


The solutions basic collection, control, and management of stray animals in urban areas (Study area: Tehran City)

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ABSTRACT

Stray animals such as cats and dogs, mainly have an independent life, are homeless, have uncontrollable reproduction, and have a large population in the environment and the city. These animals have become a concern for public health in cities and the environment. With the spread of deadly diseases such as rabies, they are considered a threat to human life and health, and their number is increasing day by day in Tehran City. Therefore, it is necessary to provide basic solutions to control and reduce the population of stray animals in Tehran City. Based on reviewing the laws of successful developed and developing countries and expert interviews with 40 people in different fields, suitable solutions for the basic collection, control, and management of stray animals in Tehran City were obtained according to the existing conditions. The results showed that the best solutions include neutering (19%), education and awareness in society (16%), collecting and transfer to shelters (15%), fines for people who violate the rules and prohibition of food to stray animals (13%), euthanasia (10%), using efficient experts and waste management (9%), registration in the system, birth certification, and microchipping of the animal (8%), amending existing laws (6%), and amending municipal contracts (4%). Therefore, it is necessary to control the population of stray animals in Tehran City with solutions such as neutering, educating informing people, and collecting stray animals to be transferred to the shelter.

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1. Introduction

Stray animals, animals without owners, especially cats and dogs, who mainly have independent, homeless, uncontrollable reproduction and overpopulation in the environment and city. They have often become an important concern for public health in cities, livestock production, and the environment. Most stray animals have a domestic origin, and the animals themselves or their previous generations are abandoned pets, due to uncontrolled breeding, the population of these animals is increasing. Some countries have thought of measures that include creating shelters to collect stray animals

from society and transfer them to shelters (Voslarova and Passantino, 2012; Silva-Rodriguez et al., 2023; Sharma et al., 2023). The presence and increase in the population of stray animals in the social environment, problems such as health and common diseases between humans and animals creating a risk to public health, threatening life and social security, environmental and ecological problems such as disrupting the natural system and ecosystem and threatening for mammals such as fox, jackal, cheetah, etc. (Abdulkarim et al., 2021; Saree et al., 2023). It is difficult to estimate the number of stray animals in a society due to their high reproductive capacity.



Under normal conditions, animals such as dogs and cats with their young can create a very huge population in a year. This means that despite the high mortality rate, their population can still be maintained. These very adaptable animals grow in different environments from villages to big cities (Abdulkarim et al., 2021). There are more than 600 million stray animals including dogs and cats worldwide. It is also estimated that there are approximately 470 million pet dogs and 370 million pet cats in the world. To achieve the effective management of stray animals in an environment, it is necessary to understand the relationship between the population of stray animals and their effects on different dimensions of the environment and to know how their relationships are influenced by other factors (threatening and environmental factors such as weather) (Legge et al., 2017). It is necessary to create a long-term and sustainable approach to deal effectively with the population of stray animals. The experiences gained from efforts to control stray animals show that effective control measures have included the adoption of more than one policy. Among the policies, western society's concept of ownership is the most popular. This policy focuses on a comprehensive, coordinated, and progressive program of owner education, mandatory registration and identification, environmental management, reproductive control of domestic animals, and animal population management through systematic breeding and marketing (OIE, 2019). All these laws must be regulated by effective and enforceable rules. The successful implementation of these laws requires the cooperation from multiple, which depends on the willingness of government departments, municipalities, veterinary centers, and non-governmental organizations (NGOs) to work together (Tasker, 2007). Several researches have been conducted in this field, some of which can be mentioned. De Ruyver et al. in 2021, focused on public opinions concerning various approaches to managing the domestic cat population in Flanders, Belgium. The study examined seven scenarios of domestic cat neutering with owner financial support, domestic cat neutering without owner financial support, encouraging responsible domestic cat ownership, trapping stray cats and taking them to shelters, trapping and examining the neutering of stray cats for release into a managed cat colony, trapping and killing of

