Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(3): 1477-1483

Received: 20-03-2020
Accepted: 22-04-2020

CM Bhadesiya
Assistant Professor, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

GR Chaudhary
Assistant Professor, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

TP Patel
Assistant Professor, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

LM Sorathiya
Associate Professor & In-charge, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

VA Patel
M.V.Sc. Scholar, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

PJ Gajjar
M.V.Sc. Scholar, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

MJ Anikar
M.V.Sc. Scholar, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

Corresponding Author:
CM Bhadesiya
Assistant Professor, Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar, Gujarat, India

Prevalence of diseases and disorders of reptiles at Veterinary Hospital of Kamdhenu University, Gujarat, India

CM Bhadesiya, GR Chaudhary, TP Patel, LM Sorathiya, VA Patel, PJ Gajjar and MJ Anikar

Abstract
Veterinarians are frequently involved in diagnosis and treatment of various diseases of different animal species including reptiles. A strong database based on large-scale investigations on existing ailments in reptile is needed in India. A university veterinary hospital provides a unique and strong platform to assess latest information on diseases of any animal species. The veterinary hospital of Kamdhenu University, Gujarat was started in April-2018 and is dealing with diagnosis and treatment of different animals. A study was undertaken to record prevalence of different diseases and disorders of reptiles on the basis of cases registered between April-2018 to December-2019. Overall, 2586 cases were registered out of which, 57 cases were reptiles with an overall prevalence of 02.20%. The registered cases belonged to 10 individual reptilian species and diseases were recorded under 11 of 17 subcategories defined for the study. Overall, highest percentage of cases were brought for general health checkup before release followed by clinical cases of digestive disorders, dermatological disorders, minor surgical conditions, general systemic conditions, dog-bite, respiratory tract disorders, major surgical conditions, nutritional/metabolic/deficiency disorders, locomotory disorders, toxicity/poisoning and miscellaneous conditions. It is concluded that the results of the study will provide a baseline data on existing disease conditions in reptiles and also generate a strong platform for research benefiting the reptiles in future.

Keywords: Categories, diseases, Gujarat, prevalence, reptiles, veterinary hospital

Introduction
The Indian subcontinent has various climatic zones which provide suitable habitat for growth and survival of a large number of animal species [1]. The reptiles are of significant importance to the ecosystem of a geographical region. Gujarat state also has a remarkable population and types of reptiles [2] including some venomous snakes (e.g., Indian spectacled cobra, Russell's viper, Common krait etc.), non-venomous snakes (e.g., Rat snake, Common trinket snake etc.), lizards (e.g., Common monitor lizard), crocodiles (e.g., Marsh crocodile) as well as different species of turtles (e.g., Indian flapshell turtle) and tortoises (e.g., Indian star tortoise).

Reptiles can suffer from diseases and disorders because of various reasons. Literature is available on diseases of reptilian species in countries other than India which suggest that reptiles can suffer from bacterial diseases [e.g., septicemia, Septicemic Cutaneous Ulcerative Disease (SCUD), ulcerative or necrotic dermatitis, abscesses, infectious stomatitis, mycoplasmosis, otitis etc.]; mycotic diseases [e.g., infection by *Aspergillus* spp., dermatophytosis etc.]; viral diseases [e.g., Inclusion Body Disease (IBD), retrovirus infection, adenovirus infection etc.], ectoparasites [e.g., snake mite *Ophionyssus* spp., ticks belonging to *Amblyomma* spp. etc.]; protozoa and endoparasites [e.g., Pentastomes etc.]; environmental conditions and traumatic injuries [e.g., burn, fractures, injuries, prey-induced trauma etc.]; metabolic and endocrine diseases [e.g., gout, osteopathy etc.]; reproductive disorders [e.g., egg-bound condition]; and certain neoplastic conditions [3, 4, 5, 6].

Such a detailed classification on the basis of etiology or system-involvement does not exist in India. Scientific literature is available from research or case studies on captive and/or wild species of Indian reptiles. For example, tick infestation in captive and wild snakes [7, 8]; necrosed venom gland in cobra [9]; injury in captive and rescued snakes [10, 11]; moth fly larvae infestation and shell infection in Indian flapshell turtles [1, 12]; fractured carapace, internal parasites and cloacal prolapse in Indian star tortoises[13, 14, 15, 16, 17]; automobile accident and foreign body gastritis in crocodiles [18, 19]; tick infestation in monitor lizards [8, 20, 21] etc.

