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Original Research

Forensic Detection of Sex- Manipulation Fraud and Associated Unethical Practices in Laboratory Rabbit Research in Bangladesh

Md. Matiur Rahman [1], Md. Mahfuzul Haque [2*], Abdullah Al Sad [2], Estiaqe Ahmed [3], Md. Julkar Nayeen [2], Ratul Zaman [4], Md. Masud Parvej [5], Tapan Kanti Paul [6], Raf Ana Rabbi Shawon [7], Tanvir Ahmed [8], Munira Parvin Mukta [9], Md Mahbubur Rahman [10*]

[1] Department of Medicine, Sylhet Agricultural University, Sylhet 3100, Bangladesh
[2] Department of Surgery and Theriogenology, Sylhet Agricultural University, Sylhet 3100, Bangladesh
[3] North East Medical College Hospital, Sylhet 3100, Bangladesh
[4] Department of Genetics and Animal Breeding, Sylhet Agricultural University, Sylhet 3100, Bangladesh
[5] Department of Anatomy and Histology, Sylhet Agricultural University, Sylhet 3100, Bangladesh
[6] Department of Livestock Services, Dhaka 1215, Bangladesh
[7] Laboratory of Wildlife Resources, Gifu University, Gifu 501-1193, Japan
[8] Faculty of Veterinary, Animal and Biomedical Sciences, Sylhet Agricultural University 3100, Bangladesh
[9] Govt. College of Applied Human Science, University of Dhaka, Dhaka-1000, Bangladesh
[10] St. Francis College, New York 11201, USA

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Corresponding author:
mahfuzsau55@gmail.com
mrahman23@sfc.edu

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Abstract: The global rabbit market has expanded substantially due to their increasing use as laboratory animals, breeding stock, meat and fur production, genetic improvement programs, and as companion animals. However, this growth has been accompanied by increasing reports of fraudulent trading practices, particularly sexual adulteration, in poorly regulated markets. To date, no comprehensive study has systematically investigated sexual adulteration fraud in rabbits traded in Bangladesh. This study aimed to explore the sexual adulteration fraud in rabbits traded in Sylhet, Bangladesh. A total of 20 rabbits marketed as males (n=10) and females (n=10) were randomly collected from market of Sylhet. All rabbits underwent systematic physical examination followed by open laparotomy under expert veterinary supervision to confirm reproductive anatomy. The results revealed that among the 10 rabbits sold as females, three (30%) were phenotypically male on external examination, while seven (70%) showed scrotal scarring indicative of prior surgical intervention. Forensic exploration confirmed the complete absence of female reproductive organs in all suspected cases. Overall, seven of 20 rabbits (35%) were confirmed as cases of intentional sexual adulteration, while three of 20 rabbits (15%) were misclassified due to improper sex identification rather than deliberate fraud. The current results revealed a substantial prevalence of sexual adulteration and sex misrepresentation in the Sylhet rabbit market, posing serious risks to laboratory animal welfare, breeding efficiency, research reliability, and economic trust. Moreover, the study suggests the urgent need for routine market monitoring, mandatory registration and licensing of rabbit traders, targeted training on rabbit sex identification for buyers and sellers, and strict enforcement of animal welfare and livestock trade regulations. Additionally, the study indicates the necessary of coordinated institutional action to prevent unethical practices and to ensure the sustainable and ethical development of Bangladesh's rabbit industry.

Keywords: Forensic, Lab Animal, Misrepresentation, Rabbit, Sexual Alteration.

