Research Article

DOI: 10.2305/XJDZ4881
Gajah 59 (2025) 56-62

Intestinal Impaction Caused by *Saccharum bengalense* in a Captive Juvenile Asian Elephant: Implications for Captive Management

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Abstract. Intestinal impaction is a common and clinically significant condition in captive Asian elephants, often triggered by fibrous plant ingestion, dehydration and reduced mobility. This case study reports a 3-year-old female elephant in Dudhwa Tiger Reserve presenting with anorexia, abdominal distension, and absence of defecation. Clinical evaluation confirmed gastrointestinal obstruction. Management included fluid therapy, anti-inflammatory medication, rectal enema, and manual disimpaction. Faecal analysis revealed undigested *Saccharum bengalense* grass. The case underscores the importance of timely intervention, experienced mahouts, field-adapted clinical protocols, and supervised foraging to reduce gastrointestinal health risks in semi-captive elephants.

Introduction

Intestinal impaction is a gastrointestinal disorder marked by the partial or complete obstruction of the intestinal tract, often caused by the accumulation of undigested food, sand, foreign bodies, or other ingested materials (Fowler & Mikota 2008). This condition is particularly concerning in herbivorous mammals, where high-fibre diets and complex digestive processes can predispose individuals to such obstructions (Plummer 2009). This condition often results in severe abdominal discomfort, inappetence, lethargy, and if left untreated, intestinal impaction can result in severe colic, systemic compromise and death (Fowler & Mikota 2008). The condition poses a significant health risk in captive wildlife, often exacerbated by limited access to natural diets, inadequate hydration and restricted mobility (Mikota *et al*. 1994).

In elephants, intestinal impaction is a significant health concern, especially in captive settings where captive feeding, restricted movement, and environmental factors may lead to digestive complications in individuals (Chandrasekharan *et al*. 2009).

Although elephants possess a simple stomach, their gastrointestinal anatomy is highly specialised. They have a distinct pharyngeal pouch terminating in a sphincter located above the larynx, which regulates the passage of food and water into the oesophagus and may assist in thermoregulation and water storage during dehydration (Fowler & Mikota 2008). Elephants lack a gallbladder but possess a large, sacculated bile duct that facilitates continuous bile secretion to aid lipid digestion (Shoshani *et al*. 2006). As hindgut fermenters, elephants rely on extensive microbial fermentation in the cecum and colon to break down fibrous plant material (Clauss *et al*. 2003; Eertink *et al*. 2020).

The intestinal tract is voluminous and elongated, with the small intestine averaging 2.1 m, the large intestine approximately 12.8 m, and the cecum ranging from 0.6 to 1.5 m in adult individuals. Despite this capacity, elephants exhibit a relatively fast digesta passage rate and low digestive efficiency for coarse, low-quality forage (Loehlein *et al*. 2003; Godron *et al*. 2019). This rapid transit, combined with factors such as reduced water intake or inadequate dietary fibre, predisposes elephants to gastrointestinal blockages and impaction (Chandrasekharan

Manuscript Editor: Christian Schiffmann

et al. 2009; Greene *et al*. 2019). Dehydration further exacerbates the risk by promoting intestinal stasis, which slows down gut motility and facilitates the accumulation of ingested material. Several other factors, such as sudden dietary changes, poor-quality roughage, low water intake, ingestion of indigestible material, or limited physical activity, can disrupt normal digestive processes, resulting in impaction (Nigam *et al*. 2022).

A healthy elephant typically defecates 15–20 times a day (Cheeran 2009). A marked reduction or absence of defecation is a critical indicator of gastrointestinal dysfunction and warrants immediate attention.

Asian elephants (*Elephas maximus*), an endangered species with declining wild populations and growing numbers in captivity, have increasingly been reported to suffer from gastrointestinal disorders, including intestinal impaction (Khadpekar *et al*. 2020). In captive environments, such as zoos, rescue centres and forest camps, limited access to diverse forage, confinement, stress, and inadequate hydration have been recognised as contributing factors (Nigam *et al*. 2022). In these settings – whether zoos, elephant camps, or rescue centres – impaction is frequently associated with suboptimal diets, ingestion of indigestible materials (such as plastic, sand, or rope), lack of exercise, or sudden dietary transitions (Khadpekar *et al*. 2020; Teodoro *et al*. 2023). Reluctance to drink water, a behaviour occasionally seen in stressed or ailing elephants, further predisposes them to this condition. Clinical signs often include inappetence, lethargy, bloating, restlessness, and a significant decrease in or absence of faecal output (Khadpekar *et al*. 2020). Compared to their African counterparts, Asian elephants often face different husbandry practices and management challenges, potentially influencing the frequency and severity of such conditions.