Hence, there is a need to establish baseline data on existing prevalence of infectious and non-infectious conditions in Indian reptiles.

Veterinarians are directly involved in diagnosis and treatment of healthcare issues in reptiles. Clinical services are provided at veterinary polyclinics, hospitals, dispensaries, mobile veterinary units functional under state animal husbandry department; wildlife care centers or rescue centers functional under forest department; and also at hospitals functioning under veterinary colleges of Gujarat. Increasing numbers of private veterinary clinics in urban and rural areas is also a promising sign for better healthcare services. Here, a well-established veterinary hospital or Teaching Veterinary Complex (TVC) of a veterinary university provides a strong platform to conduct clinical research because of direct involvement of expert clinicians, academicians, young researchers and experienced scientists trained to conduct research and disseminate knowledge to the scientific community and society. Prevalence of diseases in hospital population of reptiles has not been documented in Gujarat. A study was undertaken to assess prevalence of different diseases and disorders on the basis of cases registered at the veterinary hospital between April-2018 to December-2019. The results of the study are documented in this paper.

Materials and Methods

Place of Study

The present study was carried out at veterinary hospital functioning under the Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University at Rajpur (Nava), Himmatnagar, Gujarat. It is providing veterinary services for mammalian, avian and reptilian species since its inception in April-2018. The present study was aimed to record prevalence of diseases and disorders of reptiles which included analysis of cases registered, examined, diagnosed and treated at hospital.

Sample Collection & Diagnostic Methods:

Sample collection, laboratory examination, diagnostic approaches and therapeutic management were followed as per available guidelines/references depending on case presentation (Table-1).

Table 1: Literature referred for sample collection, laboratory examination, clinical diagnosis and therapeutics

Sample for disease diagnosis	**Reference**
Faeces/excreta, Ticks	Soulsby (1982) [22]; Barger and Macneill (2015) [23]
Blood (whenever required)	Barger and Macneill (2015) [23]; Jain (1986) [24]
Methodology	**Reference**
Staining (whenever required)	Koneman *et al.* (1992) [25]; Barcia (2007) [26]; Thairu *et al.* (2014) [27]
Examination of Faeces/excreta, identification of Ticks	Catherine *et al.* (2017) [7]; Soulsby (1982) [22]; Arsalan *et al.* (2008) [28]
Literature read for diagnostics and therapeutics	Divers and Stahl (2015) [3]; The Merck Veterinary Manual (2016) [4]; Fowler and Miller (2003) [5]; Longley (2010) [6]; Catherine *et al.* (2017) [7]; Radostits (2000) [29]; Chakrabarti (2004) [30]; Chakrabarti (2006) [31]

Categorization of Registered Cases

Two broad categories, *viz.*, [A] Category-A: Different Types of Diseases & Disorders (with 17 subcategories) and [B] Category-B: Other Categories of Cases (with 2 subcategories) were defined based on the cases registered between April-2018 to December-2019 (Table-2).

Reptiles requiring therapeutic management for different diseases were included in different subcategories of Category-A. Reptiles which were brought for physical checkup and found clinically healthy were included in 'GHC before release' subcategory of Category-B. The data generated from the study is depicted as *percentage-analysis only*.

Table 2: Categories and subcategories defined based on cases registered at veterinary hospital from April-2018 to December-2019

S. No.	**Category/Condition/System involved**		
Category-A: Different Types of Diseases & Disorders			
1	Aural Disorders	10	Miscellaneous Conditions
2	Dermatological Disorders	11	Neurological Disorders
3	Digestive Disorders	12	Nutritional/Metabolic/Deficiency Disorders
4	Dog-bite	13	Ophthalmic Disorders
5	General Systemic Conditions	14	Reproductive/Genital Disorders
6	Haemoprotozoan Diseases	15	Respiratory Tract Disorders
7	Locomotory Disorders	16	Toxicity/Poisoning
8	Major Surgical Conditions	17	Urinary Tract Disorders
9	Minor Surgical Conditions	-	-
Category-B: Other Categories of Cases			
1	General Health Checkup (GHC) before release	2	Pregnancy Diagnosis

Results and Discussion

Overall Prevalence

Overall, 2586 cases were registered at veterinary hospital between April-2018 to December-2019 out of which, 57 cases belonged to reptiles with an overall prevalence of 02.20% (Table-3).

