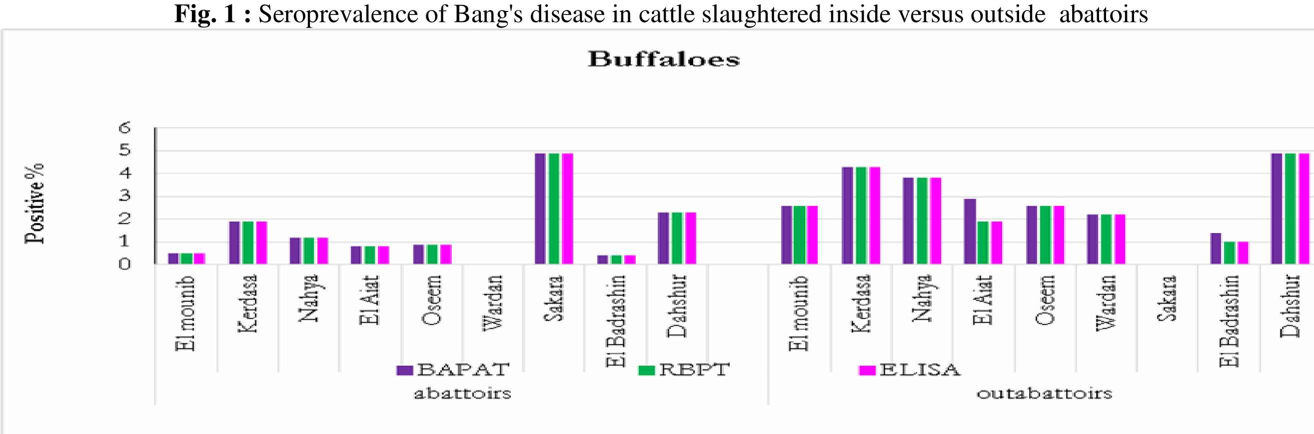

Fig. 2 : Seroprevalence of Bang's disease in Buffaloes slaughtered inside versus outside abattoirs

Table 2 : Seroprevalence of Bang's disease in bovines slaughtered inside abattoirs.

Abattoir	Cattle							Buffaloes						
	No.	BAPAT		RBPT		ELISA		No.	BAPAT		RBPT		ELISA	
		+Ve	%	+Ve	%	+Ve	%	+Ve	%	+Ve	%	+Ve	%	+Ve
El-mounib	209	3	1.4	3	1.4	3	1.4	185	1	0.5	1	0.5	1	0.5
Kerdasa	146	2	1.4	2	1.4	2	1.4	54	1	1.9	1	1.9	1	1.9
Nahya	186	4	2.1	2	1	2	1	161	2	1.2	1	1.2	1	1.2
El Aiat	207	6	2.9	6	2.9	5	2.4	122	1	0.8	1	0.8	1	0.8
Oseem	164	4	2.4	4	2.4	4	2.4	113	1	0.9	0	0.9	0	0.9
Wardan	89	1	1.1	1	1.1	1	1.1	55	0	0	0	0	0	0
Sakara	91	2	2.2	2	2.2	2	2.2	41	2	4.9	2	4.9	2	4.9
El Badrashin	201	5	2.5	4	2	4	2	283	1	0.4	1	0.4	1	0.4
Dahshur	96	4	4.2	3	3.1	3	3.1	43	1	2.3	1	2.3	1	2.3
Total	1389	31	2.2	27	1.9	26	1.9	1057	10	1	8	0.8	8	0.8

BAPAT: buffer acidified plate antigen test RBPT: Rose Bengal plate test ELISA: Enzyme Linked Immunosorbent Assay

Table 3 : Seroprevalence of Bang's disease in bovines slaughtered outside abattoirs in relation to localities.