Several case reports from India and Southeast Asia have detailed instances of intestinal impaction in captive Asian elephants, emphasising the need for prompt diagnosis and intervention to prevent fatal outcomes (Khadpekar *et al*. 2020). Diagnosis approaches range from physical examination, rectal palpation, ultrasonography and behavioural observation to post-mortem findings in fatal cases (Teodoro *et al*. 2023). The treatment protocols typically include fluid therapy, administration of laxatives and stool softeners, rectal enemas, and supportive medications such as prokinetics (Greene *et al*. 2019). In severe cases, surgical interventions may be considered, though with a variable prognosis. However, outcomes vary depending on the timing of intervention, severity of impaction and the overall health of the animal.

Despite its clinical relevance and recurring occurrence in captive populations, comprehensive research on the causative factors, diagnostic challenges and management strategies for intestinal impaction in captive Asian elephants remains sparse. This paper aims to contribute to this critical area by presenting a detailed case study of intestinal impaction in a captive Asian elephant, highlighting clinical presentation, diagnostic findings, treatment strategies and implications for husbandry and preventive care.

Case details

Case background

The case involves the treatment of a 3-year-old female Asian elephant (Fig. 1) from a camp in Dudhwa Tiger Reserve in Uttar Pradesh, India. The elephant was born and raised in captivity and weighed ~900 kg during the case. This weight was based on the formula: Body Weight = {Height X (Chest Girth)2}/10,000, where Height = 4π (Radius of pad mark of forelimb) (Kanchanapangka *et al*. 2007).

The regular diet of this elephant consisted of gram (500 g), soyabean (100 g), rice (1 kg) and clarified butter (50 g) in the morning, and rice (3 kg), jaggery (500 g) and salt (100 g) in the evening, accompanied with daily green fodder both the times. The camp has two adult female elephants apart from the affected individual. The daily green fodder provided to the three individuals weighed ~1,500 kg for the three individuals and consisted of 'gajhad' or elephant/ Napier grass (*Cenchrus purpureus*), which is a soft and juicy, ideal for animal feed (Vanitha *et*

Figure 1. Affected 3-year-old juvenile.

al. 2008). The exact amount of daily green fodder consumed by the individual in this case is not confirmed. Besides the provided diet, the elephant used to consume several wild herbs, shrubs, tree barks, leaves of various species, while on its routine daily movement for monitoring across the forest or when it was left for free grazing in the vicinity of the camp. The water was kept available to the elephant at all times. Therefore, it is expected that the elephant consumes an adequate quantity of water (i.e., 70–100 litres/day) every day. The recent travel by elephant involved its walk in the surrounding forest of the camp, which was ~10 km. The elephant did not have any previous medical history or health issues.

On 14 December 2024, the mahout (elephant handler/caretaker) reported that the elephant was exhibiting inappetence/anorexia (reluctance to food) and absence of defecation. According to the mahout, the elephant had not ingested any feed since the evening of 13 December 2024 and had not passed dung since the morning of 14 December 2024. Concurrently, the animal displayed signs of abdominal distension and restlessness since the morning of 14 December 2024, including repeated changes in posture and increased movement, suggestive of discomfort. These clinical signs persisted for approximately 12 hours, while anorexia continued for over 24 hours.

Diagnostic work-up

Clinical evaluation commenced on the evening of 14 December 2024. On physical examination, the elephant presented with a visibly distended abdomen and signs of discomfort and agitation, characterised by persistent shifting of weight, lack of stillness, and abnormal stance. No water consumption during the treatment, multiple unsuccessful defecation attempts, and straining were also observed during the diagnosis. Notably, the maintenance of a widened hind limb posture was observed. Anorexia was ongoing at the time of examination.

Rectal temperature was recorded at 37.2°C and respiration was recorded at 10 breaths/minute. The mucous membranes were observed to be pink and moist. However, heart rate measurement and abdominal auscultation could not be performed due to unavailability of the stethoscope and pulse oximeter. A per rectal examination was conducted using full-length AI gloves lubricated with a soap and water solution and inserting the hand deep inside the rectum. Due to their unavailability on the field, we could not use antiseptic lubricants (e.g., Cetrimide cream). The examination revealed an empty rectum with no palpable faecal boluses, supporting the clinical suspicion of gastrointestinal dysfunction.

