



## A Retrospective Study on 1587 Exotic Pets Presented to The Small Animal Veterinary Hospital, University of Tehran

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### A B S T R A C T

In recent decades, exotic pets are increasingly invited to homes with a wide range of variation in species and requirements that are more specialized. During a one-year period, 2408 exotic animals admitted to the Small Animal Veterinary Hospital, University of Tehran were assessed. Rabbits, hamsters, squirrels, turtles/tortoises, guinea pigs, lizards, hedgehogs, reindeer, monkeys, and snakes were referred, respectively. Owner referral cause and their gender in addition to the disease diagnosis were analyzed. While no statistical significance ( $P>0.05$ ) was observed in the total number of men and women presenting these animals, gender-based preferences were spotted for owning specific types of animal species in this study ( $P<0.05$ ). Furthermore, analysis showed that snakes and rabbits were more commonly ( $P<0.05$ ) presented for checkup; while chelonians, lizards, hedgehogs, and monkeys were more presented with health problems ( $P<0.05$ ). Other animals' results did not show statistically significant difference for admission reasons ( $P>0.05$ ). The health record assessment included 1587 animals with complete health files. The most common diseases diagnosed in most of these animals were metabolic bone disease/musculoskeletal problems and dental problems. In addition, eye problems in chelonians and urinary problems in hedgehogs were the most common diagnosis of those species. In conclusion, since the most common health problems of most participating animals were associated with mismanagement and inappropriate diet, it is highly recommended that owners be thoroughly educated by veterinarians to reduce the possibility of such conditions in exotic captive animals.

**Keywords:** exotic pets, complaint, diagnoses

### INTRODUCTION

Animals that are non-domesticated or non-native to a region are usually considered exotic animals (1). Keeping exotic animals as pets is becoming increasingly

popular (2). Iranian pet owners also have tried the diversity of animals in their houses. In many countries, rabbits have been the most popular pets from the mammalian group after the well-known conventional house pets, dogs, and cats (3, 4, 5). Squirrels, on the other hand, are illegal as pets

in many countries, but still many healthy Persian squirrels are kept in Iranian houses. Hedgehogs are also small mammals with a spiny coat that have gained some popularity as exotic pets (6). Pet guinea pigs and hamsters are among other popular small mammals kept by passionate people. Even various species of reptiles have found themselves places in Iranian homes alongside other parts of the world (7).

Some of the exotic pets have shown to pose a risk of infection in humans even when they do not show signs of illness; for example, various species of reptiles have been found to shed Salmonella from their feces (7), while Persian squirrels were shown to carry pathogenic fungi (8). In addition, caring for exotic animals is not easy for new owners nor for traditional veterinarians who have not worked in this field. With increasing studies that suggest traditional housing of even well-known exotic pets such as rabbits can detrimentally affect the animal's welfare, behavior, and health, it is vital that husbandry and health conditions of all exotic pets be thoroughly studied (9, 10). The tremendous growth of interest in exotic species in the past decade has demanded top quality veterinary care for these species that are provided by specific textbooks (11). Various exotic species have specific needs and each one should be studied separately. This fact specifically applies on the reptiles, numerous species of which are encountered in general practice and veterinarians are asked to provide special care for these animals (12). Although a well amount of specialized veterinary information is provided by some studies and textbooks (2,10,11) still such subjects have not been addressed in the middle east appropriately and the information in this regard is lacking. Therefore, this study was designed to assess the health condition of the common exotic species admitted to the Small Animal Veterinary Hospital, University of Tehran, Iran.

## MATERIALS AND METHODS

### Participants

To conduct this retrospective study, information of 2408 exotic pets admitted to the Small Animal Veterinary Hospital, University of Tehran, Iran from March 2013 until March 2014 was accessed using their electronic health files uploaded in the hospital database. The admitted exotic animals included rabbits, hamsters, squirrels, chelonian, guinea pigs, lizards, monkeys, hedgehogs, and snakes. Birds were admitted to another specialized facility; therefore, this study does not include pet birds of any kind. The recorded information in the system includes age, sex, breed, owner name and contact information, main complaint, clinical signs, and diagnosis in addition to their para-clinic results and prescribed medication. However, since determination of age and sex is not as easy in all exotic species as it is in dogs and cats, it is not uncommon for

practitioners to ignore mentioning that information. In this study, we focused on the information that was available for most cases which included the diagnosis and main complaint. All the information was then stored in MS ACCESS files.