Locality	Cattle							Buffaloes						
	No.	BAPAT		RBPT		ELISA		No.	BAPAT		RBPT		ELISA	
		+Ve	%	+Ve	%	+Ve	%	+Ve	%	+Ve	%	+Ve	%	+Ve
El mounib	215	9	4.2	8	3.7	8	3.7	76	2	2.6	2	2.6	2	2.6
Kerdasa	137	3	2.2	3	2.2	3	2.2	47	2	4.3	2	4.3	2	4.3
Nahya	196	7	3.6	7	3.6	7	3.6	52	2	3.8	2	3.8	2	3.8
El Aiat	223	5	2.2	5	2.2	5	2.2	105	3	2.9	2	1.9	2	1.9
Oseem	171	8	4.7	7	4	7	4	114	3	2.6	3	2.6	2	2.6
Wardan	92	5	5.4	5	5.4	5	5.4	45	1	2.2	1	2.2	1	2.2
Sakara	72	4	5.6	4	5.6	4	5.6	29	0	0	0	0	0	0
El Badrashin	309	8	2.6	8	2.6	7	2.3	277	4	1.4	3	1	3	1
Dahshur	69	3	4.3	3	4.3	3	4.3	41	2	4.9	2	4.9	2	4.9
Total	1484	52	3.5	50	3.3	49	3.3	786	19	2.4	17	2.2	16	2

BAPAT: buffer acidified plate antigen test RBPT: Rose Bengal plate test ELISA: Enzyme Linked Immunosorbent Assay

Bang's disease is an emerging threat and one of the most widespread pandemic zoonoses, especially in the developing countries including Egypt. Despite its potential impact on public health, the epidemiologic situation of Brucellosis in Egypt is still un controlled and vindicated further investigation (Warith, 2014). In this study, there was no isolation nor typing of the organisms infected large ruminants however, *B. melitensi*s is the predominant Brucella species in Egypt causing Bang's disease (Ramadan and Ibrahim, 2014 & Ramadan and Gafer, 2016).

Hosien *et al.* (2018) evaluated the control program of animal brucellosis of General Organization of Veterinary Services in Egypt during an outbreak investigation of brucellosis in buffalo and concluded that spread of infection to other localities occurs especially under husbandry system allowing mixed rearing of different sex, ages, aborted and pregnant, unhygienic conditions and lack of controlled movement of animals.

In table (2) results of seroprevalence of Bang's disease in bovines slaughtered in abattoirs by different serological tests illustrated that seroprevalence of Bang's disease in cattle was higher than seroprevalence in buffaloes by BAPAT in seven abattoirs (El mounib, Nahya, El Aiat, Oseem, Wardan,, El Badrashin, and Dahshur) as they were consequently (1.4%, 2.1%, 2.9%, 2.4%, 1.1%, 2.5%, 4.2%) versus (0.5%, 1.2%, 0.8%, 0.9%, 0%, 0.4%, 2.3%). Just only two abattoirs (Sakara and Kerdasa) had a higher seroprevalence in buffaloes (4.9% and 1.9%) than cattle (2.2% and 1.4%). Cattle seroprevalence In the nine abattoirs (El mounib, Kerdasa, Nahya, El Aiat, Oseem, Wardan, Sakara, El Badrashin, and Dahshur) by RBPT and ELISA they were (1.4%, 1.4%, 1%, 2.9%, 2.4%, 1.1%, 2.2%, 2%, and 3.1%) and (1.4%, 1.4%, 1%, 2.4%, 2.4%, 1.1%, 2.2%, 2% and 3.1%) respectively . Buffaloes seroprevalence in the same abattoirs by BAPAT, RBPT and ELISA was (1%, 1%, 2%, 1%, 1%, 0%, 2%, 1% and 1%), (1%, 1%, 1%, 1%, 0%, 0%, 2%, 1%and 1%) respectively. Sero prevalence in buffaloes was significantly lower than that of cattle as showed in table (5). These results agree with Refai (2002) who mentioned that percentage of brucellosis in buffalo cows was always very low during the last 50 years. Low incidence of Bang's disease in buffaloes also, ranged between 0.24 % and 0.48 % in Egypt were recorded by El-Taweel, (1999). A study in Trinidad and Tobago illustrated that buffaloes are more resistant to *B. abortus* infection and cattle are more susceptible (Adesiyun *et al.* 2010 and Adesiyun *et al.* 2011). Also, Nassar *et al.* (2019) attributed the low prevalence of brucellosis in buffaloes may be attributed to the few number of buffaloes intensive farms in comparison with cows. The major population of buffaloes in Egypt is still characterized by individuality, the resistance of buffaloes to certain extent, they recorded a seroprevalence by RBPT equal 1.8% versus 2.3% in cows. On the other hand, Refai *et al.*, (1989) recoded high prevalence of positive reactors in buffaloes were 10.2%. Variation in the seroprevalence is related to the rate of exposure, sex, course of the diseases, locality, reproductive status, vaccination strategies and different diagnostic techniques (Ghazi *et al.*, 2006). Genetic variation within the host may have a role in the resistance to brucellosis (Silva *et al.*, 2013). Gene Nramp1 which control the replication of *B. abortus* inside the macrophages is involved in resistance of water buffaloes to *B. abortus* (Borriello *et al.*, 2006)