Based on the anamnesis and clinical presentation – namely anorexia, abdominal distension, restlessness and absence of faecal output – a preliminary diagnosis of ‘intestinal impaction’ was made.

Treatment and management

Physical activity was encouraged initially by walking the elephant for several minutes to stimulate gut motility, but there was no relief from bloating, and the rectum remained empty.

An injection of Flunixin meglumine (Megludyne®, 50 mg/ml; Virbac Animal Health India Pvt. Ltd.) was administered intramuscularly at 1 mg/kg (18 ml) to reduce inflammation and pain. Syrup Gastoken (Liquid paraffin, milk of magnesia, and sodium picosulphate; Medflex Healthcare Pvt. Ltd.) and Syrup Lactulose (Welacto solution, 10 mg/15 ml; Wellgo Pharmaceutical Ltd.) were offered orally, but the elephant refused to consume them. An enema was administered using 1 litre of liquid paraffin mixed with 20 litres of lukewarm water. Two intravenous fluids – 3 litres of Ringer's Lactate (RL; Swaroop Pharmaceutical Pvt. Ltd.) and 2 litres of Dextrose Normal Saline (DNS; Swaroop Pharmaceutical Pvt. Ltd.) – were administered along with Tribivet® (50 mg Vitamin B_1 + 50 mg Vitamin B_6 + 500 μg Vitamin B_{12} per ml; Intas Pharmaceuticals Pvt. Ltd.) at a dose of 20 ml to support hydration and electrolyte balance. The treatment lasted for 3 hours. No complications or signs of secondary infection were observed during the treatment.

The mahout was advised to attempt administering the syrups orally during the night. The regular diet was made available to the elephant for the following night. The syrups were administered by the mahout at night, but the elephant still had not passed dung. However, there was a mild reduction in bloating, and the animal had passed urine.

A second per rectal examination in the same manner was carried out the next morning i.e., on 15 December 24, for 1 hour. The elephant was given time to rest periodically during this time. The per rectal temperature was recorded at 36.9°C. The examination revealed a stuck faecal bolus deep inside the rectum. Manual removal was attempted and successfully carried out by breaking the bolus into smaller portions (Fig. 2). A total of five faecal boluses were manually extracted. Notably, during bolus removal, a noticeable reduction in abdominal distension was observed.

Outcome and follow-up

Faecal analysis revealed the presence of large, undigested fragments of *Saccharum bengalense* (syn. *Saccharum munja*) (Fig. 3), a coarse, woody and fibrous grass commonly found in the region. While occasional ingestion of *S. bengalense* may occur without clinical consequence, the impaction in this case is suspected to have resulted from excessive intake or inadequate mastication and digestion of the fibrous material. The structural rigidity and high lignocellulosic content of *S. bengalense* likely contributed to gastrointestinal dysfunction and subsequent intestinal impaction.

Within an hour after the manual removal, the elephant passed two additional boluses on her

Figure 2. Manually breaking down the bolus and its removal from the rectum.

Figure 3. Munja grass (*S. bengalensis*).

own. The abdominal bloating was fully resolved, and the animal resumed normal feeding behaviour.

The elephant was orally offered 200 ml of Brotone® syrup (Virbac Animal Health India Pvt. Ltd.; liver tonic fortified with yeast and vitamins) once daily for the next 5 days to aid digestion. The elephant was advised to be monitored closely to prevent recurrence, especially by avoiding access to the aforementioned grass species, especially 'munja' grass. There was no recurrence of the condition thereafter, and no long-term complications were observed.

Discussion

Intestinal impaction is a relatively infrequent but clinically significant condition in Asian elephants, often resulting from ingestion of indigestible or poorly digestible plant material, dehydration, or reduced physical activity (Fowler & Mikota 2008). The present case describes a gastrointestinal impaction in a juvenile, captive-born female Asian elephant, with clinical resolution following a combination of supportive therapy and manual extraction of obstructive faecal material.

Comparable reports in both captive and free-ranging elephants have described impactions associated with ingestion of fibrous plant species, such as *Saccharum spontaneum*, bamboo, or other high-lignin-content vegetation (Liyanage *et al*. 2021). In this case, faecal analysis revealed undigested fragments of *S. bengalense*, a coarse, woody grass known for its high lignocellulosic content (Srivastava *et al*. 2024). This grass is not included in the regular fodder provided at the elephant camp, which primarily consists of *Cenchrus purpureus* (Napier grass), a species that is soft, palatable, and considered suitable for captive elephant diets. The camp elephants had been routinely allowed to graze freely in the vicinity of the camp, and it is postulated that the affected elephant had inadvertently consumed a substantial quantity of *S. bengalense* during a regular foraging period or while on a monitoring walk. The implicated *S. bengalense* was most likely ingested during routine forest walks, highlighting a common management challenge in semi-captive elephant systems where unrestricted foraging behaviour increases dietary heterogeneity and associated health risks, particularly in juveniles and calves, which exhibit limited dietary selectivity due to their inexperience (Koirala *et al*. 2016).