Table 3: Distribution of total registered cases and cases of reptiles

Duration	**Total registered cases**	**Cases of reptiles**
April to December, 2018	417	17 (04.08%)
January to December, 2019	2169	40 (01.84%)
Overall total	**2586 (100.00%)**	**57 (02.20%)**

The percentage of case distribution comparatively reduced from initial 04.08% (in April to December-2018) to 01.84% (in January to December-2019). The number of cases of reptiles comparatively increased from initial 17 (in April to December-2018) cases to 40 (in January to December-2019) which could be due to increased awareness regarding establishment of a functional veterinary hospital in the area.

Generally, there is a tendency among snake handlers and rescuers to bring rescued reptiles to veterinary hospital for general physical checkup before releasing them back to the wild. Initially, lack of awareness on reptiles was also observed among villagers/local residents which could have led to development of stress conditions associated with conflicts [32]. However, villagers have gradually developed cautious approach, quick response and they usually contact rescuers when they notice presence of reptiles in surroundings areas. This approach is very useful because it promotes timely rescue of reptiles, safeguards human population and reptiles, reduces chances of human-reptile conflicts, and leads to reduced chances of release of sick reptiles. It is also possible that some sick reptiles in remote areas could have gone unnoticed by local residents and rescuers. Thus, registration of cases at veterinary hospital considerably depended on the awareness about reptiles among villagers and rescuers.

Overall Category-wise Prevalence

Category-wise distribution of cases registered between April-2018 to December-2019 is shown in Table-4.

The highest percentage of cases were registered under GHC before release subcategory (26.32%) followed by clinical cases of Digestive Disorders (21.05%); Dermatological Disorders (14.04%); Minor Surgical Conditions (08.77%); General Systemic Conditions (07.02%); Dog-bite and Respiratory Tract Disorders (05.26%, each); Major Surgical Conditions and Nutritional/Metabolic/Deficiency Disorders (03.51%, each); Locomotory Disorders, Toxicity/Poisoning and Miscellaneous Conditions (01.75%, each).

Cases were not registered under 07 subcategories, *viz.*, Aural Disorders, Haemoprotozoan Diseases, Neurological Disorders, Ophthalmic Disorders, Reproductive/Genital Disorders, Urinary Tract Disorders and Pregnancy Diagnosis. However, there is a possibility that various disease conditions may be reported under these subcategories in future.

Table 4: Category-wise distribution of cases of reptiles registered from April-2018 to December-2019

S. No.	Category/Condition/System involved	April to December-2018 (n=17)		January to December-2019 (n=40)		Overall (N=57)	
		No.	%	No.	%	No.	%
Category-A: Different Types of Diseases & Disorders							
1	Dermatological Disorders	01	05.88%	07	17.50%	08	14.04%
2	Digestive Disorders	06	35.30%	06	15.00%	12	21.05%
3	Dog-bite	00	-	03	07.50%	03	05.26%
4	General Systemic Conditions	03	17.65%	01	02.50%	04	07.02%
5	Locomotory Disorders	00	-	01	02.50%	01	01.75%
6	Major Surgical Conditions	00	-	02	05.00%	02	03.51%
7	Minor Surgical Conditions	01	05.88%	04	10.00%	05	08.77%
8	Miscellaneous Conditions	00	-	01	02.50%	01	01.75%
9	Nutritional/Metabolic/Deficiency Disorders	00	-	02	05.00%	02	03.51%
10	Respiratory Tract Disorders	01	05.88%	02	05.00%	03	05.26%
11	Toxicity/Poisoning	01	05.88%	00	-	01	01.75%
Category-B: Other Categories of Cases							
1	GHC before release [Normal]	04	23.53%	11	27.50%	15	26.32%
	Total	**17**	**100.00%**	**40**	**100.00%**	**57**	**100.00%**

Distribution of Cases in Different Reptiles:

The category-wise distribution of cases in different reptilian species are shown in Table-5. Fifty seven cases included registration of cases in 10 different types of reptiles brought to veterinary hospital between April-2018 to December-2019. This included nonvenomous snakes (04 types), venomous snake (01 type), python (01 type), tortoise (01 type), turtle (01 type), terrapin (01 type) and monitor lizard (01 type).