1. Introduction

Rabbits are particularly attractive to small-scale farmers due to their rapid reproductive rate, efficient feed conversion, low space requirements, and relatively modest investment costs, making them an emerging component of peri-urban and household-level livestock systems **(Narita, 2025).** The global rabbit sector has expanded substantially over recent decades, driven by the versatile role of rabbits as laboratory animals, sources of high-quality meat and fur, breeding stock, genetic improvement models, and increasingly as companion animals **(Cullere and Dalle Zotte, 2018).** In parallel with rising global demand for affordable animal protein, the growing use of rabbits in biomedical and agricultural research, and changing household structures favoring small companion animals, rabbit farming has gained notable popularity worldwide, including in developing countries such as Bangladesh **(Sikiru et al. 2020).** Despite these advantages, the rapid expansion of the rabbit market has been accompanied by an increase in unethical and fraudulent trading practices involving breeders, market vendors, intermediaries, and, in some cases, buyers **(FAO, 2011).** These fraudulent activities collectively constitute market-level fraud within the rabbit trade and include deliberate misrepresentation of sex, age, breed, health status, and reproductive capacity. Fraudulent practices in animal markets can range from simple acts of mislabeling or misinformation to more complex, organized schemes operating across regional and international trade networks **(Goldmann, 2010).** These activities not only undermine consumer confidence and economic sustainability but also pose serious risks to animal welfare, breeding efficiency, and research reliability.

Several studies on livestock and laboratory animal trade have demonstrated that limited technical knowledge among buyers, coupled with unethical practices by sellers, substantially contributes to the prevalence of fraudulent activities in animal markets **(Mekasha et al. 2024; Adenuga and Montowska, 2023).** Inadequate enforcement of existing government regulations, weak legal accountability, and insufficient routine market monitoring further exacerbate the occurrence and persistence of such fraudulent schemes **(Motlamelle, 2023).** The nature and complexity of fraud also vary according to market demand, production systems, and consumer preferences. In live animal markets, misrepresentation by sellers is particularly common with respect to age, sex, breed, health status, and reproductive performance, especially for species such as rabbits where accurate visual assessment requires specific expertise **(Hungu, 2011).** Moreover, the increasing use of falsified or counterfeit documentation including vaccination certificates, breeding records, and health status cards has enabled dishonest traders to market underperforming, surgically altered, or unhealthy animals as high-quality breeding or companion stock **(Fox, 2025; Urbi et al., 2025).** Collectively, these practices undermine animal welfare, distort market transparency, and compromise the reliability of animals intended for breeding, research, or companionship.

Sexual alteration represents a specific and serious form of fraud in the rabbit trade, wherein sellers intentionally misrepresent male rabbits as females, most commonly through surgical removal of the testes or, less frequently, misrepresent females as males to meet buyer preferences and maximize profit **(Olabu, 2014).** Such fraudulent practices are facilitated by the limited knowledge of buyers regarding accurate sex determination, particularly among those purchasing rabbits for breeding, research, or companionship. In many cases, non-professional and unqualified individuals perform these surgical interventions without appropriate

veterinary expertise, anesthesia, or post-operative care, thereby exacerbating animal welfare concerns **(Richard, 2023; Tiva et al., 2025b).** Consequently, buyers experience substantial economic losses due to unexpected animal behavior, reproductive failure, and compromised breeding outcomes, while researchers may generate unreliable or misleading experimental data. These consequences not only undermine consumer trust but also disrupt planned breeding programs and research integrity **(Daar, 2008; Sazzad et al., 2025).** Moreover, the persistence of sexual adulteration fosters broader unethical business practices within the animal trade, occasionally extending across regional boundaries and raising significant legal, ethical, and governance challenges related to fair trade and animal welfare compliance. Considering these multifaceted impacts, there is a pressing need for the establishment and enforcement of specific regulatory frameworks governing rabbit trade, sex identification, surgical practices, and market surveillance. Although numerous studies worldwide have reported fraudulent practices involving different laboratory animals, however, no systematic investigation in rabbit has yet been conducted in Bangladesh. Therefore, the present study aimed to forensically detect sexual manipulation and related unethical practices in laboratory rabbits traded in Sylhet and to provide evidence-based recommendations to governmental authorities for controlling such activities both locally and across Bangladesh.

