

# Seroprevalence study of Animal Brucellosis in New Valley Governorate, Egypt.

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**ABSTRACT:** Brucellosis is one of the serious infectious bacterial diseases endemic in Egypt, as it makes great economic losses because it makes high rates of abortion and infertility. This work intended to detect the seroprevalence of animal Brucellosis in the New Valley governorate. From March 2022 to May 2023, a cross-sectional examination investigating the seroprevalence of Brucellosis in various animals was carried out in the five centers of the New Valley governorate, Egypt. 954 serum samples from various animals (250 cattle, 100 camels, 335 sheep, and 269 goats) were collected in total. According to a serological analysis of serum samples, the prevalence of Brucellosis in cattle, camels, sheep, and goats using the Rose Bengal Plate test (RBPT) was, respectively, (8, 12, 14.6, and 16.7%). Summer was the season with the highest Brucellosis prevalence (42.6%). El-Dakhla has the highest level of Brucellosis prevalence (26.3%). In sheep, goats, cattle, and camels, the prevalence of Brucellosis was highest in the age groups of (<2, ≤1, ≤3, and < 3-5 year), respectively. Moreover, the prevalence of Brucellosis was greater in females than in males (13.5 and 11.7%, respectively). As a result, age, locality, sex, and season are the most important danger elements that can significantly affect the seroprevalence of animal Brucellosis.

**KEYWORDS:** Brucellosis, prevalence, risk factors, New Valley governorate.

## 1. Introduction

Brucellosis is an extremely transmittable disease primarily in cattle, buffalo, camels, sheep, goats, and swine and secondarily in humans. This disease is caused by *Brucella* species and clinically characterized by sexual organ and fetal membrane inflammation, retained placenta, and a high rate of infertility. The most prominent signs are an abortion during the final trimester, followed by decreased milk production and elevated body temperatures in cattle. One of Egypt's most economically important endemic infectious illnesses is Brucellosis [1, 2, 3, 4, 5]. A tiny, Gram negative, not motile, non-spore-forming intracellular microorganism named *Brucella* has the ability to infiltrate cells such as dendritic cells, macrophages, placental trophoblasts, and epithelial cells. Recently, 12 species of *Brucella* have been identified [6, 7]. Diagnosis of Brucellosis is grounded on recognition of *Brucella* lipopolysaccharides exact antibodies in serum specimen using serological investigations. Practically, the condition is diagnosed using serological techniques. It is useful for monitoring and eradication programs' herd screening.[8, 9]. The Rose

Bengal plate test (RBPT) is the widely used serological investigation for screening of Brucellosis, as it is rapid, low cost, easy application, highly sensitive and apparent simplicity to reading [10, 11, 12, 13]. However, because to the similarities between the LPS-O chain of *Brucella* and other Gram-negative bacteria as *Escherichia coli* O157, *Vibrio cholera*, *Francisella tularensis*, and *Yersinia enterocolitica*, false-positive results are taken into consideration to be a diagnostic issue[14]. This study aimed to examine the seroprevalence of animal Brucellosis in New Valley governorate, in addition to, studying the most important risk factors that can affect the seroprevalence of animal Brucellosis as age, locality, sex, and season.

## 2. Material and method

### 2.1. Study area

The New Valley Governorate, Egypt's biggest governorate, was the site of this investigation. It is a border governorate with semi-arid weather and is located in the southwestern portion of the country, between the Nile, northern Sudan, and southeastern Libya as shown in Fig. 1. The study

included the five centers of the New Valley governorate (El-Dakhla, El-kharga, Balat, El-Farafra, and Paris).

## 2.2. Animals

Between March 2022 and May 2023, 954 serum specimens from cows, sheep, goats, and camels were studied.

## 2.3. Spicemen collection and processing

Five ml of blood was gathered from every animal that was examined (not previously vaccinated against Brucellosis) by jugular vein puncture on vacutainer tubes without EDTA kept to clot, and serum was separated by centrifuging at 3000 rpm for 15 minutes. The separated serum was labeled and transported on an ice box to the Central Laboratory for Evaluation of Veterinary Biologics (CLEVB) and preserved at  $-20^{\circ}$  until used for RBPT. The number of collected serum samples from different animals was shown in Table 1.