Out of 57 cases registered between April-2018 to December-2019, the highest percentage of cases were registered for Indian star tortoise [*Geochelone elegans*; 35.09%] followed by Rat snake [*Ptyas mucosa*; 19.31%]; Indian spectacled cobra (*Naja naja*) and Indian rock python (*Python molurus*) [12.28%, each]; Indian flapshell turtle [*Lissemys punctata*; 07.02%]; Red eared slider [*Trachemys scripta elegans*; 05.26%]; Checkered keelback snake [*Xenochrophis piscator*; 03.51%]; Common trinket snake (*Coelognathus helena*), Black headed royal snake (*Spalerosophis atriceps*) and Bengal monitor/Common Indian monitor [*Varanus bengalensis*; 01.75%, each].

The variation in the registered reptilian species could be due to availability/existence and variation in population of reptiles in different localities, experience of rescuers/handlers, cooperation of villagers, awareness among local residents, personal interest to save reptiles, communication between local residents and rescuers/staff of forest department, frequency and requirement of rescue operations in a particular area, season etc.

Table-5: Case distribution for individual reptilian species brought to veterinary hospital from April-2018 to December-2019

S. No.	Category/Condition/System involved	ISC		RS		CKBS		CTS		BHRS		IRP		IST		RES		IFST		BM/CIM	
		'18	'19	'18	'19	'18	'19	'18	'19	'18	'19	'18	'19	'18	'19	'18	'19	'18	'19	'18	'19
Category-A: Different Types of Diseases & Disorders																					
1	Dermatological Disorders	-	-	1	-	-	-	-	-	-	-	-	4	-	-	-	-	-	2	-	1
2	Digestive Disorders	-	-	-	1	-	-	-	-	-	-	-	-	5	4	1	1	-	-	-	-
3	Dog-bite	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
4	General Systemic Conditions	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	1	1	-	-
5	Locomotory Disorders	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
6	Major Surgical Conditions	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
7	Minor Surgical Conditions	-	-	-	1	-	-	-	-	-	-	-	1	1	2	-	-	-	-	-	-
8	Miscellaneous Conditions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
9	Nutritional/Metabolic/Deficiency Disorders	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Respiratory Tract Disorders	-	-	-	-	-	-	-	1	-	-	-	-	1	1	-	-	-	-	-	-
11	Toxicity/Poisoning	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Category-B: Other Categories of Cases																					
1	GHC before release	3	-	1	6	0	2	-	-	-	1	-	1	-	1	-	-	-	-	-	-
Year-wise distribution of cases		4	3	2	9	0	2	0	1	0	1	1	6	8	12	1	2	1	3	0	1
Overall number of cases (N=57)		07		11		02		01		01		07		20		03		04		01	
Overall percentage (100.00%)		12.28%		19.31%		03.51%		01.75%		01.75%		12.28%		35.09%		05.26%		07.02%		01.75%	

'18= April to December, 2018; '19= January to December, 2019

Other abbreviations: ISC=Indian spectacled cobra; RS= Rat snake; CKBS=Checkered keelback snake; BHRS= Black Headed Royal snake; IRP=Indian rock python; IST=Indian star tortoise; RES=Red eared slider; IFST=Indian flapshell turtle; BM/CIM=Bengal monitor/Common Indian monitor lizard

Types of Cases

Different types of cases observed in different reptilian species are shown in Table-6. Some representative pictures of disease conditions are depicted in Figure-1 to Figure-7.

