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Occurrence of gastrointestinal parasites among dromedary camels at the Maiduguri abattoir in Borno State, Nigeria

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Abstract

Neglected tropical gastrointestinal parasites are present in locales with poor sanitation, continually spilling over to various populations, causing malnutrition and other problems in infected animals. This is because of limited access to treatment and public health interventions in endemic areas. This study aimed to determine the prevalence and risk factors of gastrointestinal parasites among camels presented for slaughter at Maiduguri abattoir. A cross-sectional study was carried out among 150 conveniently sampled camels. Faecal samples and other relevant data were collected from the sampled camels. Faecal samples were subjected to floatation and sedimentation techniques while descriptive and regression statistics were applied to analyse the data. Of the 150 camels, 44 of them were not infected, 95 had a single parasitic infection, and 11 of the camels had mixed parasitic infections. Total prevalence was 70.7% and five genera of parasite eggs were discovered from the faecal samples. The prevalence was 68.7% for *Strongylus* species, 2.7% for *Fasciola* species, 0.6% for *Strongyloides* species, 3.3% for *Trichuris* species, and 2.7% for *Moniezia* species. Univariate regression analysis disclosed a weak strength of relationship (Multiple R= 0.2) between sex with the dependent variable, but a positive linear relationship existed and it was statistically significant (P= 0.007). 2.3% of variation in the dependent variable was explained by the independent variable sex. Multivariate regression analysis revealed a weak strength of relationship (Multiple R= 0.22) between the independent variables with the dependent variable; and none were statistically significant. This meant that prevalence of *Strongylus* species infection was high while those of *Fasciola* species, *Strongyloides* species, *Trichuris* species, and *Moniezia* species were low. Public health veterinarians, local authorities, and the State Government should collaborate to prioritize camel food hygiene from pastoralist level and quarantine stations to abattoir level.

Keywords: Abattoir level, Borno State, Dromedary camel, Gastrointestinal parasites, Nigeria, Risk factors

Introduction

Gastrointestinal parasites are a few of the numerous and frequent pathogens which are severely detrimental to camels' health. Not only do these parasites bring about nutritional and immune deficiencies in addition to slow development and stunted growth, they have unhealthy outcomes on the quality of camel milk and meat (Guowu *et al.,* 2020). Camels become infected with these parasites after browsing on contaminated pastures or by consuming infective larvae from contaminated drinking water (Muhomed *et al.,* 2017). Apart from this, the spread can be triggered when importing and exporting countries of camel, overlooking the implementation of control measures or undertreatment of infected camels with potent drugs during quarantine period (El-Khabaz *et al.,* 2019).

With a worldwide population accounting to roughly 35 million distributed over 47 countries, the one-humped camels have an important role in the economy of a great number of boundaries and desert regions of the earth where they thrive under unpleasant conditions, as some places are confronting the reality about climate change and expansion in drought circumstances (Zhu *et al.,* 2019). The hardness of the camel has led to a change in livestock choice in various regions from cattle to camels, consequently increasing the population of the later (Zhu *et al.,* 2019). Yet, there is paucity of information regarding parasite of camel which can decrease their meat and milk output (Sazmand *et al.,* 2019). High prevalence of parasitic diseases in camel populations has been noted as a serious problem. The major factor that comes into play for the proliferation of these parasites and the subsequent infection of camels is the fluctuating geo-climatic conditions and scarcity of feeds (Muhomed *et al.,* 2017). Also, pastoralists are constrained by the absence of veterinary services, governmental or private drug stores, and professional assistance focusing on improving the production and productivity of their camels (Kibebew *et al.,* 2021).

