International Journal of Zoology and Applied Biosciences
Volume 10, Issue 5, pp: 9-16, 2025
https://doi.org/10.55126/ijzab.2025.v10.i05.002
ISSN: 2455-9571
http://www.ijzab.com
Research Article

OPERATIONALIZING VETERINARY COMPLIANCE IN CAPTIVE ASIAN ELEPHANTS (*Elephas maximus*): A VOLUNTARY MANAGEMENT APPROACH

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Article History: Received 12th July 2025; Accepted 31st August 2025; Published 30th September 2025

ABSTRACT

Providing preventive and therapeutic veterinary care to captive Asian elephants (*Elephas maximus*) requires methodologies that uphold animal welfare while ensuring personnel safety. This study evaluates the implementation of a protected contact (PC) management system in combination with operant conditioning using positive reinforcement to facilitate voluntary participation in clinical procedures. This approach was applied to a range of routine and advanced veterinary interventions in rehabilitated elephants, resulting in 100% compliance for pedicure, sphygmomanometry, and intramuscular injection; 96.4% for phlebotomy; 89.3% for oral examination; 75% for pulse oximetry; and 71.4% for thermometry. Moderate compliance was observed for trunk wash (67.9%) and ocular ultrasonography (64.3%), while the lowest compliance was recorded for electrocardiography (57.1%). These results demonstrate the efficacy of a welfare-centric, voluntary approach in minimizing stress responses, reducing reliance on chemical restraint, and enhancing procedural compliance and safety for both elephants and veterinary personnel.

Keywords: Asian elephant, Protected contact, Operant conditioning, Veterinary compliance, Welfare.

INTRODUCTION

The Asian elephant (*Elephas maximus* Linnaeus, 1758), is currently listed as "Endangered" by the International Union for Conservation of Nature (IUCN) (Williams et al., 2020), and protected under Schedule I of India's Wildlife (Protection) Amendment Act, 2022. As of January 2019, India recorded a population of 2,675 captive elephants under the custody of forest departments, elephant camps, rescue and rehabilitation centers, zoos, and private owners (MoEF, Govt. of India, 2019). Veterinary care for captive elephants poses logistical and ethical challenges due to their size, strength, intelligence, and potential for stress-induced behavioral responses. Historically, elephants were managed under a free-contact system, where mahouts (handlers) maintained close physical interaction, often using dominance-based methods (Fernando, 1989; Koehl, 2000; Locke, 2006). This approach carries significant occupational risks, including serious injuries and fatalities, due to the animals' strength and unpredictable behavior (Manoharan, 2020).

A paradigm shift towards protected contact (PC) has gained momentum over recent decades (Desmond & Laule, 1991). PC systems utilize physical barriers between elephants and handlers, promoting both safety and welfare. In these systems, handlers maintain interaction through a protective barrier, while elephants retain the freedom to disengage from the interaction (Otten, 1994). The Association of Zoos and Aquariums (AZA) supports PC systems, asserting that the future of elephant management should be grounded in protected contact principles (Priest, 1994). When combined with operant conditioning using positive reinforcement, elephants can be trained to voluntarily cooperate with clinical procedures without compromising their welfare (Laule & Whittaker, 2000; Mellen & Ellis, 1996). The primary goal of positive reinforcement training (PRT) is to replace negative associations with husbandry tasks by reinforcing them with

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rewarding experiences, such as receiving preferred food items (Clubb & Mason, 2001). Numerous studies have demonstrated the application of PRT to encourage voluntary participation in veterinary procedures (Fagen et al., 2014; MV, 2024; Selvaraj et al., 2025; Wendler et al., 2019). However, the quantitative effectiveness of such methods has rarely been documented. This paper evaluates PRT outcomes in captive Asian elephants by documenting compliance rates across various veterinary procedures.

MATERIALS AND METHODS

Subjects and housing

Wildlife SOS, in collaboration with the Uttar Pradesh Forest Department, has operated the Elephant Conservation and Care Centre (ECCC) in Mathura district, Uttar Pradesh since 2010. The facility is dedicated to the rescue and rehabilitation of abused, exploited, and confiscated elephants. Currently, 32 rescued Asian elephants, aged 1–70 years, are housed and managed under a protected contact system. After medical evaluation, 28 elephants (87.5%) were enrolled in the operant conditioning program; four were excluded due to medical reasons. All enrolled elephants had prior exposure to basic operant conditioning (MV, 2024) and underwent refresher and procedure-specific training prior to implementation.

Training protocol

Training protocols were tailored based on each elephant's health status, behavior, and medical history. Food preferences were determined through pairwise comparisons. Clicker training was used, where the clicker served as a secondary reinforcer paired with high-preference food rewards (e.g., fruits, sugarcane, dates, roasted gram). Training was conducted twice daily for 10–15 minutes, focusing on clinical behaviors and employing a systematic shaping approach. A behavior was considered learned when performed reliably on three consecutive occasions. Once foundational behaviors were established, elephants were gradually desensitized to touch and medical equipment using consistent positive reinforcement.