Table-6: Different types of diseases, symptoms and cases registered in reptilian species from April-2018 to December-2019

S. No.	Reptilian species	Types of conditions/symptoms/registered cases
1	Indian spectacled cobra (*Naja naja*)	GHC before release [Normal]Dog-bite Accidental organophosphate poisoning Dysecdysis, dehydration and debility Traumatic injury
2	Rat snake (*Ptyas mucosa*)	GHC before release [Normal] Infection on tail Gastrointestinal worm infestation (*Strongyloides* spp.) Traumatic injury Dysecdysis and rostral abrasion
3	Checkered keelback snake (*Xenochrophis piscator*)	GHC before release [Normal]
4	Common trinket snake (*Coelognathus helena*)	Pneumonia
5	Black headed royal snake (*Spalerosophis atriceps*)	GHC before release [Normal]
6	Indian rock python (*Python molurus*)	GHC before release [Normal] Tick infestation (*Amblyomma gervaisi*) Traumatic injury Stress and shock
7	Indian star tortoise (*Geochelone elegans*)	Anorexia Diarrhea Hypothermia Traumatic injury Fracture of carapace Prolapse Maggot wound Pneumonia Gastrointestinal worm infestation (Nematodes)
8	Red eared slider (*Trachemys scripta elegans*)	Anorexia Limb edema, fibrosis and metabolic bone disease
9	Indian flapshell turtle (*Lissemys punctata*)	Shell and skin infection Hypothermia Dehydration and debility
10	Bengal Monitor/Common Monitor (*Varanus bengalensis*)	Tick infestation (*Amblyomma gervaisi*), injury on tail and giardiasis

The diseased reptiles were treated by use of suitable therapeutic agents based on suggestions mentioned in different resources [3, 4, 5, 6]. There is no available published literature with such an extensive documentation on prevalence of diseases and disorders of reptiles in Gujarat.

The database generated through the study can be utilized to initiate target-specific veterinary healthcare services for reptiles, to develop extension education strategies, to arrange

awareness campaigns, to impart knowledge to students and veterinary practitioners regarding existing diseases of reptiles, to establish and implement disease prevention strategies, and to conduct advanced research on diseases of reptiles in future.

Fig 1: Treatment of accidental poisoning in an Indian spectacled cobra

Fig 2: Dog-bite wounds in an Indian spectacled cobra

Fig 3: Infection on tail of a Rat snake

Fig 4: Traumatic injury in an Indian rock python

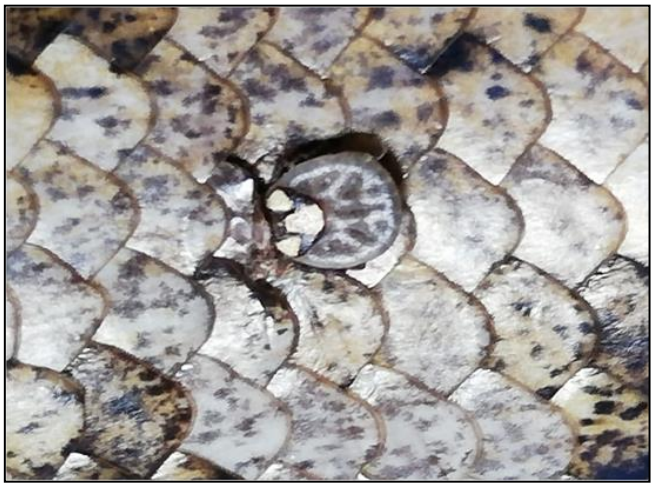

Fig 5: Tick infestation in an Indian rock python (Female *Amblyomma gervaisi* tick)

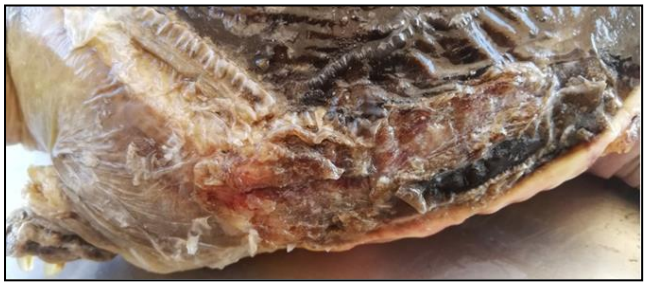

Fig 6: Shell infection in an Indian flapshell turtle

Fig 7: Fractured carapace in an Indian star tortoise

Conclusions

The findings of the study provide baseline data on existing prevalence and types of various diseases in reptiles. It is concluded that such large-scale investigations should be carried out on regular basis and documentation of individual cases should also be encouraged to generate a strong database on existing healthcare issues faced by the reptiles. Such investigations will be helpful for veterinary practitioners, academicians, scientists and biologists to understand existing systemic diseases of reptiles and to develop necessary healthcare and management strategies for effective reptile conservation.

