

A cross sectional study on reproductive health disorders in dairy cattle in Sudan

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ABSTRACT

A cross sectional survey was carried out in dairy farms in four States of Sudan to determine prevalence of reproductive health disorders that affect dairy cattle industries in the country. A total of 575 adult female cows in dairy farms located in Khartoum, Gezira, Sennar, and White Nile States were investigated using questionnaire survey and face-to-face interviews with the owners. The results indicated that 24.4% of the animals were affected with one or more reproductive health disorders. Abortion (57.1%) represented the major health problem affecting calf yield, followed by infertility (34.3%) and neonatal death (8.6%). Other health problems included stillbirth, vaginitis and retained placenta, anomalies, metritis and repeat breeder. Most of the abortion cases were detected during third trimester (76.25%) followed by first (12.5%) and second (11.25%) trimesters. Finally, countrywide investigations of reproductive disorders and increasing awareness to the owners are recommended for designing successful control strategies of reproductive disorders in Sudan.

Keywords

Awareness, Dairy cattle, Reproductive disorders, Sudan

ARTICLE HISTORY

Received : 06 August '14, Revised: 26 September, '14,
Accepted : 02 October, '14, Published online: 03 December, '14.

INTRODUCTION

Livestock plays great role in agriculture and livelihoods in African countries. In many households, animals are considered as their most important asset (Coetzer and Tustin, 2004). Cattle, sheep, goats and poultry give milk and meat that meets the demand of protein; in addition, horse and camel are used for transportation especially in rural areas. They also provide leather which is used in many local industries. In addition, livestock play important role in social networking and income generation. Furthermore, livestock contributes to the national economy as huge number of animals and animal products like leather are exported. Thus, the health of livestock has critical influence on health and wellbeing of African people (Coetzer and Tustin, 2004).

Sudan is a large country consisting of desert, semi-desert, poor savannah and rich savannah zones. The contribution of animal resources in the national income (GDP) is approximately 30% and constitutes 48-50% of the agricultural sector output. The livestock population is estimated at 30 million cattle, 39 million sheep, 31 million goats and 5 million camels. About 39% of livestock are found in the western Sudan, 27% in the south Sudan, 24% in the central Sudan, and 10% in the eastern and northern Sudan. Most of the animal populations are owned by nomads and raised under extensive system in the vast grass land range in western and eastern Sudan, as described by the Directorate of Planning Ministry of Animal Resources and Range. Despite the large number of cattle and their economic importance in Sudan, the productivity is low due to the constraints of disease, nutrition, poor