2. Methodology

2.1 Experimental Animals and Study Area

Experimental animals "Rabbit" were collected from Lalbazar, Sylhet Sadar-3100, Bangladesh. A total of 20 rabbits (males, n=10; females, n=10) with an average body weight of approximately 1.5–2.0 kg and aged 6–8 months were used in the study. All experimental procedures were conducted at the Department of Surgery and Theriogenology, Sylhet Agricultural University, Bangladesh.

2.2 Experimental Design

The rabbits were experimentally stratified according to sex into two distinct groups: Group A (n=10 male rabbits) and Group B (n=10 female rabbits). Prior to any invasive procedures, all rabbits were subjected to comprehensive physical and other clinical examinations, including assessment of external genitalia, body condition, and general health status, to ensure suitability for the study. Following this initial examination, surgical interventions were carefully conducted to scientifically confirm sex and to identify any evidence of sex-manipulation or other unethical practices. All procedures were carried out in accordance with standard veterinary surgical protocols and were performed under the direct supervision of an experienced veterinarian, ensuring animal welfare, procedural accuracy, and scientific rigor throughout the investigation.

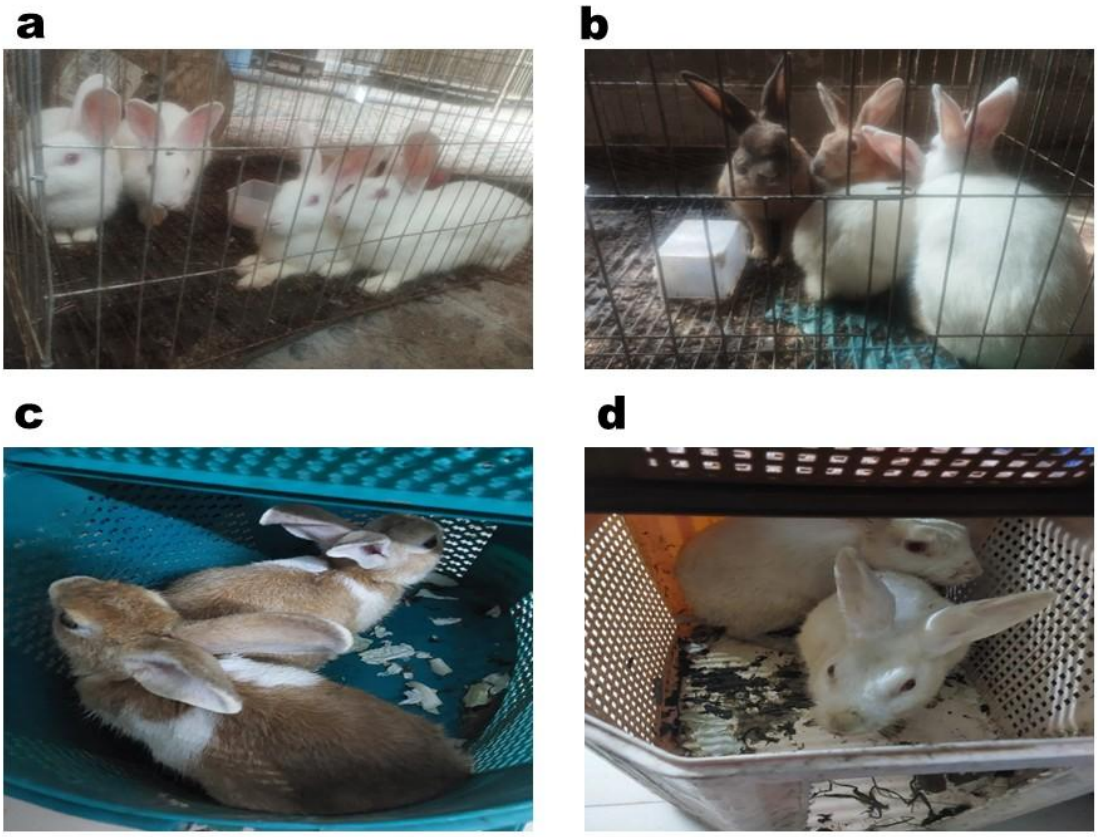

Figure 1. Housing conditions of rabbits. (a, b) Rabbits confined in iron cages; (c, d) Rabbits housed in plastic cages.