Conflict of Interest

Authors declare no conflict of interest with special regards to funding. The study did not involve experimental trials on any reptile.

Acknowledgements

Authors acknowledge staff of veterinary hospital; forest department; Himmatnagar Nature Club (HNC); staff of PAH, KU, Rajpur for moral support; villagers and other stakeholders.

References

1. Bhadesiya CM, Jani R. Diagnosis and management of moth fly larvae infestation in an Indian flapshell turtle (*Lissemys punctata*; Lacepede, 1788). Int. J. Adv. Res. Biol. Sci. 2020; 7(5):75-80.
2. Ardesana R, Jhala R, Bharad M. A preliminary report on reptiles of Khirasara Vidi, Rajkot District, Gujarat, India. Reptile Rap#180. In: Zoo's Print. 2018; 33(2):17:22
3. Divers SJ, Stahl SJ. Mader's Reptile and Amphibian Medicine and Surgery. Third Edition. Elsevier Inc. ISBN 978-0-323-48253-0. 2019.
4. The Merck Veterinary Manual. Aiello SE (Editor-in-Chief). Moses MA (Executive Editor). 11th Edition. Publisher: Melissa Adams. ISBN-13: 978-0911910612. ISSN: 0076-6542, 2016, 1967-2002.
5. Fowler ME, Miller RE (Eds). Zoo and wild animal medicine: current therapy (5th edition). St Louis, MO: W. B. Saunders, 2003.
6. Longley L. Saunders Solutions in Veterinary Practice. Small Animal Exotic Medicine. Saunders Elsevier. ISBN: 978-0-7020-2985-1, 2010.
7. Catherine BR, Jayathangaraj MG, Soundararajan C, Guru B, Yogaraja D. Prevalence of *Amblyomma gervaisi* ticks on captive snakes in Tamil Nadu. J. Parasit. Dis. 2017; 41(4):952-958.
8. Ajith Kumar KG, Ravindran R, Johns J, Chandy G, Rajagopal K, Chandrasekhar L *et al*. Ixodid tick vectors of wild mammals and reptiles of Southern India. Journal of Arthropod-Borne Diseases. 2018; 12(3):276-285.
9. Raj R, Mukherjee P, Chaudhari S, Basu S, Datta U. Surgical removal of necrosed venom gland in Indian spectacled cobra (*Naja naja*) – A case report. Bulleting UASVM Vet. Med. 2017; 74(1):126-128.
10. Raut PA, Sonkhusale VG, Khan LA, Nakade MK, Bodkhe AM. A case report of management of snake's injury in captivity. Vet. World. 2008; 1(11):346.
11. Ali S, Choudhary B, Barman R, Narayanan A. Surgical intervention in snakes rescued in eastern Assam, India. Vet Brief#3, In: Zoo's Print. 2017; 32(5):27-32.
12. Bhadesiya CM, Jani RG, Rao N, Shah BR. Diagnosis and therapeutic management of carapace infection in an Indian flapshell turtle (*Lissemys punctata*; Lacepede, 1788). In: Compendium and Abstract Book of 34th Annual Convention of ISVM and National Symposium organized by Department of Veterinary Medicine, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, 2016, 252.
13. Allwin B, Jothi SB, Kumar NV, Nag BSP. A case of carapace fracture in an Indian star tortoise (*Geochelone elegans*). Vet. Sci. Res. J. 2017; 8(1-2):77-78.
14. Jeyathilakan N, Raman M, Jayathangaraj MG. Occurrence of *Camallus trispinosus* in a captive Indian star tortoise (*Geochelone elegans*). J. Parasit. Dis. 2015; 39(1):117-119.
15. Khan S, Satheesh A, Alexander J. Diagnosis and therapeutic management of gastrointestinal parasitism among the captive population of Indian star tortoise (*Geochelone elegans* Schoepff, 1795) at Zoological Garden, Thiruvananthapuram, Kerala, India. J. Parasit. Dis. 2020; 44:453-456.
16. Singh J, Mire AK, Mishra B, Kanwar BPS, Bara SL, Roopali B *et al*. Surgical management of massively large sized cloacal prolapse in an Indian star tortoise (*Geochelone elegans*). Journal of Entomology and Zoology Studies. 2019; 7(2):647-649.