## 2.4. Serological examination of serum spicemen by Rose Bengal Test

[15] The reagent was graciously provided by the Veterinary Serum and Vaccine Research Institute, Abbassia, Cairo, Egypt. All analyzed serum samples (954) were analyzed using antigen stained with Rose Bengal and buffered to a low pH ( $3.65 + 0.05$ ). The test was carried out by simply adding of the tested serum and the reagent to the plate, mixing them completely with a glass rode or toothpick, shaking the plate for four minutes with an electric rocker, and then recording the level of agglutination. If agglutination was identified, the results were regarded positive; if none was, they were deemed negative.

## 2.5. Ethical approval

Samples collection was approved by Institutional Review Board (IRB) with Local Approval Number (04-2023-200248).

## 3. Results and Discussion

Animal Brucellosis is an important zoonotic infectious bacterial illness for both public health and economic value. This disease characterized by localized inflammatory lesions of various tissues, inflammation of the reproductive

**Table 1:** Number of serum specimen examined from animals in five centers of the New Valley governorate during the study period.

Localities	Animals				Total
	Cattle	Camel	Sheep	Goats	
El-Dakhla	65	44	53	49	211
El-kharga	29	0	57	13	99
El- farafra	46	56	56	54	212
Balat	65	0	142	128	335
Paris	45	0	27	25	97
<b>Total</b>	<b>250</b>	<b>100</b>	<b>335</b>	<b>269</b>	<b>954</b>

**Table 2:** Overall prevalence of Brucellosis among animal species using RBPT.

Animal	No	Positive	%
Cattle	250	20	8
Camel	100	12	12
Sheep	335	49	14.6
Goat	269	45	16.7
<b>Total</b>	<b>954</b>	<b>126</b>	<b>13.2</b>

organs and fetal membranes, abortion, and sterility[16, 17]. In this study, the New Valley governorate's seroprevalence of Brucellosis in various animals was assessed using the RBPT . The data presented in Table 2 showed that the seroprevalence of Brucellosis in cattle is 8%. These results are in harmony with [18] who indicated that the prevalence of cattle Brucellosis in the New Valley governorate was 10.56%. On the other hand,[19] that the seroprevalence of cattle Brucellosis in Dakahlia governorate was 29%. Much lower results were reported in some previous studies of bovine Brucellosis in Iran, Cameroon and China by 0.001, 3.3, and 1.9% respectively [20, 21, 22]. Additionally, overall infection rate in camels in this study was 12%. A higher result (19%) was reported in Dakahlia governorate [19] . However, the lower result (4.04%) was documented in the North Western Coastal area [23]. The data illustrated in Table 2 indicate that the seroprevalence of sheep Brucellosis was (14.6%). A similar result was documented in Assiut and North Western Coastal area by (15.87%) and, (13.50%) respectively [24, 23]. However, lower result was documented in several previous studies (7.2, 3.89, 11 and, 9.09%) [18, 25, 26, 27]. demonstrated that the seroprevalence of sheep Brucellosis was (28%). Moreover, the results obtained in Table 2 revealed that the highest infection rate was reported in goats at a rate

**Table 3:** Seroprevalence of Brucellosis between animal species in pertaining to season.

Animal Species	Winter			Spring			Summer			Autumn		
	No	+ve	%	No	+ve	%	No	+ve	%	No	+ve	%
Cattle	26	4	15.4	189	15	7.9	6	0	0	29	1	3.4
Sheep	86	0	0	126	17	13.5	52	22	42.3	71	10	14
Goat	79	17	21.5	125	18	14.4	10	7	70	55	3	5.5
<b>Total</b>	<b>191</b>	<b>21</b>	<b>10.9</b>	<b>440</b>	<b>50</b>	<b>11.4</b>	<b>68</b>	<b>29</b>	<b>42.6</b>	<b>155</b>	<b>14</b>	<b>9</b>

**Table 4:** Seroprevalence of Brucellosis among animal species in pertaining to locality.

Animal	El-Kharga			El Dakhla			Paris			Balat			El-Farfra		
	No	+ve	%	No	+ve	%	No	+ve	%	No	+ve	%	No	+ve	%
Cattle	29	0	0	65	7	10.7	45	0	0	65	9	13.8	46	4	8.7
Sheep	57	18	31.5	53	15	28.3	27	0	0	142	6	4.2	56	10	17.8
Goat	13	0	0	49	22	44.9	25	1	4	128	18	14	54	4	7.4
Camels	0	0	0	44	3	6.8	0	0	0	0	0	0	56	9	16.07
<b>Total</b>	<b>99</b>	<b>18</b>	<b>18.2</b>	<b>211</b>	<b>47</b>	<b>22.3</b>	<b>97</b>	<b>1</b>	<b>1.03</b>	<b>335</b>	<b>33</b>	<b>9.8</b>	<b>212</b>	<b>27</b>	<b>12.7</b>