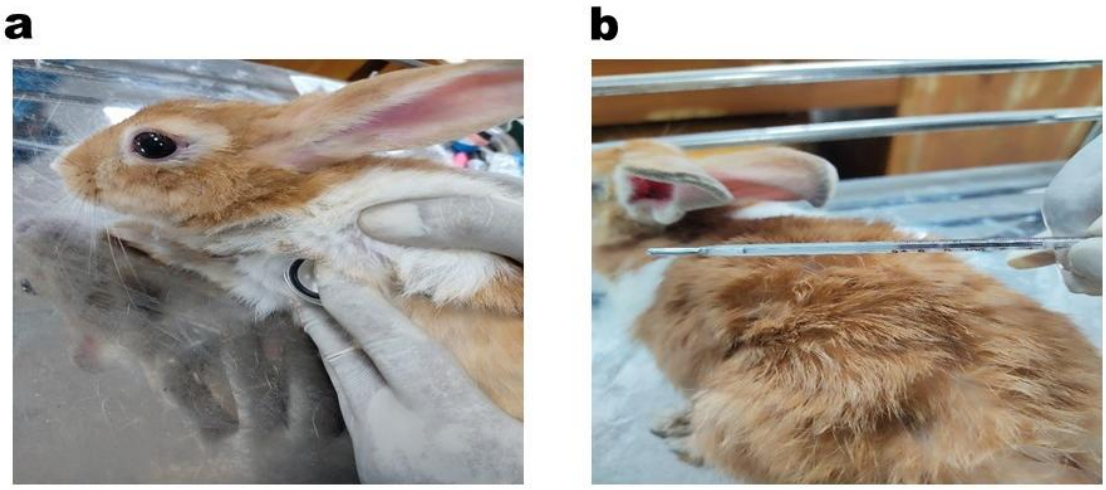

Figure 2. Physical and physiological examination of rabbits prior to forensic assessment. (a) Measurement of heart rate; (b) Measurement of rectal body temperature to assess general health status before further examination.

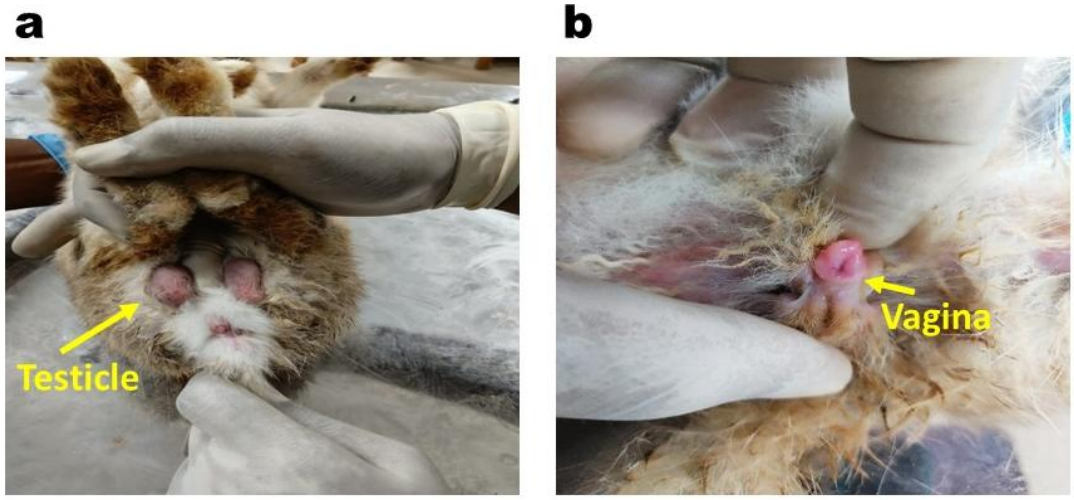

Figure 3. External genital examination for preliminary sex identification of rabbits. (a) Male rabbit showing external genital characteristics; (b) Female rabbit showing external genital characteristics during routine physical examination.