The absence of any prior medical history and the acute onset of clinical signs, including anorexia, abdominal distension, and absence of defecation, was particularly instructive in this case. The relatively rapid onset, coupled with a lack of response to initial conservative management (oral syrups and induced movement), underscored the severity of the impaction and justified escalation to manual intervention.

The treatment strategy in this case was largely effective, involving a multi-modal approach combining anti-inflammatory medication (Flunixin meglumine), supportive intravenous fluids (RL and DNS), and nutritional supplementation (Tribivet and Brotone). While oral medications were initially refused by the elephant, subsequent overnight administration by the mahout indicated the importance of caretaker familiarity and behavioural conditioning in therapeutic compliance. Notably, the use of per rectal examination not only facilitated diagnosis but was also critical for therapeutic intervention. Manual disimpaction, though labour-intensive, was successful in relieving the obstruction and restoring normal gastrointestinal function.

This case also highlights the practical challenges in field-based elephant medicine, such as the absence of advanced diagnostic tools (e.g., ultrasonography, endoscopy) and the need for pragmatic alternatives and a frugal innovation approach, in absence of required equipment. The use of lubricated soap-water solution instead of standard antiseptic lubricants for per rectal procedures represents a field-adapted protocol.

From a management perspective, a key lesson drawn from this case is the importance of monitoring for non-standard dietary intake during unsupervised grazing or routine forest movements. Even in otherwise healthy individuals with balanced diets and adequate hydration, the

ingestion of inappropriate forage can precipitate serious gastrointestinal conditions (Mikota *et al*. 1994). Therefore, mahouts and veterinary staff must remain vigilant during the elephants' free-ranging activities and educate caretakers to recognize early signs of digestive disturbances.

Going forward, dietary intake during forest excursions should be observed more closely, and foraging areas known to contain *S. bengalense* and other high-fibre grasses should be avoided or access minimized. Additionally, this case demonstrates the value of early detection and timely intervention in preventing more severe outcomes, such as intestinal rupture or systemic toxemia, which have been reported in advanced cases of impaction (Mikota *et al*. 1994).

Conclusions

This case highlights the importance of instant diagnosis, timely clinical intervention, and a comprehensive supportive treatment regimen in the successful management of intestinal impaction in Asian elephants. It highlights the necessity for site-specific management protocols and routine monitoring of diet and foraging behaviour, particularly in semi-captive settings where elephants may have access to potentially harmful plant species. Camp environments situated within or adjacent to wild habitats should be regularly assessed to prevent the consumption of fibrous, indigestible vegetation such as *S. bengalense*, which may contribute to gastrointestinal disturbances. Juvenile elephants, due to their exploratory feeding behaviour and immature digestive systems, should be closely supervised during grazing and foraging activities to minimise risk.

The critical role of the mahout, especially one with long-term familiarity with the individual elephant, was evident in this case, both in recognising early clinical signs and in facilitating treatment compliance.

This case also highlights the pressing need for improved access to diagnostic resources in remote field settings, alongside the development and systematic documentation of field-adapted clinical protocols.

Furthermore, regular monitoring of molar progression, should be emphasised as a key preventive measure to ensure effective mastication and digestion. Routine oral inspections must be incorporated into elephant training for oral examination and drug administration. Periodic oral inspections and assessments of faecal fibre length, as proposed by Schiffmann *et al*. (2023) can help identify dental anomalies early. Such practices can serve as simple yet reliable indicators of chewing efficiency and overall gastrointestinal health. These measures are essential to enhancing health management and emergency response capabilities in elephant conservation programs.

Acknowledgements

We sincerely pay our gratitude to the Field Director, Dudhwa Tiger Reserve, and the Deputy Director, Dudhwa National Park. We would also like to thank the Department of Environment, Forestry and Climate Change, Uttar Pradesh, GoI. We thank the Mahouts and caretakers of the captive elephants at Dudhwa National Park, Uttar Pradesh, India, for their support during the treatment.

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