

## Rotavirus infection in cattle

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Hind Abdel-Mageed Rikabi<sup>4</sup>, Husham Mohammed Al-Hasssan Atalfadeel<sup>3</sup>

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Article Info	Abstract
<p><b>Article history:</b></p> <p>Received: 28 October 2024 Accepted: 23 April 2025 Available online: 15 January 2026</p> <p><b>Keywords:</b></p> <p>Cattle Electron microscopy ELISA Group A rotavirus Polyacrylamide gel electrophoresis</p>	<p>Rotavirus is one of the major causes of diarrhea in different animal species and has a bad economic impact due to the losses in neonates and productivity. To investigate the occurrence of this infection in bovine calves, three localities in Khartoum State, Sudan, were selected. A total of 200 fecal samples were collected from diarrheic calves; 100 from Khartoum and 50 from each of Khartoum Bahari and Omdurman provinces. Collected samples were screened for a group A rotavirus antigen using enzyme-linked immunosorbent assay (ELISA). Positive results were seen in 40.00% of samples; the highest prevalence of 42.00% was found in samples from Khartoum province. Five ELISA-positive samples were examined under electron microscope, and characteristic wheel-like appearance of rotavirus was visualized. Polyacrylamide gel electrophoresis was also applied on 15 of the positive samples; eight samples showed different polyacrylamide gel electrophoretic group A rotavirus long profile with different patterns. The results showed that the occurrence of rotavirus infection in cattle in Khartoum State is increasing.</p> <p>© 2025 Urmia University. All rights reserved.</p>

### Introduction

Bovine diarrhea is considered one of the most important problems facing animal health and production. Main causative agent for bovine diarrhea is the group A rotavirus (RVA), consisting of 11 segments of double stranded RNA classified in the Reoviridae family.<sup>1</sup> Based on the common inner capsid protein VP6, rotaviruses are classified into eight distinct groups (RVA - RVH); mostly RVA, RVB, RVC, and RVH are associated with acute gastroenteritis in humans and animals, and RVA is the most species causing severe infection in this family.<sup>2</sup> In Asia, rotavirus infections have been reported in China,<sup>3</sup> India,<sup>4</sup> Kuwait,<sup>5</sup> Iran,<sup>6</sup> and Türkiye.<sup>7</sup> In Europe, rotavirus infection in bovine calves has been reported in Switzerland,<sup>8</sup> and Italy.<sup>9</sup> In Africa, rotavirus was found to exist as a cause of diarrhea in many countries, such as Algeria,<sup>10</sup> Egypt,<sup>11</sup> and Ethiopia.<sup>12</sup>

In Sudan, in Friesian dairy farm, rotavirus was detected in 77 of 116 diarrheic calves,<sup>13</sup> and detected rotavirus antigen was 33.00% of 40 tested calves, in a dairy farm in Khartoum State, Sudan.<sup>14</sup> This study was intended to investigate the current prevalence of rotavirus infection in cattle in different localities in Khartoum State, Sudan.

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### Materials and Methods

This study was conducted in Khartoum State, Sudan, often known as the triangular capital, which is divided into three main geographical areas separated by the Blue and White Niles, including Khartoum at the base of the triangle to the south, Khartoum Bahari to the north-east, and Omdurman to the west.

**Samples collection.** A total of 200 fecal samples were collected from diarrheic calves at the three main localities of Khartoum State; Khartoum (n = 100), Khartoum Bahari (n = 50), and Omdurman (n = 50).

**Group A rotavirus antigen detection.** Collected fecal samples (N = 200) were examined for RVA using enzyme-linked immunosorbent assay (ELISA) kits (Rotavirus IDEIA, DAKO Diagnostics, Cambridgeshire, UK) as described by the manufacturer.

**Electron microscopy (EM).** Five ELISA-positive samples were stained by 3.00% phosphotungstic acid and examined through EM to visualize the viral particles, as described previously.<sup>15</sup>

**Polyacrylamide gel electrophoresis (PAGE).** Rotavirus ELISA-positive samples were examined for the viral RNA using PAGE, according to the published method.<sup>15</sup>



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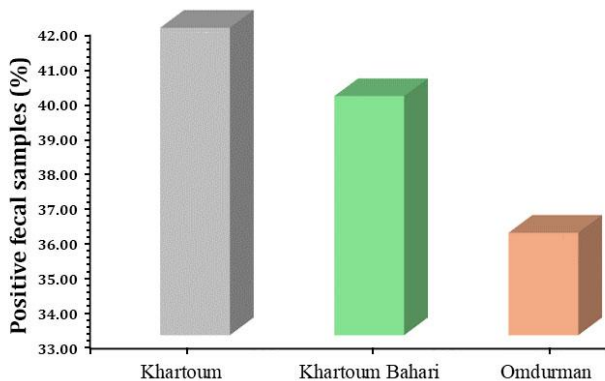
Briefly, the dsRNA was extracted by phenol chloroform (Thermo Fisher Scientific, Merelbeke, Belgium), precipitated by 3.00 M sodium acetate (Thermo Fisher Scientific) and three volumes of cold ethanol at  $-20.00^{\circ}\text{C}$  overnight, and centrifuged at  $10,000\text{ g}$  for 10 min. The PAGE was carried out in 10.00% polyacrylamide slab gels (Thermo Fisher Scientific), using a 3.00% stacking gel (Thermo Fisher Scientific), with the discontinuous buffer system described formerly,<sup>15</sup> without sodium dodecyl sulfate. Finally, 30.00  $\mu\text{L}$  of the extract was loaded and electrophoresis was performed at 100 V for 16 - 18 hr. The dsRNA segments were visualized using silver staining.<sup>15</sup>