The one humped camel is one of the prime domestic animals in the semi-arid and arid geographical areas as it provides high-quality food at comparably low cost, withstanding the exceedingly harsh geographical conditions of these regions. The contribution of camel as source of meat is increasing because of the protean capacity it renders rather than a symbol of social prestige, which was the function it used to render but has since markedly died out (Kadim *et al.,* 2008). Problems can materialize because camels can act as a point source for diseases due to of the increasing public's choice for camel meat (Zhu *et al.,* 2019), absence of biosafety and biosecurity procedures in various regions, as well as advancement at the interface with wildlife as coexistence between camel herds and non-domestic species come into being. Moreover, there are less chances for disease surveillance and control (Zhu *et al.,* 2019). The present condition of nearly all slaughterhouses in developing countries specifically Nigeria is a problem with regards to the huge failure in their cycle of operations, sanitary conditions, and management (Kwage *et al.,* 2016). This will lead to risks of disease spillover from camels to humans or from abattoir workers to the public. In Maiduguri, camel meat is second on the scale of preference to that of cattle (Mahmuda *et al.,* 2014). Due to inadequacy of information or data on gastrointestinal parasites among camels in Nigeria (Mamman *et al.,* 2024), there is the requirement for comprehensive research on gastrointestinal parasites among camels foreseeing the economic significance of its involvement in providing meat of great nutritional value to the populace in the study area (Jaji *et al.,* 2017).

Therefore, this study aimed to determine the presence of gastrointestinal parasites among camels that were slaughtered at the Maiduguri abattoir, to differentiate morphologically at genus level of the parasite(s) present, and to explain the possible risk factors associated with enteric parasite carriage among them.

Materials and Methods

Study area

This study was carried out at the Maiduguri abattoir, located in Maiduguri, Borno State. The State, with an area of 69,436 sq.km, is situated within the semi-arid zone of the Northeastern part of Nigeria. It is placed within the coordinates latitude 11.8311° N and longitude 13.1510° E.

Study design

This was a cross-sectional study. Convenient non-probability sampling was utilized to choose the camels for this study. Camels were presented for slaughter at the Maiduguri abattoir from October to December, 2024. Apart from the faecal sample collected per rectum, data on camel age, sex, degree of cleanliness, and body condition score were assessed.

Aseptically, 10 grams of faecal samples were collected using disposable sterile hand gloves from

restrained camels, by inserting the index and middle fingers into the rectum of the camels. All faecal samples were transferred to a universal container, which was initially labelled and kept in a box containing ice packs. The faecal samples were transported to the Helminthology Laboratory at the Faculty of Veterinary Medicine, University of Maiduguri, for faecal analysis within two hours of collection.

Sampled camels were examined closely to classify them as either "one-humped (Dromedary) camels" or "two-humped (Bactrian) camels" based on the anatomical appearances of the humps. The age of each sampled camel was determined by rostral dentition as described by Bello *et al.* (2013). The ages of the camels were further categorized into "greater than three years (>3)" or "less than three years (<3)" for this study. The degree of cleanliness was classified as either "clean" or "dirty" by close examination of each camel, especially the perineal region, in a roundabout manner. The body condition score of each camel was determined by close examination as described by Faye *et al.* (2001). For the design of this work, it was further categorized as either "good" or "poor."

Sample size calculation

The sample size for this study was calculated using the formula for sample size estimation provided by Ogston *et al.* (1991):

$n = (Z^2\ 1\text{-}\alpha/2\ P(1\text{-}P) / d^2$

Where n = sample size, $Z^2 1\text{-}\alpha/2 = 1.960 \rightarrow 3.842$; $d^2 = 0.5 \rightarrow 1$; and the value of P = 0.69 was referred to a previous study by Wakil *et al.* (2017). The sample size of 82 camels was calculated; however, a total of 150 camels were recruited for this study.

Coprological examination

Two grams of faecal samples were obtained from each of the 150 camels' universal bottles that were preserved under 4℃ and weighed on a scale. Each weighed faecal sample was screened grossly to examine the colour, consistency, presence of adult worms, or other contaminants. It was transferred into a laboratory mortar and grinded using a pestle to a pasty form. Faecal floatation and sedimentation techniques were applied for the processing of the samples to identify the parasites as described by Soulsby (1984).

Floatation technique using zinc sulfate reveals presence of gastrointestinal parasites' eggs, oocysts, or cysts by concentrating them in solution of a zinc sulfate, which has a higher specific gravity than the eggs, oocysts, or cysts; permitting them to come up to the surface of the solution. So, for all the 150 camel faecal samples, the procedure continued by placing two grams of the faeces into a wide-mouth plastic disposable cup. Four millilitres of zinc sulfate floatation solution were added to a jar and mixed with the faeces properly. An additional 4 ml of the zinc sulfate floatation was poured into the jar and mixed again. Faecal suspensions were filtered to remove debris using a strainer into a new jar. The strained contents of the jar were transferred into a 10-151 ml test tube supported in a rack. Additional zinc sulfate floatation solution was poured into the sediments till a --slightly convex meniscus was formed at the surface of the test tubes. Coverslips were carefully placed over the meniscus, and parasites were allowed to come to the top of the solution under the coverslips for a time of 15 minutes. Coverslips were carefully removed, making sure a small drop of solution remained on them and were placed on a microscope slide. Slides were examined at 10× and 40× lenses to allow for the identification of nematode, cestode, or trematode eggs, and oocysts and cysts of protozoans at the genus level that may be present in the sampled camels. Modified Ziehl Nelsen staining method as described by Henriksen & Pohlenz (1981), and Lugol's iodine staining method were performed for identifying *Cryptosporidium* species and Giardia cysts, respectively.