In this work, the results showed that RBPT and BAPAT showed high rate of sensitivity as screening tests. These findings agreed with El-Gibaly (1993) & Montasser *et al.* (2011) and Koriem *et al.* (2013). On the other hand, other studies illustrated that BAPAT was more accurate and sensitive than the other traditional tests for Bang's disease screening in bovine serum (Angus and Barton 1984 & Gall and Nielsen 2004); this may be due to the partial instability of some antigen preparations used in the other serological tests. In addition, MacMillan, (1990) and Rabehi *et al.* (2018) reported that the RBPT antigen when repeatedly cycled between refrigerator and room temperature during use may be deteriorated. This agrees with that ELISA was the most sensitive test (Saz *et al.*, 1987). The test is easy to perform, rapid and can be automated (Osoba *et al.*, 2001). Furthermore, ELISA is a precious and dependable addition of brucellosis serological tests (Sayour, 1995).

The arrangement of cattle seroprevalence in different abattoirs by RBPT illustrated that Dahshur abattoir has the highest seroprevalence (3.1%) followed respectively by El Aiat abattoir (2.9%), Oseem abattoir (2.4%), Sakara abattoir (2.2%), El Badrashin abattoir (2%), Elmounib abattoir (1.4%), Kerdasa abattoir (1.4%), Wardan abattoir (1.1%), and the lowest seroprevalence was recorded in Nahya abattoir (1%). By ELISA the same arrangement was recorded with only a slight decrease of seroprevalence in El Aiat abattoir from (2.9%) by RBPT to (2.4%) by ELISA. These results agree with results recorded in other localities in Egypt by Ramadan *et al.* (2019) and Nassar *et al.* (2019). On the other hand, results in this study were lower than that obtained by Montasser *et al.* (2001) and Abdelbaset *et al.* (2018) they recorded that the percentage among cattle was 10%, 7.75% by using BAPAT, RBPT at south provinces of Egypt. These results of seroprevalence of bovines in table (2) revealed that the high prevalence of Bang's disease indicated that the Bang's disease infection was wide spread in cattle marketed in some localities in Giza governorate which represents a significant risk to public health especially abattoir workers and veterinarians.

In table (3) results of seroprevalence of Bang's disease in bovines slaughtered outside abattoirs by different serological tests illustrated that seroprevalence of Bang's disease in cattle by BAPAT In the nine localities out of abattoirs of (El mounib, Kerdasa, Nahya, El Aiat, Oseem, Wardan, Sakara, El Badrashin, and Dahshur) was (4.2%, 2.2%, 3.6%, 2.2%, 4.7%, 5.4%, 5.6%, 2.6% and 4.3%). By RBPT they were (3.7%, 2.2%, 3.6%, 2.2%, 4%, 5.4%, 5.6%, 2.6% and 4.3%). ELISA showed these results respectively (3.7%, 2.2%, 3.6%, 2.2%, 4%, 5.4%, 5.6%, 2.3% and 4.3%). Seroprevalence in buffaloes was by BAPAT (2%, 2%, 2%, 3%, 3%, 1%, 0%, 4%, and 2%). By RBPT they were (2%, 2%, 2%, 2%, 3%, 1%, 0%, 3%, and 2%). By ELISA results were (2.6, 4.3, 3.8, 1.9, 2.6, 2.2, 0, 1 and 4.9) respectively. These results were lower than that were recorded by AL-Habaty *et al.* (2015) who recorded 10.23% seroreactive in cattle and 2.91% in buffaloes by BAPAT and RBPT where all animals were slaughtered outside abattoirs in Assiut governorate. Difference in results may be attributed to difference in localities. Ayoola *et al.* (2017) recorded higher results (Seroprevalence by RBT was 7.8% of bovine brucellosis in slaughtered cattle) in Ibadan, South-Western Nigeria