### Health Diagnosis

Reference reasons were divided into two groups of "Checkup" and "Health issue"; while the diagnoses were put into one of the fourteen categories as following: Healthy; Metabolic Bone Disease (MBD)/Musculoskeletal problems (MS)/Fractures; Dental problems; Heart conditions; Digestive problems; Skin problems; Infectious diseases; Shock and Emergency; Respiratory problems; Eye and ear problems; Urinary system problems; Parasitic infections; Reproductive problems; Neoplasia.

### Statistical Analysis

A Two sample T-test was conducted to see if statistical difference existed between the total number of men and women presenting exotic pets. Chi square Tests were also used to see if statistical significance existed between the number of men and women presenting each species of the exotic pets, in addition, to the difference between the presenting reason of various animals. A P value of less than 0.05 was considered significant. The SPSS software (version 20; SPSS Inc. Chicago, IL, USA) was used for this analysis.

## RESULTS

### Participants

According to our results during one-year period, 2408 exotic animals were admitted to the Small Animal Veterinary Hospital, University of Tehran. Animals included rabbits (998), hamsters (520), squirrels (361), various species of chelonians (turtles/tortoises) (216), guinea pigs (155) and lizards (95); followed by hedgehogs (15), reindeer (13), monkeys (28) and snakes (7). Table 1 shows detailed number of each type of participating animals, availability of their health files, and gender of their owners.

### Health Files

Some health files were incomplete, and health files of 817 animals lacked main information. Therefore, these files were excluded from the study in addition to four reindeer's, which were also lacking information. The remaining 1587 were included in the assessment.

### Owner Gender

A total of 1282 women admitted the exotic animals compared with 1126 men. Rabbits, guinea pigs, hedgehogs,

and chelonians were more likely to be kept by women while more men owned squirrels, lizards, snakes, reindeers and monkeys. There were highly statistically significant differences between men and women presenting those beforementioned specific animal species ( $P < 0.001$ ). This is while no statistical significance was spotted on the owner gender for generally presenting an exotic pet ( $P = 0.83$ ). The detailed information is shown in Table 1.

### Complaints and Health Problems

About 75% of rabbits and snakes were referred for a checkup and nearly half of the hamsters, squirrels, and guinea pigs were admitted for the same purpose. Chelonians (65.3%), monkeys (77%), lizards (82.4%), and

hedgehogs (93%), on the other hand, were more commonly presented with health issues. The detailed information of the owner complaint and registered diagnoses of the admitted exotic animals are shown in Table 2. The statistical analysis revealed that there were no significant differences between animal species presented more commonly for checkup ( $P > 0.05$ ), except for rabbit which yielded a very low P value of less than 0.001. While all animal species presented more commonly for health problems showed highly statistical difference ( $p < 0.001$ ).

Of total 574 rabbits, 212 were found healthy and 195/394 hamsters, 59/243 squirrels, 49/164 chelonians, 70/96 guinea pigs, 5/85 lizards, 1/14 hedgehog, 2/13 monkeys, and 2/4 snakes were also reported healthy (Table 2).

**Table 1.** Number of referred animals to the Small Animal Veterinary Hospital, University of Tehran, according to their owners' gender and availability of health profile in the system

Animal species	Health Files Status		Owner Gender		Total Referred Cases (%)
	complete	incomplete	Male	Female	
Rabbits	574	424	422 <sup>b</sup>	576 <sup>a</sup>	998 (41.4)
Hamsters	394	126	225 <sup>b</sup>	295 <sup>a</sup>	520 (21.6)
Squirrels	243	118	218 <sup>a</sup>	143 <sup>b</sup>	361 (15)
Chelonian*	164	52	77 <sup>b</sup>	139 <sup>a</sup>	216 (9)
Guinea pigs	96	59	68 <sup>b</sup>	87 <sup>a</sup>	155 (6.4)
Lizards	85	10	74 <sup>a</sup>	21 <sup>b</sup>	95 (4)
Monkeys	13	15	19 <sup>a</sup>	9 <sup>b</sup>	28 (1.2)
Hedgehog	14	1	6 <sup>b</sup>	9 <sup>a</sup>	15 (0.6)
Reindeer	4	9	12 <sup>a</sup>	1 <sup>b</sup>	13 (0.5)
Snakes	4	3	5 <sup>a</sup>	2 <sup>b</sup>	7 (0.3)
<b>Total</b>	<b>1591</b>	<b>817</b>	<b>1126<sup>a</sup></b>	<b>1282<sup>a</sup></b>	<b>2408 (100)</b>

<sup>a-b</sup> Values in a row without a common superscript differ significantly at  $P \leq 0.05$ . \*Includes turtles and tortoises

The most common health problems of rabbits were the musculoskeletal problems including metabolic bone disease and bone fractures (219/574) followed by dental problems (88/574). Guinea pigs also suffered from the same diagnoses most commonly 18 and 10 out of 96, respectively. In addition, squirrels (142/243) and chelonians (38/164) were most diagnosed with MBD and musculoskeletal problems. Hamsters, on the other hand, were more prone to dental problems (48/394) followed by skin problems and trauma (39/394). Lizards were severely affected by MBD and musculoskeletal problems (77/85) while the same problems were the most common in monkeys as well (4/13) (Table 2).