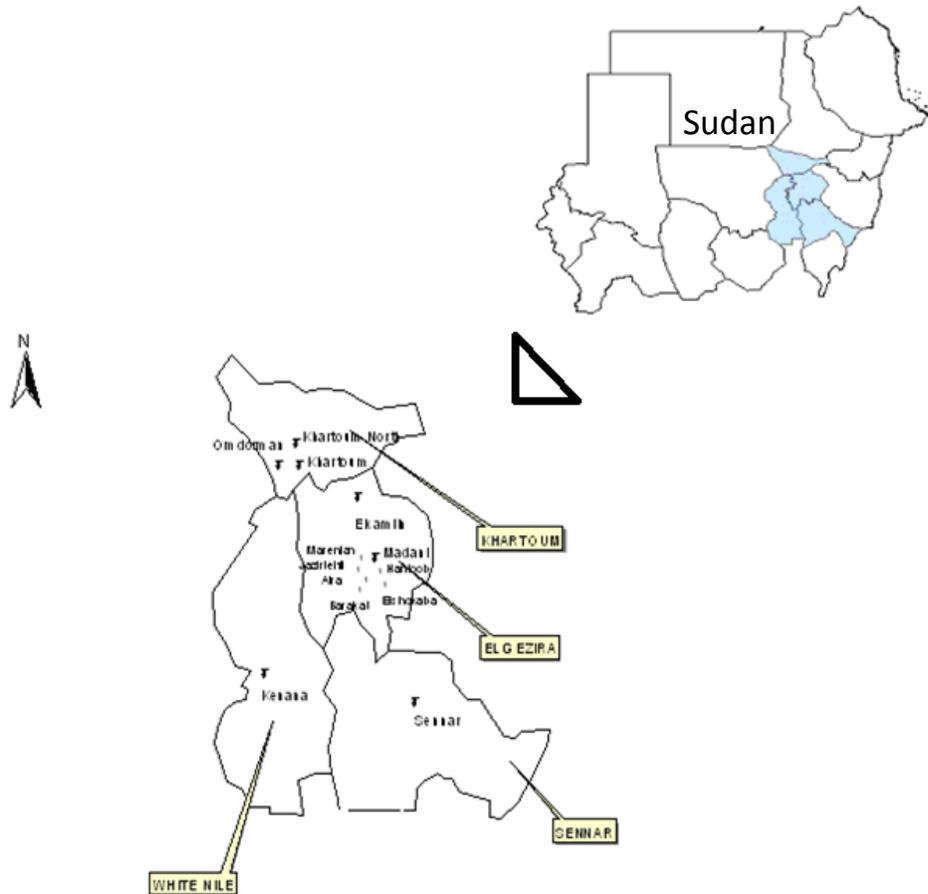


Figure 1. Locations in Sudan from where specimens and sera were collected. The figure showed four states in Sudan; Khartoum state, Gaira state, Sennar state, and White Nile state.

management and poor performance of indigenous breeds.

It had been recognized that many syndromes in the reproductive process affect the pregnancy and gestation, and lead to loss of calf production. Many terms are applied to these conditions; embryonic death, fetal death (mummification, fetal maceration, abortion and stillbirth), dystocia, retained fetal membrane (RFM), metritis and repeat breeder (Kennedy and Miller, 2007); that results in poor reproductive performance of dairy cattle. In particular, abortion and infertility in cattle are two of the greatest problems. It is difficult to determine the causes of bovine abortion because abortions are caused by numerous infectious and noninfectious factors (Njiro et al., 2011). The objective of the present study was to investigate the clinical incidence of reproductive disorders in dairy farms in Sudan emphasizing on abortion, infertility and death of calf after birth (conditions that affect calf yield), and to collect base line data needed for formulating possible strategies for prevention and control of reproductive diseases.

MATERIALS AND METHODS

Study area: The study covered four States in Sudan; these were Khartoum State, Gazira State, Sennar State, and White Nile State. The investigation area extends from the latitudes 43° 20' E to 32° 50' W and longitudes 15° 75' N to 13° 32' S. This area is semi-desert in the north and savannah in the South (Figure 1).

Study design and animal population: Cross-sectional type of study using questionnaire survey and field visit, was carried out in dairy farms in four States in Sudan. A total of 673 female cows were investigated, of which 575 adults (2 years and above) were considered for analysis. Cattle dairy farms were located around Khartoum State (5 in Khartoum, 7 in Khartoum North and 5 in Omdorman); Gazira State (9 in Alshukaba, 8 in Wad Madani, 1 in Alkamleen); Sennar State (1 in Sennar), and White Nile State (1 in Kenana) (Table 1, Figure 1).

Questionnaire survey: A total of 37 owners of cattle dairy herds were interviewed face-to-face using close-

Table 1. Study area in Sudan and numbers of farms investigated.

State / Locality		Number of farms investigated	Management	
			No of IFM	No of SIFM
Khartoum state	Khartoum	5	4	1
	Khartoum North	7	5	2
	Omdorman	5	5	-
Gazira State	Alshukaba	9	-	9
	Wad Madani	8	2	6
	Alkamleen	1	-	1
Sennar State	Sennar	1	-	1
White Nile State	Kenana	1	1	-
Total		37	17	20

Legend: IFM=Intensive farm management, SIFM=Semi-intensive farm management.

ended questions to ease data processing; minimize variation and improve precision of responses. In the survey, information on reproductive health problems as well as management system and particulars related to individual cows such as sex, age, locality, breed and season were collected. Moreover, data were collected from cases with clinical signs of abortions at different stages of pregnancy, infertility, stillbirth, congenital defects, neonatal death (death after 1-2 days after birth) and animals which appeared healthy among target herds.

Testing for Brucellosis: A total of 262 serum samples were collected from adult cows. The samples were tested for *Brucella abortus* antibodies using Rose Bengal test (RBT), as described by Morgan et al. (1969).

Data processing and analysis: Questionnaires were numbered (coded) before processing and the collected data were sorted manually. Demographic data, the prevalence and the relative frequencies of reproductive health problems were determined as percentages (Table 2, 3, 4 & 5). Seropositivity to *B. abortus* was expressed in percentage.

RESULTS AND DISCUSSION

Number of questionnaires administered was 37. The participants included were all males, mostly between 40-50 years old. The management system in the studied herds was found as intensive or semi-intensive system. Out of the 37 farms visited, 14 were intensive and 3 were semi-intensive in Khartoum State while, 3 were intensive and 17 were semi-intensive in other areas (Table 1).