In comparing results inside and outside abattoirs, the highest seroprevalence of Bang's disease in cattle slaughtered outside abattoirs using ELISA was in Sakara (5.6%). This reflects increasing hazards of zoonotic infection in this area. Followed by Wardan, Dahshour, Oseem, El mounib, Nahya, El badrashin, El Aiat and kerdasa with seroprevalence (5.4%, 4.3%, 4%, 3.7%, 3.6%, 2.3%, 2.2% and 2.2%) respectively. on the other hand, inside the abattoirs, the highest seroprevalence of Bang's disease in cattle was in Dahshour (3.1) followed by El Aiat, Oseem, Sakara, El badrashin, El mounib, kerdasa, Wardan and Nahya. (2.4%, 2.4%, 2.2%, 2%, 1.4%, 1.4%, 1.1% and 1%). The highest seroprevalence of Bang's disease in buffaloes slaughtered outside abattoirs using ELISA was in Dahshur (4.9%). This reflects elevating hazards of zoonotic infection in this area. Followed by Kerdasa, Nahya, El mounib, Oseem, Wardan., El Badrashin and Sakara with seroprevalence (4.3%, 3.8%, 2.6%, 2.6%, 2.2%, 1.9%, 1% and 0%) respectively. on the other hand, inside the abattoirs, the highest seroprevalence of Bang's disease in buffaloes was in Sakara (4.9%) followed by Dahshur, kerdasa, Nahya, Oseem, El Aiat, El mounib, El badrashin, and Wardan (2.3%, 1.9%, 1.2%, 0.9%, 0.8%, 0.5%, 0.4% and 0%). The results revealed that the seroprevalence of Bang's disease was higher in cattle than in buffalo. This may be due to that buffaloes have more resistant to the disease than cattle (Fosgate *et al.*, 2011). The results assure that seroprevalence of Bovines (cattle and Buffaloes) slaughtered outside abattoirs is significantly higher than that slaughtered inside abattoirs. These results may be attributed to the negative attitudes and practices of small house holders in Egypt towards the infected or suspected to be infected animals with brucellosis due to unfair compensation. Some farmers sell animals which they suspect that they are infected with Bang's disease to butchers or at market (Holt *et al.*, 2011). Low compensation was estimated by (Holt *et al.*, 2011) and (Eltholth *et al.*, 2015) with an average of 3,876 LE which is less than 20% of the real price of the slaughtered animal. Nassar *et al.* (2019) recorded that Egyptian house holders prefer to sell infected or suspected to be infected animals to butchers than notifying veterinary authorities due to unfair compensation.

These practices increase hazards of zoonotic infection with *Brucella* species (Uche and Agbo, 1985). These negative attitudes of animal house holders is accompanied by other negative attitudes and practices of some butchers which slaughter animals outside abattoirs dedicated to slaughter infected animals or any other abattoir.

As for statistical analysis, Table 4 illustrated the risk factor associated with brucellosis serological status in serum samples of examined animals. Inside abattoirs, there were significant differences (P < 0.05) among the three serological examinations (BAPAT, RBPT, ELIZA) While there was no significance (P > 0.05) them outside the abattoirs. These results insured by chi square values (table 4) which represented higher significance (P< 0.01)within tested animals by using BAPAT and RPPT while moderate significance was detected (p<0.05) among tested animals by using ELIZA test inside the abattoirs. On the other hand, no significance was detected (P>0.05). Also P value insured these results (table 4) where all P values detected were lower than 0.05 inside while they were higher than 0.05 outside. it may be worth to mention that when P value is lower than 0.05 ,that means a significant value is detected.