For the eggs of trematodes which did not float in standard floatation techniques, faecal sedimentation technique was applied to recover them. So, five grams of faecal samples from the sampled camels were mixed thoroughly with 200 ml distilled water in a 250 ml beaker. Faecal suspensions were filtered with the aid of a strainer into a second beaker. Sedimentation was allowed for a period of thirty minutes. Supernatants were discarded carefully using a pipette. Sediments were mixed thoroughly again with 200 ml of distilled water. Intermediate steps were repeated three times till the supernatants were removed. Sediments were transferred to a petri dish following the final discarding of the supernatant. A drop of methylene blue, which stains the background, was added to the sediments of the 150 faecal samples. They were then examined for the presence of eggs using dissecting microscope. Identification of helminth eggs was based on helminthological keys as described Soulsby (1984) and Taylor *et al.* (2007).

Statistical method

Data analysis for this study was accomplished using Microsoft Excel worksheet for windows 2016.

Descriptive statistics were applied to summarize the data and determine the prevalence of gastrointestinal parasites among the 150 camels enrolled on this study. Univariate and multivariate regression statistics were used to test for associations between the various categorical groups, and variables were considered significant at $P < 0.05$.

Results

The analysis revealed that the majority of the camels were greater than three years old, male, clean, in good body condition, and all were dromedary camels (Table 1).

The result of the analysis disclosed that 44(29.3%) of the camels were not infected, 95(63.3%) had a single infection, and 11(7.3%) of them had mixed infections (Table 2). The overall prevalence of gastrointestinal parasites among the dromedary camels was 70.7%, but then at the genus level, the prevalence of 68.7% for *Strongylus* species was the highest, followed by 3.3% for *Trichuris* species, 2.7% for *Fasciola* species, 2.7% for *Moniezia* species, and 0.7% for *Strongyloides* species (Table 3).

Univariate regression analysis results for this study revealed a weak strength of relationship (Multiple R= 0.2) between sex and the prevalence of gastrointestinal parasites among the dromedary camels, but a positive linear relationship existed. That is, as the variation in prevalence of gastrointestinal parasites among the dromedary camels increases, the explanatory variable sex increases, even though just 2.3% of the variation in the dependent variable was explained. Furthermore, a significant association between sex and the prevalence of gastrointestinal parasites among the dromedary camels prevailed (P=0.007; CI 95%: -0.013, ₋ 0.426) (Table 4).

Table 1: Distribution of the dromedary camels according to the categorical variables

Variables	Study group (n = 150)	%
Camel classification		
Dromedary	150	100
Bactrian	0	0
Age (Years)		
>3	82	54.7
<3	68	45.3
Sex		
Male	131	87.3
Female	19	12.7
Degree of cleanliness		
Clean	123	82
Dirty	27	18
Body condition score		
Good	120	80
Poor	30	20

Table 2: Distribution of gastrointestinal parasitic infection among the dromedary camels (n=150)

Camel's faecal sample	N	%
Overall infection	106	70.7
Not infected	44	29.3
Single infection	95	63.3
Mixed infection	11	7.3

Table 3: Prevalence of gastrointestinal parasites among the dromedary camels (n=150)

Parasites	Type of parasite	N	%
Strongylus species	Nematodes	103	68.7
Trichuris species	Nematodes	5	3.3
Fasciola species	Trematodes	4	2.7
Moniezia species	Cestodes	4	2.7
Strongyloides species	Nematodes	1	0.7

Table 4: Univariate regression model for the variables among the dromedary camels (n=150)