Total 784 animals were investigated in all farms with an average of 21 animals per farm ranging from 10 to 80). Of these, 85.8% (n=673/784) were females and

14.2% (n=111/784) were males. The details on age classes, sex and breed of these animals are presented in Table 2. Most of the animals (n=486; 62.0%) were in the production age group (i.e., 36 month or above). Moreover, 94% (n=737/784) of the animals involved were crossbred (local x Friesian) while only 6% (n=47/784) were indigenous breed (Table 2). Of 673 female included in the study, 575 were adult cows (2-yrs or above); out of these, 24.35% (n=140/575) were affected with one or more reproductive health problem (Table 3). The results of the current study indicated that abortion (57.1%) was the major reproductive problem affecting calf yield (Table 4) followed by infertility (34.3%) and neonatal death (8.6%). The occurrence of abortion at different stages of gestation is shown in Table 5. Most abortions (76.25%) took place during the third trimester. The other reproductive conditions reported by the owners included stillbirth 9 (6.4%), anomalies 2 (1.42%), vaginitis 16 (11.42%), repeat breeder 1 (0.71%), metritis 8 (5.71%), and retained placenta 2 (1.43%) (Table 4). It is worth mentioning that animals affected with retained placenta and metritis are known to suffer a significantly higher risk of subfertility, acetonemia, left displaced abomasum and cystic ovarian disease

Table 2. Demographic data and the total number of animals in the investigated farms in four States in Sudan.

Variable	Group	No. of animal	%
Gender	Female	673	85.8
	Male	111	14.2
Age groups (month)	1-6	58	7.4
	7-12	85	10.8
	13-24	50	6.4
	25-36	105	13.4
	≥36	486	62.0
Breed	Local	47	6
	Cross	737	94

Table 3. The prevalence rate of clinical reproductive problems in dairy cattle in Sudan.

Method of study	Total number of adult female cows examined (≥ 2 -yrs.)	Number of cows with Problems (%)	Number of cows without Problems (%)
Questionnaire survey	575	140 (24.35)	435 (75.65)

Table 4. The major reproductive health problems occurrence in dairy cattle in Sudan.

Problem	Frequency	IFM	SIFM	Prevalence (%)
Abortion	80	62	18	57.14
Infertility	48	41	7	34.28
Neonatal Death	12	3	9	8.57
Stillbirth	9	7	2	6.4
Anomalies	2	2	0	1.42
Vaginitis	16	13	3	11.42
Repeat breeder	1	1	0	0.71
Retained placenta	2	1	1	1.43
Metritis	8	8	0	5.71

Legend IFM=Intensive farm management, SIFM= Semi-intensive farm management

Table 5. Abortion at different stages of gestation in Sudan.

Stage of gestation	No. of abortion (%)
1st trimester	10 (12.5%)
2nd trimester	9 (11.25%)
3rd trimester	61 (76.25%)
Total	80 (100%)

conditions that negatively impact the reproductive and productive efficiency of cattle (Opsomer and de Kruif, 2009). Most owners acknowledged that the occurrence of abortion and infertility caused significant economic losses including death of new born calves and drop in milk production due to both infertility and abortion.

The incidence of reproductive disorders was more frequent in intensively managed farms as compared to semi-intensively managed one (Table 4). This was more obvious among aborted ($n=62/80$) and infertility cases ($n=41/48$) in intensively managed farms. In contrast, neonatal death was mostly recorded in semi-intensive ($n=9/12$) than in intensive system. It was noted that most of the abortions (76.25%) were late and took place during third trimester (Table 5). Crowdedness and the poor hygienic conditions of intensively managed farms around urban area in Sudan could be the major contributing factors to the higher incidence of reproductive disorders noted in these farms.

It is worth mentioning that in 29.73% ($n=11/37$) farms, we investigated other animal species like goats, sheep, horses and dogs. Six of these farms reported abortions in sheep and goats beside cattle abortion. Most of the herds owners ($n=35/37$; 95%) were aware of the reproductive and productive problems (mostly

brucellosis) affecting their animals. There was no awareness to other causes (e.g., bacterial, parasitic, nutritional etc.) of reproductive disorders. However, the owners were well aware of other conditions such as Foot and Mouth disease (FMD), tropical theileriosis, rinderpest, and Jone's disease. In particular, the condition called Heesh (Heat intolerance syndrome - a sequel of FMD) was widespread and well known to the owners. During our visits, in many herds, we observed jaundice, diarrhea, nasal discharge, corneal opacity (especially Soba farm Khartoum, Khartoum State which had been previously diagnosed with pathology as toxoplasmosis), nervous signs, lameness, smaller than normal, weak and dull calves.