**Table 5:** prevalence of Brucellosis in sheep and goats in pertaining to age

Age (year)	sheep			Goats		
	No.	+ ve	%	No.	+ ve	%
≤1	72	8	11	72	13	18
1-2	80	7	8.7	70	10	14.3
≥2	183	34	18.5	127	22	17.3
<b>Total</b>	<b>335</b>	<b>49</b>	<b>14.6</b>	<b>269</b>	<b>45</b>	<b>16.7</b>

**Table 6:** prevalence of Brucellosis in cattle and camels in pertaining to age.

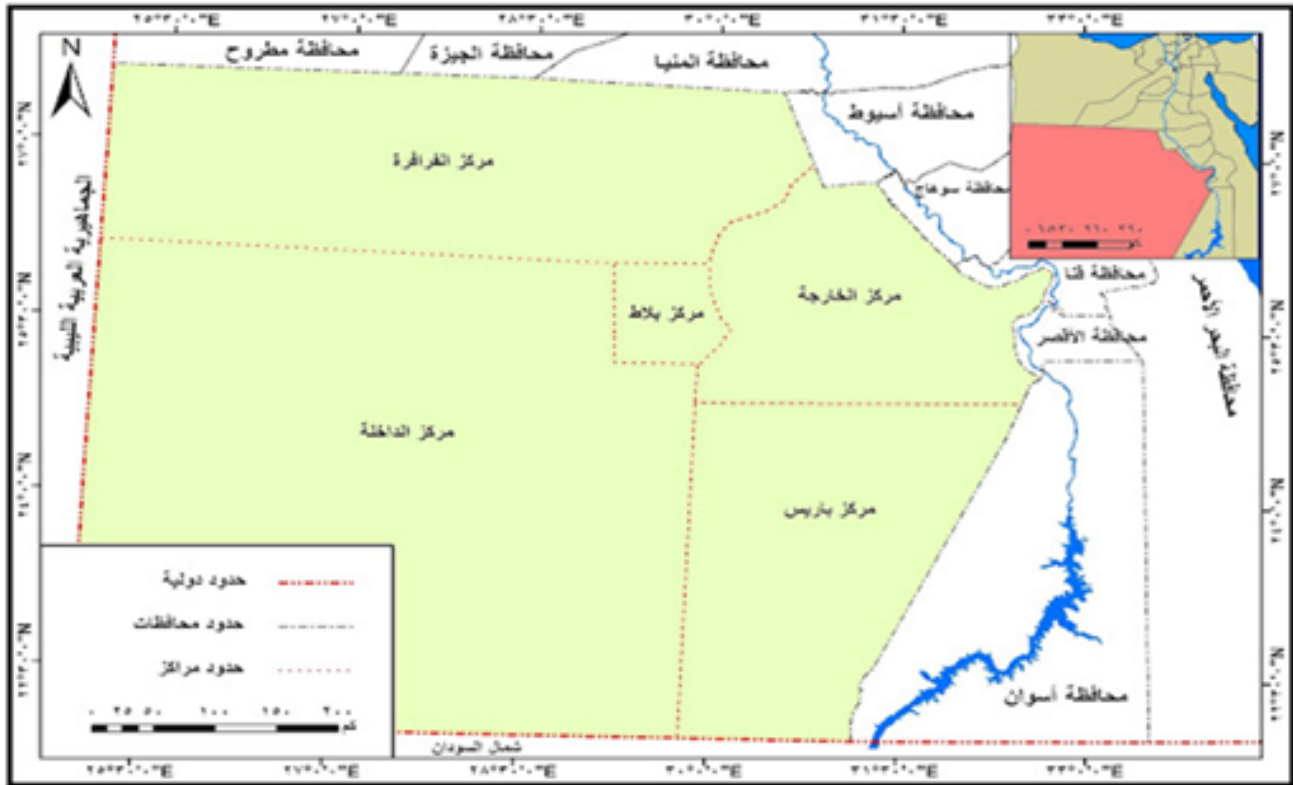
Age (year)	Cattle			Camels		
	No.	+ ve	%	No.	+ ve	%
≤3	69	7	10.14	41	2	4.8
3-5	75	4	5.3	10	3	30
≥6	106	9	8.5	49	7	14.3
<b>Total</b>	<b>250</b>	<b>20</b>	<b>8</b>	<b>100</b>	<b>12</b>	<b>12</b>