17. Bhadesiya CM, Anikar MJ, Gajjar PJ, Chaudhary GR, Patel TP. Conservative management of 1° cloacal prolapse in an Indian star tortoise (*Geochelone elegans*; Schoepff, 1795). In: Compendium and Abstract Book of National Symposium and 37th Annual Convention of Indian Society for Veterinary Medicine at College of Veterinary and Animal Sciences, Bikaner, Rajasthan, 2019, 260.
18. Brahmbhatt AN, Joshi BP, Prajapati KS, Ghodasara DJ, Dave CJ, Jani PB *et al*. A Case report of Foreign body Gastritis in Crocodile. Pp. 91. In: Compendium of 31st Annual Conference of Indian Association of Veterinary Pathologists, 5th Annual Meeting of Indian College of Veterinary Pathologists and National Symposium organized by Department of Veterinary Pathology, College of Veterinary Science & Animal Husbandry, Anand Agricultural University, Anand, Gujarat, 2014, 91.
19. Bhadesiya CM, Jani RG, Thaker AM, Ghodasara DJ. A case study of post-mortem of a baby crocodile with automobile accident. Pp. 132. In: Compendium of XXXIInd Annual Convention of ISVM & International Symposium organized at Faculty of Veterinary Science & Animal Husbandry and Technology of Jammu, Jammu (J & K), India, 2014, 132.
20. Soundararajan C, Muthukrishnan S, Latha BR. Occurrence of ticks on reptiles. Ind. Vet. J. 2013; 90(4):120.
21. Bhadesiya CM, Patel VA, Gajjar PJ, Anikar MJ. First Record & Clinical Management of Tick Infestation by *Amblyomma gervaisi*, Giardiasis and Tail Injury in a Bengal Monitor (*Varanus bengalensis*; Daudin, 1802) in Himmatnagar, Gujarat (India). Int. J. Adv. Res. Biol. Sci. 2020; 7(5):71-74.
22. Soulsby EJL. Helminths, arthropods and protozoa of domesticated animals. 7th Edition. Baillere Tindall, London, 1982.
23. Barger AM, Macneill AL. Clinical Pathology and Laboratory Techniques for Veterinary Technicians. John Wiley & Sons, Inc. Oxford, United Kingdom. ISBN 978-1-118-34509-2. 2015.
24. Jain NC. Examination of the Blood and Bone Marrow. In: Schalm's Veterinary Hematology, 4th Edition, K. M. Varghese Company, Bombay, 1986.
25. Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC. Diagnostic Microbiology, Philadelphia: J.B. Lippincott Company, 1992.
26. Barcia JJ. The Giemsa Stain: Its History and Applications. Int. J. Surg. Pathol. 2007; 15(3):292-296.
27. Thairu Y, Nasir IA, Usman Y. Laboratory perspective of gram staining and its significance in investigations of infectious diseases. Sub-Saharan African J. Med. 2014; 1(4):168-174.
28. Arsalan HS, Al-Farwachi MI, Abdul-Majeed MO, Al-Hankawe OKh, Al-Iraqi OM, Al-Hasan MM *et al*. Veterinary Clinical Diagnostic Procedures for Fourth Year Students. Department of Internal and Preventive Medicine, College of Veterinary Medicine, University of Mosul, 2008.
29. Radostits OM. Veterinary Medicine. A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses, 9th Edition, 2000.
30. Chakrabarti A. Textbook of Preventive Veterinary Medicine. Kalyani Publishers, New Delhi, India, 2004.

31. Chakrabarti A. Textbook of Clinical Veterinary Medicine, 3rd Edition. Kalyani Publishers, New Delhi, India, 2006.
32. Bhadesiya CM, Anikar MJ, Chaudhary GR, Patel TP, Patel V. Clinical management of conflict-induced stress and shock in an Indian rock python (*Python molurus*; Linnaeus, 1758). In: Compendium and Abstract Book of National Symposium and 37th Annual Convention of Indian Society for Veterinary Medicine organized by Department of Clinical Veterinary Medicine, Ethics and Jurisprudence, College of Veterinary and Animal Sciences, Bikaner, Rajasthan, 2019, 250.