Table 4 : Risk factors associated with brucellosis serological status in examined cattle and buffaloes serum samples

Odds ratio positive/negative Cows vs buffaloes		OR (cows vs Buffaloes)	P - value	df	Chi-square value	No. of examined sample	Serological test	
0.560	1.339	0.418	0.014	1	6.021**	2446	BAPAT	Inside abattoirs
0.525	1.366	0.385	0.014	1	5.996**	2446	RPPT	
0.541	1.353	0.400	0.020	1	5.444*	2446	ELIZA	
0.767	1.125	0.682	0.157	1	2.003NS	2270	BAPAT	outside abattoirs
0.727	1.146	0.634	0.106	1	2.611NS	2270	RPPT	
0.705	1.158	0.609	0.085	1	2.962NS	2270	ELIZA	

* : Significant at p ≤ 0. df : Degree of freedom OR : Odds ratio

** : highly significant at p ≤ 0.01 NS: Non significant p>0.05

As for risk value (OR) in table 4, results indicated that all values of cows inside and outside were more than (1.00) which indicated that a positive association between the disease and the risk. That means increased exposure accompanies with increased disease. While in buffaloes that was not the case where the values of (OR) were lower than (1.00) which indicated negative association between the disease and the risk factors.

Table 5 illustrated the seroprevalence of animal brucellosis inside versus outside abattoirs by using BAPAT. There was no significant effect (P>0.05) between the two species (cows and buffaloes) inside the abattoirs while that was not the case outside the abattoirs where there was a significant difference between the two species (P<0.05) outside the abattoir.

Table 5 : Seroprevalence of cattle and buffaloes brucellosis inside versus outside abattoirs

Means of animals	ELIZA		Means of animals	RBPT		Means of animals	BAPA T		Place / Animals
	Outside abattoirs	Inside abattoirs		Outside abattoirs	Inside abattoirs		Outside abattoirs	Inside abattoirs	
2.79^{A}	3.70^{a}	1.89^{b}	2.84A	3.73^{a}	1.94^{b}	3.0556^{a}	3.87^{a}	2.24^{b}	Cattle
1.33^{B}	1.78^{a}	0.89^{b}	1.39B	1.89^{b}	0.89^{b}	1.611^{b}	2.11^{b}	1.11^{b}	Buffaloes
	2.74^{A}	1.39^{B}		2.81^{A}	1.42^{B}		2.99^{A}	1.68^{B}	Means of place
0.61	0.61		0.63	0.63		0.70	0.70		LSD
0.86			0.88			0.99			LSD of interaction means

Examined animals inside abattoirs are 2446 (1389 cattle and1057 buffaloes) Means with the same letter are not significantly different

Examined animals outside abattoirs are 2270 (1484cattle and786 buffaloes)

Small litters: Significance of the Interaction Capital litters: Significance of main Means

Also highly significant difference (P<01) was detected between the two places (inside and outside) by using BAPAT. The same results were detected when using the other two tests. All results in table 5 indicated that there were highly significant difference (P<01) in response to disease between the two species.

Conclusion

Bang's disease was significantly wide spread in ruminants slaughtered out of abattoirs more than that slaughtered inside abattoirs in Giza Governorate. Unfair compensation leads to bad attitude of animal householders who prefer to sell infected or suspected to be infected animals to bluchers. Lack of strict censorship and supervision on butcher shops encourages butchers to slaughter such animals outside abattoirs. The absence of pre and post mortem examination and inspection, unhygienic disposal of blood, genital organs, and edible offal during out abattoir slaughter increase hazards of zoonotic and from animal to animal infection and environmental pollution. Plans for removing obstacles to safe slaughtering in abattoirs must start immediately .Strict measures must be taken to prevent slaughtering outside slaughterhouses to control disease in animals and humans.

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Author Disclosure Statement

There are no competing financial interests. The authors expressed their own views.

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