**Table 7:** prevalence of Brucellosis in animal species in pertaining to sex

Animal	Female			Male		
	No	+ ve	%	No	+ ve	%
<b>Cattle</b>	<b>229</b>	<b>19</b>	<b>8.3</b>	<b>21</b>	<b>1</b>	<b>4.8</b>
<b>Camel</b>	<b>79</b>	<b>11</b>	<b>13.9</b>	<b>21</b>	<b>1</b>	<b>4.8</b>
<b>Sheep</b>	<b>273</b>	<b>43</b>	<b>15.8</b>	<b>62</b>	<b>6</b>	<b>9.7</b>
<b>Goat</b>	<b>228</b>	<b>36</b>	<b>15.8</b>	<b>41</b>	<b>9</b>	<b>21.9</b>
<b>Total</b>	<b>809</b>	<b>109</b>	<b>13.5</b>	<b>145</b>	<b>17</b>	<b>11.7</b>

of (16.7%). On the other hand, much higher results were recorded by some authors (25.62%) and (20%) [19, 23]. On the contrary, lower rates of infection were detected

in goats in the New Valley Governorate (7%) [18]. The season of the year had a clear impact on the infection rates in animals as shown in Table 3, where the highest infection in the summer (42.6%) and the lowermost infection rate was noted in autumn (9%). These results incompatible with [28] who demonstrated that rate of infection in the tested animal in Ethiopia was high in the wet season than in the dry season. Additionally, [26] recorded that the rate of infection was high in winter (16.51%). The results recorded in Table 4 indicate that locality has an impact on infection rates with *Brucella* in animals, where the highest rate of infection was recorded at El-Dakhla center 22.3%. The ecological variations have been told to influence the Brucellosis prevalence [29, 26, 30, 23]. In the study of the influence of age on the infection rate of animals with Brucellosis, the results in Table 5 indicate that the highest rate of infection was detected in the age group > 2 in sheep (18.5%) while in goats, the age group ≤ recorded the highest rate of infection (18%). These results agreed with Sayed et al. (2010) who showed that the top rate of infection among sheep was at the age > 2 y In the study of the influence of age on the rate of infection of goats with Brucellosis, the results in Table 5 indicate that the highest infection rate was detected in the age group ≤1 which recorded the highest rate of infection



**Figure 1:** The location and borders of the New Valley governorates.

(18%). These results compatible with [31, 32, 23]. who showed that the highest rate of infection among goats was at young animals than adults. On the contrary, higher rates of infection were detected in goats at age > 1.5 year by [18, 33] and higher rates of infection were detected in goats at age > 4 year by [34]. Also, the age factor has an impact on the infection rates in cattle and camels as recorded in Table 6, where the highest rate of infection in camels was (30%) in the age group < 3-5. While in the cows, the highest prevalence rate was in the age group  $\leq 3$ . Age group  $\leq 3$  showed the highest infection rate in cattle (10.14%). These results disagreed with [18] who revealed that the highest infection rate amongst cattle was at age < 1 year by 25%. The highest infection rate in camels was (30%) in the age group < 3-5. On the contrary, higher rates of infection were detected in camels at age 8-11 years by (19.1%) [35]. The rate of infection in females and males was represented in Table 7 and the infection rate was high in females (13.5%). These results agreed with (Sayed et al., 2010; Alhamada et al., 2017; Diab et al., 2018; Nguna et al., 2019). On the other hand, These results are not

consistent with [25, 23, 35] who indicated that males had the highest infection rate than females.

#### 4. Conclusion:

This study reveals the presence of a high prevalence of Brucellosis in cattle, camels, sheep, and goats in the five centers in the New Valley Governorate that represent a serious public health hazards. The most important risk factors that influence the seroprevalence of animal Brucellosis are age, locality, sex, and season.

#### 5. Recommendations:

The periodic examination and vaccination of animals against Brucellosis is recommended. To stop the spread of Brucellosis in Egypt, veterinary services and public health officials must work together.

#### 6. Acknowledgements:

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## 7. Competing interests

No author has a competing interest.

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