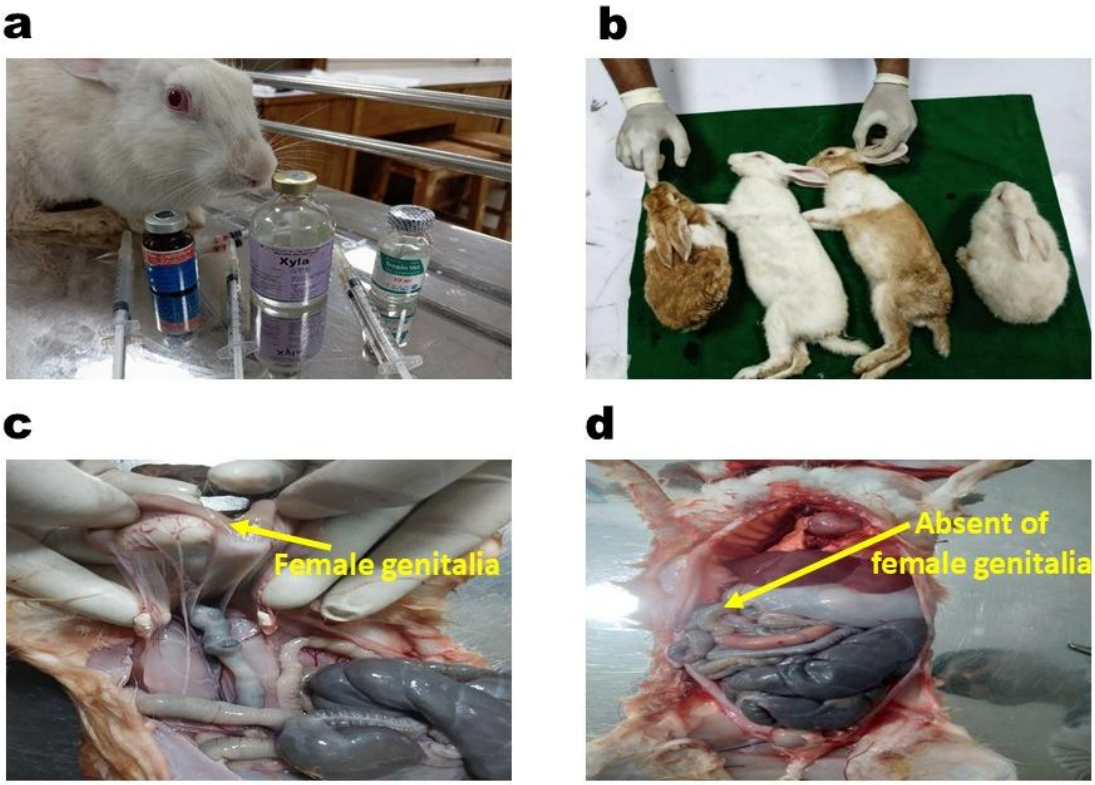

Figure 4. Surgical investigation for confirmation of sex manipulation in rabbit. (a) Administration of pre-anesthetic and anesthetic agents; (b) Rabbit under anesthetic effect prior to surgical exploration; (c) post-anesthetic recovery phase; (d) Surgical confirmation of female reproductive organs; (e) Absence of female genital organs confirming sex alteration.