## Results

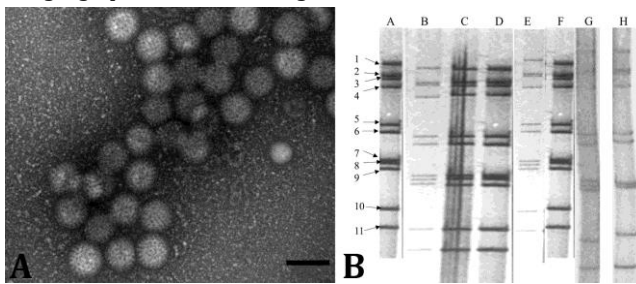
**Group A rotavirus antigen detection.** Rotavirus antigen was detected in eighty (40.00%) fecal samples; the highest prevalence (42.00%) was observed in samples collected from Khartoum city (Fig. 1).

**Electron microscopy.** Two out of five samples showed the characteristic wheel-like structure of rotavirus (Fig. 2A).

**Polyacrylamide gel electrophoresis.** Eight out of 15 rotavirus ELISA-reactive stool samples showed the classical RVA electropherotype. All positive samples showed characteristic RVA RNA electrophoretic long profile with different patterns (Fig. 2B).



**Fig. 1.** Percentage of positive fecal samples for group A rotavirus as tested by enzyme-linked immunosorbent assay according to the geographical areas investigated in Khartoum State, Sudan.



**Fig. 2. A)** Group A rotavirus detected in diarrheic calf fecal samples by electron microscopy (Bar = 100 nm), and **B)** Polyacrylamide gel electrophoresis for rotavirus RNA extracted from diarrheic calves showing characteristic group A rotavirus RNA long profile with bands representing the eleven segments (1 - 11).

## Discussion

Rotavirus causes one of the most significant infections affecting young animals; the infection results in diarrhea negatively affecting health status and leading to losses in newborn.

In the current study, RVA antigen was detected in 40.00% of tested samples, being much lower than the prevalence previously detected (66.00%) in the first report of the infection in Khartoum, Sudan,<sup>13</sup> and Switzerland (59.00%).<sup>8</sup> Our result is comparable with reports from different countries, including Iraq, 43.00 and 46.00% in two provinces,<sup>16</sup> the pooled prevalence (46.00%) of 29 reviewed publications in China,<sup>3</sup> and 49.00% in Iran.<sup>6</sup> Nonetheless, our results are higher than the other report of rotavirus in a dairy farm (33.00%) in Khartoum State, Sudan,<sup>14</sup> as well as other countries, like Kuwait (29.00%),<sup>5</sup> Italy (17.00%),<sup>9</sup> and Algeria (15.00%),<sup>10</sup>. Lower prevalence was also reported in India (11.00%),<sup>4</sup> Egypt (9.00%),<sup>11</sup> Türkiye (7.00%),<sup>7</sup> and in calves in Ethiopia.<sup>12</sup>

Within the studied localities, although there was no significant difference in the prevalence rates, slightly higher frequency was detected in the Khartoum city; this may be attributed to the existence of a large number of dairy farms with variable hygienic measures, secondly Khartoum Bahari with a large number of dairy and beef farms. Omdurman has the largest livestock markets in the state mainly for adult animals, but fewer farms are existing.

Rotavirus infections in cattle were confirmed using EM.<sup>17</sup> In this study, rotavirus was visualized using EM in only two samples; this could be attributed to the degradation of the virus during storage of samples.

In this study, PAGE was used to detect the RNA profile, and different long profiles were detected in eight out of 15 (53.00%) samples; it may be due to the RNA degradation during transport and storage of samples. However, our results are higher than the report of RNA-PAGE, detected 12.00%, which also showed long electropherotype.<sup>18</sup>

From the results of this study, as well as the previous reports, it was concluded that rotavirus infection in bovine is existing and could be increasing in Khartoum State, Sudan. The situation in other States of Sudan should be studied especially in areas with high animal population, like Kordofan and Darfur. In both States many complaints of calve diarrhea are raised to the public, as well as private veterinary clinics (unpublished data), and rotavirus was detected in camel calves at Kordofan State, Sudan.<sup>19</sup>

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## Conflict of interest

The authors declare that there is no conflict of interest.

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