	Variables	Beta	SE	R^2	Multiple R	P Value	Lower 95%	Upper 95%
	Intercept	1.370	0.115	0.003	0.057	0.000	1.142	1.597
1.	Age	-0.052	0.075	0.003	0.057	0.486	-0.201	0.096
	Intercept	1.061	0.131	0.023	0.151	0.000	0.802	1.319
2.	Sex	0.207	0.111	0.023	0.151	0.007*	-0.013	0.426
	Intercept	1.182	0.121	0.006	0.079	0.000	0.944	1.421
3.	Degree of cleanliness	0.094	0.097	0.006	0.079	0.335	-0.098	0.286
	Intercept	1.083	0.117	0.024	0.154	0.000	0.852	1.314
4.	Body condition score	0.175	0.092	0.024	0.154	0.060	-0.008	0.358

*Statistically significant P<0.05; 95% CI

Table 5:

Model	Variables	Beta	SE	P value	Lower 95%	Upper 95%
	Intercept	0.828	0.246	0.000982	0.341376	1.313594
1	Age	-0.012	0.076	0.880175	-0.16145	0.138529
2	Sex	0.172	0.113	0.132284	-0.05247	0.395726
3	Degree of cleanliness	0.091	0.097	0.346999	-0.09966	0.281717
4	Body condition score	0.151	0.094	0.110943	-0.03519	0.338067

R^2 = 0.046, Adjusted R^2 = 0.0199, Multiple R = 0.215, P<0.05, 95% CI

Multivariate logistic regression analysis results for this study unveiled a weak strength of relationship (Multiple R= 0.22) between the prevalence of gastrointestinal parasites among the dromedary camels with the independent variables. And none were statistically significant, that is, age (P= 0.88), sex (P= 0.13), degree of cleanliness (P= 0.35), and body condition score (P= 0.11). Only 4.6% of the variation in the prevalence of gastrointestinal parasites among the dromedary camels was explained by the independent variables (Table 5).

Discussion

The total prevalence of gastrointestinal parasites among sampled dromedary camels at the Maiduguri abattoir was found to be high. The indigenous studies performed by Bamaiyi & Kalu (2011), Mahmuda *et al.* (2014), Wakil *et al.* (2017) and Mamman *et al.* (2024) with sample sizes of 105, 100, 300, and 202 reported an overall prevalence of 92.4%, 78%, 64.66%, and 69.3%, respectively. Two of their findings were lower, while the other two were higher than what was observed in this study. These indicate an increase, a decrease, and then an increase in the trend of prevalence of gastrointestinal parasitic infections over time. Also, regardless of the sample sizes, these show that the presence of gastrointestinal parasites among dromedary camels is high. When a disease trend is decreasing, it means that there is or are effective control measure(s) somewhere along the camel food chain. While when it is increasing, it indicates otherwise. And samples conveniently sampled agree with these. Besides season, vegetations and humidity of the regions, lapses in abattoir operations, as well as imported camels from various neighbouring countries, determine the high prevalence of gastrointestinal parasites among camels in the study area. Furthermore, it implies that indigenous camel pastoralists and camel traders are ignorant of this domain or have failed to care for their livestock's health due to the high cost of deworming or inadequate coverage of veterinary services in the remote regions. In addition, the quarantine stations bordering the study area with neighbouring countries are obsolete owing to certain social factors.

The foreign research carried out by Mahmoud *et al.* (2008), Hossein *et al*. (2013), Alemu *et al.* (2014), Bekele (2014), Ibrahim *et al*. (2016), Muhomed *et al.* (2017), El-Khabaz *et al.* (2019) and Hassan *et al.* (2024), with sample sizes ranging from 100 to 412 and prevalences of 41.08% to 80.0% from local and 51.3% to 79.0% from imported. These results were either higher or lower than those found in this study. Tropical zones in Africa with their variable seasons of the year and with questionable interventions, such as regular deworming, enlightening camel owners concerning parasite control, treatment-seeking behaviour in place, as well as ideal anthelminthic drugs for parasites, that is drugs with broad spectrum and achieving the desired potency, have high (41.08% - 80%) and widespread gastrointestinal helminth infection among the dromedary camels. Therefore, it