Clinical procedures and implementation

Phlebotomy

Ear vein desensitization was performed using antiseptics and syringes. Blood sampling was carried out using a butterfly cannula (Figure 1).

Pedicure

Elephants were trained to present their feet for manual corrective toenail trimming and topical treatment (Figure 2).

Sphygmomanometry

Elephants were conditioned to keep their tails immobile for 90–120 seconds for blood pressure monitoring with inflatable cuffs (Figure 3).

Figure 1. Blood collection from the auricular vein of a rehabilitated *E. maximus* using a butterfly cannula under protected contact.

Figure 2. Voluntary foot presentation by *E. maximus* during pedicure enabling foot inspection and corrective toenail trimming.

Ocular ultrasonography

Elephants were trained to tolerate the application of coupling gel and gentle probe contact for transpalpebral ultrasonography (Figure 4).

Figure 3. Non-invasive sphygmomanometry using a digital blood pressure monitor.

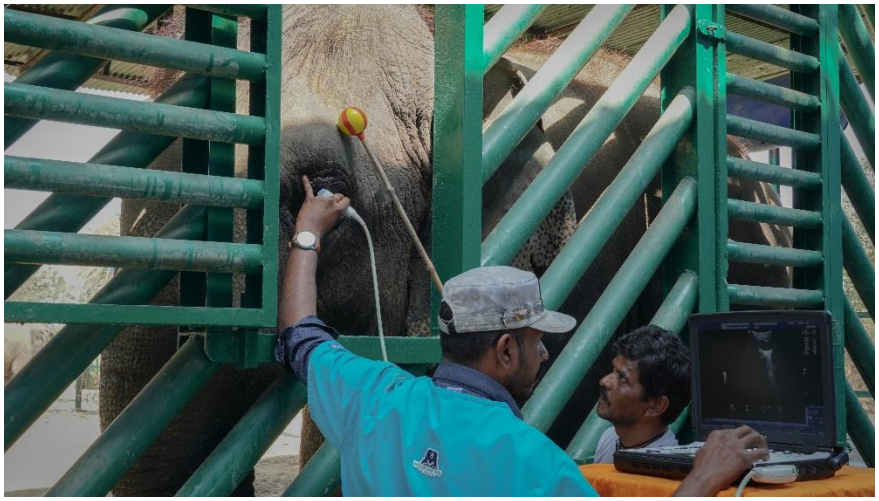

Figure 4. Transpalpebral ocular ultrasonography in a rehabilitated *E. maximus* performed under protected contact with operant conditioning

Electrocardiography

Electrodes were introduced and clipped onto the chest, elbows, and stifles, with ECG readings taken while elephants remained calm (Figure 5).

Figure 5. Electrocardiographic (ECG) monitoring enabling accurate cardiac rhythm assessment.

Pulse oximetry

A probe was attached to the auricular pinna to measure arterial oxygen saturation and pulse rate (Figure 6).

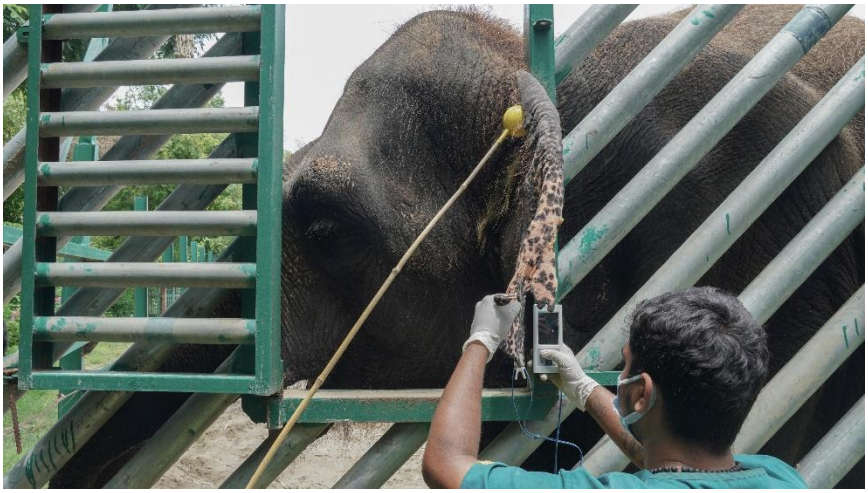

Figure 6. Measurement of arterial oxygen saturation (SpO_2) and pulse rate using a pulse oximeter probe attached to the auricular pinna.

Thermometry

Elephants were trained to tolerate rectal insertion of a lubricated digital thermometer while maintaining stillness (Figure 7).

Figure 7. Rectal thermometry by using a flexible tip digital thermometer.

Trunk wash

Elephants were conditioned to hold and expel sterile saline from the trunk into sterile bags for microbial testing (Figure 8).