stray cats, and no action to manage the stray cat population. Demographic analyses showed that there are three important factors (attitude towards cats, residential area, and gender), two weaker factors (education and having children), and two almost insignificant factors (age and cat ownership) for the acceptance of management scenarios. Maktabi et al. (2022) examined the protection of urban animal rights in Iran by following the example of leading countries. They found that in Iran, the management and organization of urban animals and the protection of their rights are not appropriate. They suggested that Iran should consider adopting the correct and humane methods of controlling the population of urban animals conducted in some countries. This would ensure the health and well-being of both humans and animals and guarantee their rights. It was suggested that municipalities collect, vaccinate, and neuter urban animals with the support of supporters. Zhang et al. (2022) analyzed the statistical analysis of the impact of stray animals on people's lives in China. By examining people in different places, data was collected and analyzed by SPSS and EXCEL software, and the impact of stray animals on people's lives was investigated. All regions, governments, and all kinds of shelters for stray animals should work together to solve the problem of stray animals. Among the management suggestions, we can mention the adoption of TNR (Trap-Neuter-Return) to prevent the excessive reproduction of stray animals, improve the shelter of stray animals by creating a scientific shelter, and amend the relevant laws and regulations. In Iran, there are 6 to 8 million pets such as dogs and cats. According to the Tehran Municipal Waste Management Organization, based on the latest estimates, it is estimated that there are between 30000 and 35000 stray dogs in Tehran. But the number of stray dogs in Tehran province is more than 400000 dogs and, in the country, more than 2 to 3 million dogs. Of course, due to various reasons, especially the release of dogs around Tehran, it is not possible to provide accurate statistics of their number. Additionally, the estimated number of stray cats is also over 400,000. According to Statistics every day more than 500 people are bitten by owned dogs and about 55 people are bitten by stray dogs. Annually, over 260000 cases of animal bites are reported in the country, and more than 80% of them involving dogs. Stray animals, especially dogs, are considered a threat

to human life and health by spreading deadly diseases such as rabies, and their number is increasing day by day in a city like Tehran. So, there is a need for appropriate management solutions to control the population in Tehran. Therefore, the purpose of this research is to provide basic solutions for the collection, control, and management of stray animals in Tehran.

2. Material and Methods

2.1. The study area

Tehran is the capital of Iran and a city with a population of about 9.26 million people, which is expected to reach 10.2 million people by

2030. This city constitutes about 11% of the total population of Iran (Jamialahmadi et al., 2023). The geographical extent of Tehran city varies from $51^{\circ}4'$ to $51^{\circ}36'$ longitude and latitude from $35^{\circ}34'$ to $35^{\circ}50'$ (Ranjgar and Niccolai, 2023). Tehran is located in the north-central part of Iran, next to the slopes of the Alborz mountains, and has a hot and dry climate. The average summer temperature in Tehran varies between 30 and 40 °C and in winter the minimum temperature reaches -15 °C. During spring and winter, most areas are affected by the Mediterranean low-pressure system (Sedaghat and Sharif, 2022). The geographic location of the study area is shown in Fig. 1.