means that these regions in Africa do not consistently apply the mentioned interventions or measures that have been stated, so that all camels along the camel food chain will test completely negative for gastrointestinal parasites. Based on the observations from the studies, the dry season recorded the highest occurrence of gastrointestinal parasites, so the rainy season may have minimal influence in these regions (Alemu *et al.,* 2014; Bekele, 2014; Ibrahim *et al.,* 2016; Muhomed *et al.,* 2017; Hassan *et al.,* 2024). This may be because during the dry season, water is scarce, leading to contamination with faeces containing parasites for camels in the region. In addition, during the dry, warm and optimal temperature, the parasites can lay their eggs, and these favour continuous development of the parasites' egg to the adult stage, which can readily survive in the environment, as compared to the rainy season, which has minimal effect or influence on the parasites' occurrence and development to an adult stage. Moreover, importation without proper quarantine, lack of regular surveillance are triggering intestinal carriage, which is impacting the occurrence and introduction of these gastrointestinal parasitic infections in some places. Also, it shows that the most densely populated regions of the world with dromedary camels, which are arid and semi-arid regions (Muhomed *et al.,* 2017), are faced with a lack of knowledge on control strategies, which has contributed to the high prevalence of gastrointestinal parasites in this class of livestock, simply due to neglect. Furthermore, countries within the subtropics have reported a high prevalence of gastrointestinal parasites. This implies that the climatic condition of these zones and the traditional camel husbandry systems favour their occurrence.

The prevalence of *Strongylus* species (68.7%) among the sampled dromedary camels at the Maiduguri abattoir was observed to be high. Alemu *et al.* (2014), Mahmuda *et al.* (2014), Muhomed *et al.* (2017), Wakil *et al.* (2017), Mamman *et al.* (2024) and Hassan *et al.* (2024) in their works reported prevalences of *Strongylus* species which were 41.1%, 43.1%, 51.3%, 59.67%, 62.96%, and 64.7%, respectively. This study recorded the highest prevalence when compared to the other studies. Adult female Strongylus species reproduce relatively in large numbers depending on the species (Roeber *et al.,* 2013).

The prevalence of *Trichuris* species (3.3%) among the sampled dromedary camels at the Maiduguri abattoir was found to be low. The researches carried out by Mahmoud *et al.* (2008), Bamaiyi & Kalu (2011), Hossein *et al.* (2013), Mahmuda *et al.* (2014), Ibrahim *et al.* (2016), Muhomed *et al.* (2017), Wakil *et al.* (2017), Hassan *et al.* (2024) and Mamman *et al.* (2024) discovered prevalences among dromedary camels which were 1.62% from local, 4.2%, 4.5%, 5.26% from imported, 7.41%, 8.0%, 11.4%, 12.2%, 14.0%, and 15.4%, respectively. One of the findings was lower, while the others were higher than what was discovered in this study. Based on the observations from the studies done by Hossein *et al.* (2013), Muhomed *et al.* (2017), and Mamman *et al.* (2024), camels' ages might have resulted in the high prevalence of *Trichuris* species as compared to the other studies and this study, which have a low occurrence of the species.

The prevalence of *Fasciola* species (2.7%) among the sampled dromedary camels at the Maiduguri abattoir was found to be low. The studies carried out by Mahmuda *et al*. (2014), Wakil *et al*. (2017), El-Khabaz *et al*. (2019), Bouragba *et al*. (2020), Mamman *et al*. (2024), and Hassan *et al*. (2024), observed prevalences of *Fasciola* species which were 1.9%, 0.9%, 3.3%, 0.4%, 3.8%, and 2.0% respectively. The works done by El-Khabaz *et al*. (2019) and Mamman *et al*. (2024) showed a higher occurrence of *Fasciola* species as compared to this study and the other studies. Certain features may be partly responsible for the occurrence, regardless of whether they have a significant difference or not. These may be host factors like body condition, host resistance, age, and sex, or management factors like the production system, either intensive or semi-intensive.

The prevalence of *Moniezia* species (2.7%) among the sampled dromedary camels at the Maiduguri abattoir was found to be low. Bamaiyi & Kalu (2011), Alemu *et al.* (2014), Bekele (2014), Mahmuda *et al.* (2014), Ibrahim *et al.* (2016), Muhomed *et al.* (2017), Wakil *et al.* (2017), El-Khabaz *et al.* (2019), Bouragba *et al.* (2020), Hassan *et al.* (2024) and Mamman *et al.* (2024), in their studies, reported prevalences among dromedary camels ranging from 0.7 to 10.64%. The work carried out by Hassan *et al.* (2024) concurred with the finding of this study. The other studies reported prevalences which were either higher or lower to what was observed in this study. Defining characteristics namely age and sex of the camels possibly contributed to the studies with higher presence of *Moniezia* species. The sampled populations have larger percent of older camels and female camels with other comorbidities which have brought about the high carriage of the helminth species.