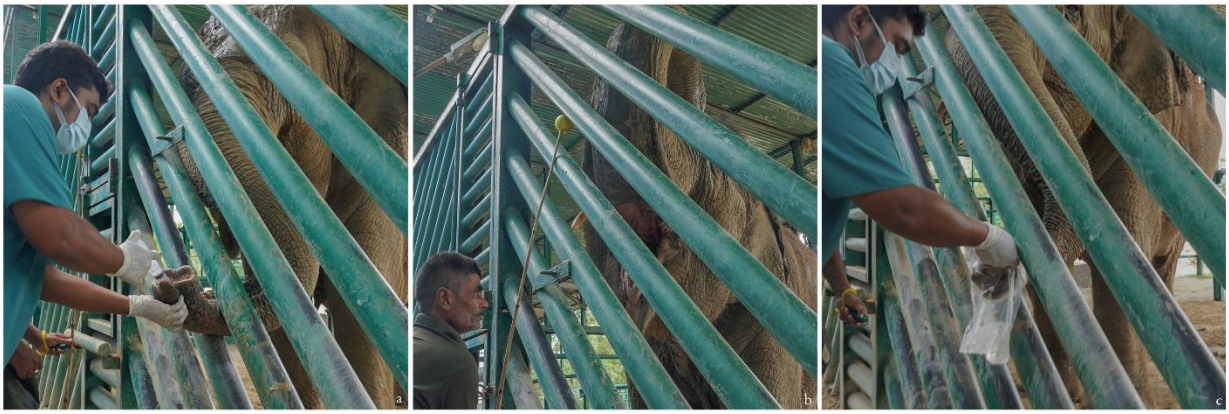

Figure 8. Trunk wash procedure: (a) flushing of the trunk using sterile saline; (b) elephant in a trained "trunk hold" position; (c) collection of effluent in a sterile bag.

Oral examination

Elephants were trained to lift their trunks and open their mouths for visual inspection of the oral cavity, with documentation via photographs (Figure 9).

Figure 9. Oral cavity showing healthy molar occlusion during a routine oral examination

Intramuscular injection

Elephants were conditioned to remain stationary during injections into the shoulder or hip muscles for medication administration (Figure 10).

Figure 10. Administration of intramuscular injection at hip region under protected contact.

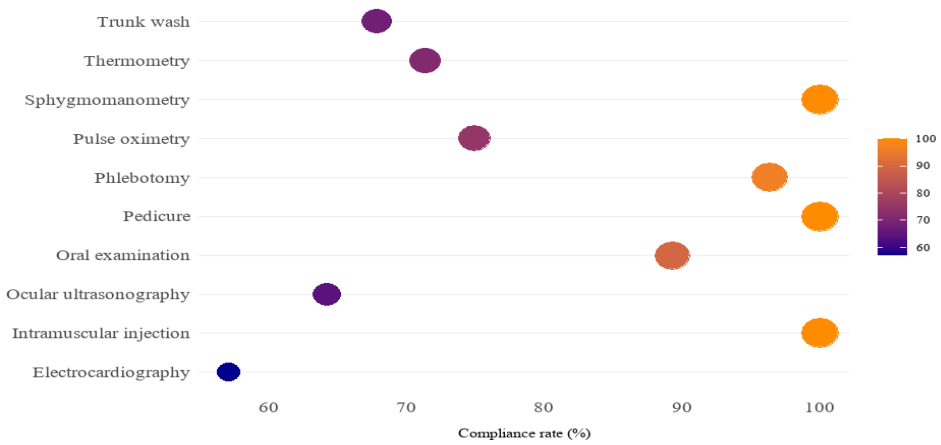

Figure 11. Compliance rates for various veterinary procedures in rehabilitated *E. maximus* (n=28).

RESULTS AND DISCUSSION

Ten routine clinical procedures were evaluated for compliance in 28 elephants. As shown in Figure 11, full compliance (100%) was recorded for pedicure, sphygmomanometry, and intramuscular injection. Phlebotomy achieved 96.4% compliance, followed by oral examination (89.3%). Pulse oximetry and thermometry recorded moderate compliance at 75% and 71.4%, respectively. Trunk wash procedures had 67.9% compliance. The lowest compliance rates were observed for ocular ultrasonography (64.3%) and electrocardiography (57.1%).

CONCLUSION

The integration of protected contact and operant conditioning represents a transformative advancement in captive elephant healthcare. This approach enhances both elephant autonomy and procedural safety, aligning with

modern welfare standards. Voluntary participation reduced the need for chemical restraint, minimized stress, and improved diagnostic accuracy. It also significantly improved staff safety. The findings support the broader adoption of PC systems as a replicable model for elephant healthcare institutions seeking improved welfare outcomes.

ACKNOWLEDGMENT

The authors express sincere gratitude to the Co-Founders of Wildlife SOS, Mr. Kartick Satyanarayan and Smt. Geeta Seshamani, for their unwavering support and guidance. We thank the Uttar Pradesh Forest Department for their continued collaboration and extend our appreciation to the Wildlife SOS animal care staff for their dedication and contributions to this program.

CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

FUNDING

This study received no specific funding from public, commercial, or not-for-profit funding agencies.

AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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