### DISCUSSION

According to our findings, 2408 animals of exotic species were admitted to the Small Animal Veterinary Hospital, University of Tehran during a one-year period. No statistical difference was observed regarding the gender of

the owner and men and women equally presented exotic animals ( $P < 0.83$ ) in our study. However, another study found otherwise and reported more women admitting exotic pets (13). In the meantime, according to our results, there were statistically significant variation in men and women's tendencies for owning specific animals' species. Women preferred rabbits, hamsters, turtles/tortoises, and guinea pigs while men picked more exotic species such as squirrels, lizards, monkeys, reindeers, and snakes.

The most common admitted species in this study belonged to rabbits (41%) followed by hamsters (21.6%) and squirrels (15%). Chelonians (9%), guinea pigs (6.4%), and lizards (4%) were admitted with lower numbers. Our findings came in agreement with other parts of the world that have considered rabbits as the most common mammalian exotic pets (3, 9). According to Pet Ownership and Demographics statistics of 2017 and 2018, 1534 households out of 1000 in the United States keep rabbits in the United States. The same report mentions 3669 household keeping reptiles and 1978 keeping other

mammals (4). Ferret, the popular playful pet in Europe and the United States, has not put its footsteps in Iran yet. According to a survey, ferrets (22%) and lizards (8.8%) were at the top of the list after psittacine birds (13). Being unique and cool is an enough reason for some people to keep reptiles at home (13). Of the animals participating in our study, 56.3% were admitted for checkup and routine veterinary consultations, whereas the remaining 43.7% were admitted for some health complains. Remarkably similar rate of admission cause was found in another study where 44.4% of owners admitted their exotic pets as a result of an illness (13). Of the total participating animals in

our study, 595 (37.5%) were found healthy (Table 2). This rate was elevated probably by owners taking their exotic pets for checkup and veterinary consultations; since many owners are unaware of the proper care for their exotic pets.

Musculoskeletal problems including metabolic bone disease and bone fractures were the most common type of health problems in rabbits in the current study (219/574) followed by dental problems (88/574). Rooney et al. in 2014 (10) reported that the most common problems of rabbits referred to the veterinarians were flystrike (88.5%), followed by dental and ear problems at the same rate (88%).

**Table 2.** Details of owner complaints and diagnosis of the referred cases according to the animal's type

Complains	Animal Species									Total
	Rabbits	Hamsters	Squirrels	Chelonian	Guinea pigs	Lizards	Hedgehog	Monkeys	Snakes	
Checkup/%	431/75.1 <sup>a</sup>	202/51.3 <sup>a</sup>	129/53.1 <sup>a</sup>	57/34.7 <sup>a</sup>	53/55.2 <sup>a</sup>	15/17.6 <sup>a</sup>	1/7 <sup>b</sup>	3/23 <sup>b</sup>	3/75 <sup>a</sup>	89/56.3
Health issues/%	143/24.9 <sup>b</sup>	192/48.7 <sup>a</sup>	114/46.9 <sup>a</sup>	107/65.3 <sup>b</sup>	43/44.8 <sup>a</sup>	70/82.4 <sup>b</sup>	13/93 <sup>a</sup>	10/77 <sup>a</sup>	1/2 <sup>b</sup>	69/43.7
<b>Diagnosis</b>										
Healthy	212	195	59	49	70	5	1	2	2	595
MBD, MS*, Fractures	219	15	142	38	18	77	3	4	-	516
Dental problems	88	48	3	-	10	-	-	-	-	149
Heart conditions	-	35	-	-	-	-	-	1	-	35
Digestive problems	57	11	9	4	2	7	-	1	-	91
Skin problems**	34	39	25	5	10	7	-	2	1	123
Infectious diseases	24	4	2	-	-	3	-	-	-	33
Shock	20	4	8	-	2	2	-	-	-	36
Respiratory problems	18	23	44	24	8	6	1	2	1	127
Eye and ear problems	13	8	11	46	3	-	-	1	-	82
Urinary system problems	10	-	8	-	-	-	8	-	-	26
Parasitic infection	9	5	43	-	6	-	-	-	-	63
Reproductive problems	6	12	-	-	-	3	-	1	-	22
Neoplasia	4	3	-	-	3	-	1	-	-	11
<b>Total†</b>	574	394	243	164	96	85	14	13	4	1587