3. Result

A total number of 20 rabbit(s) collected from Lalbazar, Sylhet sadar by an inexpert person to detect the frauds on rabbit(s) (Table 1). Before performing any kind of examination first detect the physiological status of male and female means respiration rate/ minute, heart rate/mi and temperature at ^{0}F (Table 2 & 3). Following that to detect the fraudulence activities of on all rabbits under goes through physical examination for sex detection followed by surgical investigations by open laparotomy (Table 4).

3.1 Physical Examination

During physical examination of rabbit(s) for sexual fraud detection of male and female, 3 among 10 rabbit(s) sold as female by seller were basically found as male on the basis of testicular and penis persistence. Beside this, after examination of perineal area, scrotal scar found among 7 from 10 rabbit(s) those were labeled as female by seller however originally, they were male.

3.2 Surgical Investigations

For confirming the suspected sexual adulteration, an open laparotomy surgery was performed on all suspicious individuals under the close supervision of an Assistant Professor from Surgery and Theriogenology department of Sylhet Agricultural University. No female reproductive organs were found among each suspected individual that indicate that they were basically male.

3.3 Prevalence and pattern of fraud

Through physiological and surgical intervention, 7 rabbit(s) among 20 were found surgically altered from male to female due to high demand and price of female rabbit. This study represents that about 35% of sexual fraudulency activities occurs in rabbit market at Sylhet, Bangladesh. The study also remarks that 15% of misrepresentation occurred due to lack of proper knowledge about rabbit sexing which invite the seller to take the space for performed this fraud.

3.4 Complications

Minor infection on scrotal area, wound on scar formation area, in appetite and physiological stress were found among sexual adulterer rabbit as a post-operative signs, this indicate that unethical activities and inexpert person involvement on fraud activities on rabbit.

Table 1. Types of fraud on Rabbit Trade

Fraud Type	Description	Reference
Species Substitution	Selling non pure breeds as high genetic lines or represent pet breed as a meat breed	Rahman, M. H et al., (2023). *Market fraud and animal welfare concerns in small livestock trading: A South Asian perspective.* Asian Journal of Agricultural Economics, 12(4), 201–213.
Sexual Alteration	Male or female organ removed through surgical intervention or hormonal treatment given to suppress the function of genital organ	
Trade documentation Fraud	Adulterate age, vaccination or health certificate	
Smuggling/Illegal Transport	To avoid tax or welfare regulations in trade	
Welfare or Origin fraud	State a farm raised rabbit when they collect from illegal way or intensive	
E-commerce or online pet sale fraud	Fake sellers or advance payment scams	
Misrepresented By products	Fake fur or mislabeled meat in process goods	

Table 2. Physiological Data of Male Rabbit(s)

Traits	Age (month)	Body weight (kg)	Color	Respiration rate (per min)	Heart Rate (per min)	Temperature (^{0}F)
MR1	6	1.8	White	44	168	101.5
MR2	8	1.5	Brown	42	200	102.6
MR3	7	1.7	White	34	170	102.8
MR4	8	1.8	White	36	170	101.6
MR5	6	2.0	White	34	170	102.0
MR6	6	1.8	Black & Brown	50	220	103.5
MR7	7	1.6	Brown	50	210	104.2
MR8	7	1.9	Black & Brown	44	200	103.4

MR9	7	1.8	White	38	150	101.8
MR10	8	1.5	White	40	170	101.6

** MR= Male Rabbit

Table 3. Physiological Data of Female Rabbit(s)

Traits	**Age (month)**	**Body weight (kg)**	**Color**	**Respiration rate (per min)**	**Heart Rate (per min)**	**Temperature (^{0}F)**
FR1	7	1.7	White	40	170	101.4
FR2	8	1.7	Brown	40	210	102.0
FR3	7	1.7	White	36	160	102.4
FR4	8	1.5	White	34	150	102.6
FR5	6	1.6	White	38	160	102.1
FR6	6	1.6	Brown	48	200	104.0
FR7	6	1.5	Brown	46	190	103.8
FR8	6	1.6	Brown	48	210	103.6
FR9	7	1.7	White	40	150	102.6
FR10	7	1.5	White	38	160	102.6