Reproductive disorders have been found to be a major reason for decreased reproductive efficiency and of lifetime productivity (De-Vecchio et al., 1992). Very little is known about the extent of major reproductive disorders in dairy cattle in Sudan. Mohamadain (1994) studying the records of 6861 imported pure exotic breed (mostly Friesian) cattle in large commercial dairy farms reported incidences of 28%, 41.0%, 35%, 7% and 2% of abortion, dystocia, metritis, still birth and congenital deformities, respectively. While Ibn Ouf (cited by Mohamadain, 1994) stated that the incidences of metritis mounted to 16% in local cattle, 21% in 50%-crossbred, 24% in 75%-crossbred and 28% in purebred dairy cattle.

According to the results in the current study, a total of 575 adult cows were examined for the major reproductive problems by questionnaire survey. Out of these, 140 (24.35%) were found to be affected by at least one of these problems, this is slightly higher than the findings of Dinka (2013) who reported that 18.3% of

dairy cattle in Central Ethiopia were affected with reproductive disorders. In the present study, abortion (57.1%) figured out as the major problem affecting small holder dairy cattle in the study area. This was much higher than the earlier (28%) findings in Sudan (Mohamadain, 1994) and that of Bitew and Prasad (2011) and Gashaw et al. (2011) who reported 11% and 1% of abortion in cattle in South Western Ethiopia, respectively. On the other hand, repeat breeding (26.8%) was the major reproductive disorder in Central Ethiopia (Dinka, 2013) as compared to 0.71% in the current study. Differences in prevalence in reproductive disorders in different regions may reflect variations in predisposing factors including nutritional status and management (Gashaw et al., 2011).

Although, the results from our questionnaire showed that the number of reproductive problem cases in Sudan was significant, however, farmers did not consider (apart from abortion) them to be of great importance and they attributed most of the cases to brucellosis without looking for the real etiology. This agreed with Dechicha et al. (2010) who recorded that 85.7% of the practitioners encountered abortions sporadically with 60% of the veterinarians thought that the probable cause of abortions was brucellosis.

The present study also assessed the occurrence of abortion at different stages of gestation and found that the highest percentage of abortion was occurred at last trimester (76.25%) followed by first (12.5%) and mid trimester (11.25%). This might be due to numerous factors affecting last stage of pregnancy. Givens and Marley (2008) mentioned the factors that impact the outcome of embryonic and fetal death including gestational ages, where BoHV-1 was recorded to cause abortion in cows at different stages, while Bovine Viral diarrhea (BVD) was recorded at first and mid trimester. Givens and Marley (2008) recorded epizootic bovine abortion (EBA) virus causing abortion in cows at last trimester.

In the present study, Rose Bengal test showed that 39 (14.4%) out of the 262 adult cows tested were positive for *B. abortus* antibodies. However, our data revealed that brucellosis was not associated ($p < 0.078$) with the studied reproductive problems indicating that other factors or disease conditions might be involved in this syndrome in central Sudan. Indeed, serological surveys indicated that several disease agents including Bovine Herpes virus-1, Bovine Herpes virus-4, BVD viruses, *Neospora caninum* and *Toxoplasma gondii* (Elhassan et al., 2011; Ibrahim et al., 2012; Hussein et al., 2012; Elfahal et

al., 2013), Bluetongue (Elhassan et al., 2014a) and Akabane viruses (Elhassan et al., 2014b) infections were prevalent in Sudan.

CONCLUSION

The current investigation showed a wide variety of reproductive health problems affecting small holder dairy cattle in Sudan. The situation demands for further investigations in both crossbred and indigenous breed of cattle to determine causes, economic impact, and appropriate control strategies under different management systems. This study also clearly indicates that lack of awareness about reproductive disorders among the majority of small holder farms and their importance in the economic viability of these farms. Hence more efforts should be extended towards education and increasing awareness of the animal owners about these problems and their proper management.

ACKNOWLEDGMENT

The authors would like to thank the Director of Veterinary Research Institute and the Director General of Animal Resources Research Corporation for financial support and permission for the work to be published.

COMPETING INTERESTS

The authors declare that they have no competing interests among them.

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