<sup>a-b</sup> Values in a row without a common superscript differ significantly at  $P \leq 0.001$ . \*Musculoskeletal. \*\*skin problems also include trauma and wounds. †Some animals suffer from more than one condition, therefore, the number of diagnoses in an animal may surpass the total number of diseased animals

Having said that, in addition to other references, it appears that dental problems are one of the most common captive rabbit health issues (11). It has been suggested that only indoor rabbits develop this condition, while outdoor rabbits with complete access to grazing do not; therefore, this acquired condition is associated with the rabbits' husbandry practices (14). MBD or secondary nutritional hypoparathyroidism is a chronic condition caused by inappropriate diet and husbandry and many animals may not show clinical signs until it is too late (15). It has been suggested that many of the traditional practices for rabbits' husbandry could affect not only the rabbits' health but also their welfare (9). Dental problems affect many other animals kept in captivity. Hamsters, the second most common exotic mammal of our study, also were reported most with dental problems (48/394). According to our

findings, skin problems were the second most common health problems in hamsters. This category included skin abscesses and trauma wounds which were commonly reported in hamsters. They could be related to this fact that many owners are unaware of that hamsters prefer solitary husbandry and keeping more than one hamster can increase the risk of fighting trauma wounds and abscesses in these species (11).

Squirrels were the third popular exotic pets in the current study and, as with rabbits, MBD and musculoskeletal problems were the most common conditions they were diagnosed with (Table 2). A radiographic study on 111 Persian squirrels (*Sciurus anomallus*) revealed an extremely high incidence (43.2%) of rickets in the immature pet squirrel population resulting in pelvic and vertebral deformity in most affected squirrels

(16). On the other hand, another study reported otherwise. They mentioned dermatological and intestinal problems as the most common health problems in these animals (17). Various husbandry conditions can be the cause of such results. Turtles/tortoises' first diagnosis in our study was eye problems, most of which could be related to hypovitaminosis A (11). Second most common diagnosis in turtles/tortoises was also MBD and musculoskeletal problems (Table 2). As with other animals, this condition in chelonians can be directly related to husbandry practices (11). Our guinea pig participants' most common diagnoses were also MBD and musculoskeletal problems followed by dental problems (Table 2). In a retrospective study assessing the disease prevalence in 1000 guinea pigs, dental problems were the most common disease followed by skin problems (18). Moreover, MBD and musculoskeletal problems were the most common diagnosis in our lizard participants with a very high rate compared to other animals (77 out of 85) (Table 2). A retrospective study assessing 529 bearded dragons, digestive problems were first, followed by skin and musculoskeletal problems, respectively. Calcium to phosphorus ratio was reversed in all measured lizards in the same study regardless of the referral cause (15). This finding highlights that captivity can seriously affect this ratio in bearded dragons predisposing these animals to MBD. Monkeys were also most reported with the same condition (Table 2). It has been mentioned that some captive monkeys are provided with diets low either in calcium or vitamin D3 which results in MBD (19). On the other hand, hedgehogs were most reported with urinary problems in our study, which is known as one of the five most common health conditions in this creature (20).

In conclusion, with little variation, MBD and musculoskeletal problems in addition to dental problems were the most common diagnosis in our study regardless of the animal species. Both conditions are the result of inappropriate diet and husbandry practices in most species (11,21). Moreover, an association has been mentioned even between chronic stress and osteoporosis in Juvenile American Alligators highlighting the importance of this category of health conditions in exotic and wild animals kept in captivity (22). In addition, the wide diversity of exotic species kept by ignorant owners makes it difficult to provide the necessary care for these unique animals many of which are prey animals and can hide signs of their disease very easily and some others may even be endangered species (23). Thus, some exotic pets (e.g., Hedgehogs) can be challenging patients and even a routine physical examination may need sedation or general anesthesia (24). Finding only eighty-one healthy guinea pigs out of 1000 pet guinea pigs is a good indicator that current husbandry practices for many exotic pets are inappropriate (18). Therefore, we seriously recommend that owners be educated by specialized veterinarians to

stay away from keeping species that are illegal as pets and to become aware of the essential needs of the animal they choose to keep as a pet to provide the best care for them.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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