** FR= Female Rabbit

Table 4. Physical and Surgical Investigation to Detect Sexual Fraudulence Activity

Traits	**Rabbit (n)**	**Observation**	**Remarks**
Total Rabbit examined	**20**	10 male and 10 female	
Sexual misidentification (originally male but sold as female)	**3**	Testis and penis persist	Lack of buyer knowledge
Surgically adulterer female from male	**7**	Surgical scar on scrotal area	Neutered/Castrated rabbit
Surgical confirmation of adulterer	**7**	Female genital organ did not find	
Prevalence and pattern of fraud	**3**	**Misrepresentation**	**15%**
	7	**Sexual Adulterer**	**35 (%)**

4. Discussion

The present study revealed that 35% of rabbits traded in the Sylhet market, Bangladesh were subjected to sexual adulteration which was unequivocally confirmed by the surgical investigation. The hidden causes of such practices may be associated with market-driven preferences for specific sex characteristics, breeding demand, misrepresentation to meet buyer demand, and the absence of effective regulatory oversight in live animal markets. The inadequate awareness of animal welfare standards and limited regulatory enforcement of veterinary inspection protocols may further facilitate the persistence of such fraudulent activities. Although this is the first study to report the forensic detection of sex manipulation in laboratory rabbits in Bangladesh, the availability of directly comparable literature remains limited, restricting the scope for a more comprehensive discussion. To date, no published studies have specifically addressed surgical or cosmetic sexual alteration in laboratory rabbits within the context of South Asian live animal markets. Consequently, the present findings were interpreted by drawing indirect comparisons with reports of sexual fraud and structural genital modification in other animal species. This lack of species- and region-specific evidence indicates a critical knowledge gap and underscores the need for further systematic investigations into fraudulent sex manipulation practices, their underlying drivers, and their implications for animal welfare, research integrity, and market regulation.

There are relatively few published reports documenting fraudulent practices related to sex manipulation across different animal species. Previous study reported the cosmetic and sexual fraud in camel trading practices, clearly demonstrating that deliberate anatomical manipulation has been employed as a deceptive strategy within livestock markets **(Tharwat, 2025; Tiva et al., 2025a).** Such type of practices reflected the intentional human intervention aimed at altering external or internal sexual characteristics to misrepresent an animal's true sex. Consistently, other studies reported the intentional structural modifications of the rabbit penile morphology, providing compelling evidence that sexual manipulation is not confined to large livestock species but may also extend to small animals **(Olabu, 2014; Richard, 2023).** The comparable forms of sex-related misrepresentation have also been reported in other species including small ruminants and poultry, where traders exploited limited buyer expertise and subtle sexual dimorphism to misclassify animals for sale **(Tefera Mekasha et al. 2024; FAO, 2011).** On the other hand, deceptive practices in wildlife and exotic animal markets involving sex misidentification and physical alteration have similarly been linked to weak regulatory oversight and insufficient veterinary inspection **(Nijman, 2010; Wyatt, 2013).** In addition to confirmed cases of deliberate sexual fraud, present study reported that 15% of the animals misrepresented due to inadequate knowledge among buyers regarding accurate sex identification, rather than intentional anatomical manipulation. This observation consistent with the findings of Tefera Mekasha et al. (2024) that emphasized the limited technical awareness among market participants, combined with weak regulatory enforcement, creates a permissive environment for sex-related misrepresentation in animal trade systems within developing countries **(Akhter et al., 2025).**