The prevalence of *Strongyloides* species (0.7%) among the sampled dromedary camels at the

Maiduguri abattoir was found to be low. Mahmoud *et al.* (2008), El-Khabaz *et al.* (2019), Mamman *et al.* (2024), Ibrahim *et al.* (2016), Hassan *et al.* (2024), Bamaiyi & Kalu (2011), Mahmuda *et al.* (2014), Wakil *et al.* (2017), Bouragba *et al.* (2020), Bekele (2014), Muhomed *et al.* (2017), and Alemu *et al.* (2014), in their works, found prevalences among dromedary camels which were 0.4%, 0.8%, 2.3%, 4.8%, 8.0%, 8.5%, 9.3%, 9.5%, 11.2%, 13.8%, 22.3%, and 32.9%, respectively. One of the findings was lower while the others were higher as compared to what was documented in this study. Older camels in the sampled populations that are female, with poor body condition, and no history of deworming were having other co-existing conditions which might have led to the high presence of *Strongyloides* species. Also, rainy season was an attribute in one of the research projects which might have favoured the high occurrence.

The association between the explanatory variable sex with prevalence of gastrointestinal parasites among the sampled dromedary camels at the Maiduguri abattoir was found to be statistically significant. The indigenous studies done by Wakil *et al.* (2017) and Mamman *et al.* (2024) found no significant association between sex with prevalence of gastrointestinal parasites which was contrary to the findings of the study.

The foreign research done by Ibrahim *et al.* (2016) noticed that there was no significant association between sex with prevalence of gastrointestinal parasites which was contrary to what was observed in this study. Muhomed *et al.* (2017) in their work reported that sex had an insignificant effect on the presence of helminth parasites, which disagreed with the finding of this study. The work done by Bouragba *et al.* (2020) did not find any significant association between sex and diarrhoea, which disagrees with the findings of the study. Hassan *et al.* (2024) in their study did not notice any significant association between sex and gastrointestinal parasite infection, which also disagreed with the findings of the study. The research conducted by Bekele (2014) disclosed that camels' sex was not statistically significant with the occurrence of gastrointestinal parasites, which disagreed with the findings of the study. Alemu *et al.* (2014) in their study observed that there was no significant association between the prevalence of gastrointestinal parasites the sex of the camels, which also contradicted the findings of the study.

In conclusion, it can be deduced that the prevalence of gastrointestinal parasites among sampled dromedary camels at the Maiduguri abattoir was high. Whereas at genus level the prevalence of *Strongylus* species was the highest, followed by *Trichuris* species, *Fasciola* species, *Moniezia* species, and *Strongyloides* species. Age, sex, degree of cleanliness, and body condition of the camels had a weak strength of association with the prevalence of gastrointestinal parasites. While sex was statistically significant, only 2.3% of the variation in prevalence of gastrointestinal parasite infection among the dromedary camels was explained by this independent variable.

Therefore, it is recommended that continual surveillance to determine other risk factors, apart from sex, contributing to the presence of gastrointestinal parasites among camels, with emphasis at the pastoral level and camel trading routes into the state. The State Government should restore to health/normality of the operational conditions of existing as well as establish more quarantine stations, at the designated areas, that permit entries of camels from neighbouring countries into the state. Local authorities should collaborate with public health veterinarians, and the State Government to sort out all social conflicts and other matters arising from various quarantine stations to the abattoir level. These measures will intervene in the intermittent occurrence of gastrointestinal parasites among camel livestock and promote antemortem meat inspection in the cycle of operation at the Maiduguri abattoir.

Limitation of this study is that the camels were selected through convenience sampling, because it is simple to implement, quick to collect the data, has low cost, and of its readily available sample pool. However, the sampled dromedary camels in this study may or may not perfectly represent the variables of wider population of the dromedary camels, and the findings from this study may not be generalized to the target population of the dromedary camels.

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Conflict of Interest
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