Sex identification in rabbits is inherently challenging, particularly for juvenile animals or individuals with subtle external sexual dimorphism, and may be further complicated by stress, handling conditions, or prior physical modification. Importantly, this difficulty is not restricted to inexperienced buyers; even trained

personnel may encounter diagnostic uncertainty under field conditions. Such limitations in reliable sex determination have long been recognized as a structural vulnerability in animal trade, as noted by Feshbach and Sones (1971). Consequently, this diagnostic ambiguity serves as a primary enabling factor for both unintentional misclassification and deliberate fraudulent practices, allowing sex misrepresentation to persist in the absence of routine veterinary verification. Collectively, these studies indicated that sex-related fraud in animal trade represents a cross-species phenomenon, facilitated by anatomical ambiguity, market demand, and inadequate enforcement mechanisms. The convergence of evidence across diverse animal groups supports the interpretation that sexual manipulation and misrepresentation are systematic practices rather than isolated events that underscoring the need for strengthened forensic veterinary approaches and regulatory guidelines. Together, these findings highlight the need for capacity building in buyer education, standardized sex identification guidelines, and strengthened veterinary inspection protocols to decline misrepresentation, protect animal welfare, and improve transparency within live animal markets.

This study has several limitations that should be acknowledged. First, sample collection was restricted to the Sylhet region, which may limit the generalizability of the findings to other regions of Bangladesh. The trading practices, buyer awareness, and regulatory enforcement can vary substantially across geographic locations; therefore, the prevalence and dynamics of sex manipulation observed in this study may not fully represent the national scenario. Additionally, the relatively limited sample size and market-based sampling pattern may have constrained the detection of regional or seasonal variability in fraudulent practices. The future studies incorporating larger sample sizes, multiple markets across different regions, and cross-sectional sampling designs are necessary to provide a more comprehensive and representative assessment of sex manipulation and misrepresentation in laboratory and commercial rabbit trade in Bangladesh.

5. Conclusion

This study provides clear forensic evidence of sex alteration related fraud in laboratory rabbits traded in Sylhet, with important implications for the broader context of rabbit trade in Bangladesh. The findings demonstrated that such malpractice was primarily facilitated by limited knowledge of accurate rabbit sex determination among buyers, particularly newcomers, which creates opportunities for intentional misrepresentation by sellers. Beyond its economic and breeding-related consequences, this unethical practice poses serious concerns for animal welfare, as it often involves invasive manipulation and inadequate post-procedural care. The persistence of these practices further reflects insufficient market monitoring, weak enforcement of existing regulations, and limited accountability mechanisms, which collectively create an enabling environment for fraudulent activities to occur. To address these challenges, strengthening market monitor should be prioritized, followed by the implementation of targeted awareness and education campaigns for buyers and traders. In addition, the introduction of mandatory registration and licensing systems for rabbit traders and breeders is strongly recommended. Our study suggests a multi-sectoral approach involving the Department of Livestock Services, city corporations, and law enforcement authorities, coupled with sustained awareness initiatives among animal owners and traders, could substantially reduce sex-related fraud in rabbit markets. The present also suggest that such interventions would not only enhance ethical trading practices and animal welfare standards but also support the sustainable development of the

rabbit industry for research, breeding, and commercial purposes in Bangladesh.

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Author Contribution

Md. Matiur Rahman - Formal analysis, investigation, methodology, supervision, writing original draft, writing- review and editing. Md. Mahfuzul Haque - Conceptualization, formal analysis, investigation, methodology, writing original draft, writing- review and editing. Abdullah Al Sad- Formal analysis, investigation, methodology, writing- review and editing. Estiaqe Ahmed- Methodology, investigation, validation. Ratul Zaman - Data curation, methodology, resources, validation. Md. Masud Parvej- Data curation, methodology, resources, validation. Tanvir Ahmed- Methodology, resources, validation. Raf Ana Rabbi Shawon - Methodology, resources, validation. Munira Parvin Mukta - Methodology, resources, validation

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A statement of conflicting interests

The authors declare that they have no competing interests relevant to this manuscript.

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