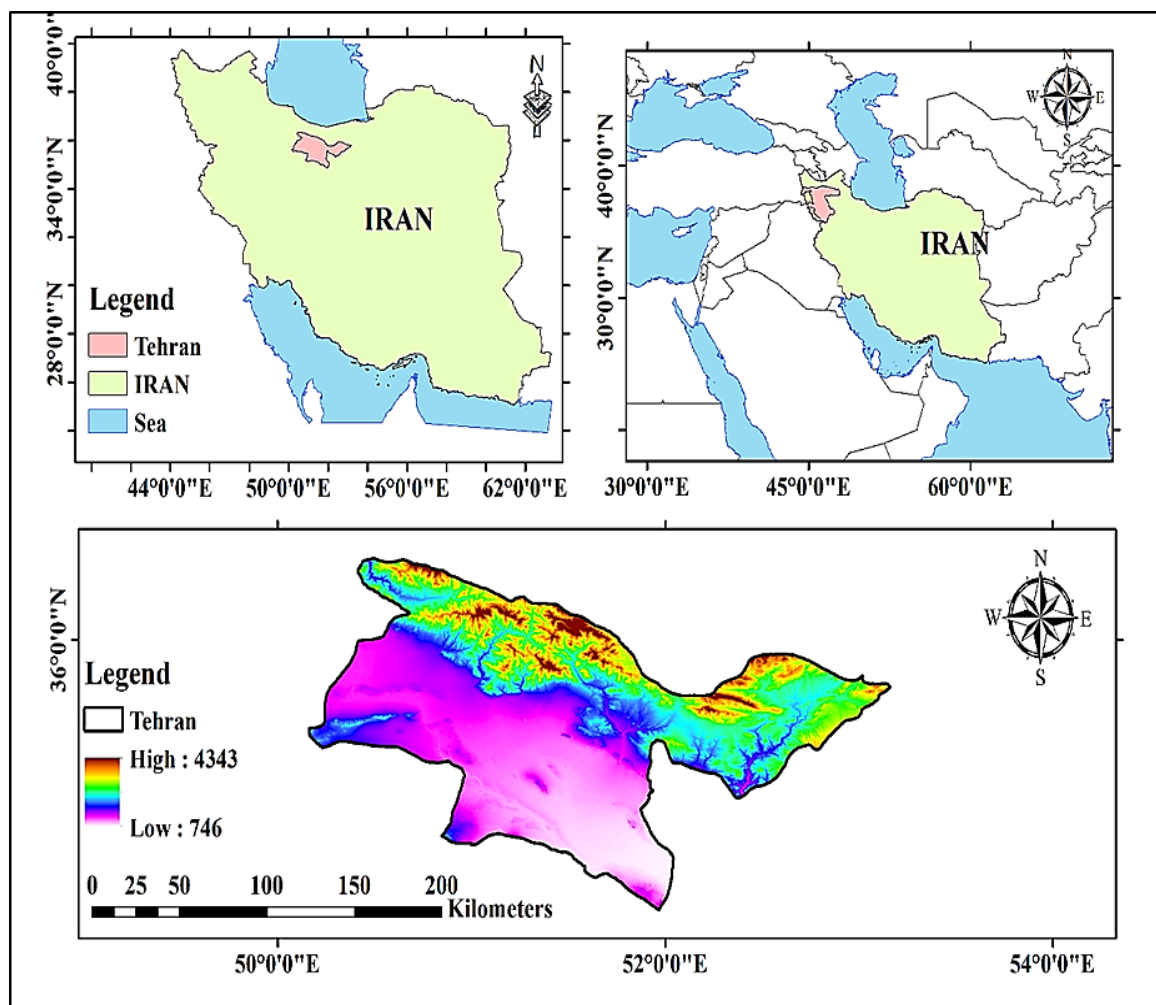


Fig. 1. Geographical location of the study area

2.2. Research method

Basic methods of collection, control, and management of stray animals at the level of cities for Tehran City, based on the study and review of the laws of various developed and developing countries that had some successful

performance in this field, including the United States, Canada, Norway, Germany, Netherlands, England, France, Belgium, Switzerland, Italy, Estonia, Japan, China, Turkey, etc. Also, 40 experts in various fields of agriculture, natural resources, environment, biology, geography, urban management,

ordinary people, people with pets in the whole country of Iran, and officials of Tehran Municipality to obtain suitable solutions for basic collection, control, and management of stray animals in the city according to the existing conditions, specialized interviews were conducted face to face and virtual.

3. Results and discussion

According to the expert interviews conducted with different people regarding the appropriate solutions for basic collection, control, and management of stray animals in Tehran City, 9 appropriate solutions were

proposed. These solutions, in order from the highest to the lowest percentage, include neutering (19%), education and awareness in society (16%), collecting and transfer to shelters (15%), fines for people who violate the rules and prohibition of food to stray animals (13%), euthanasia (10%), using efficient experts and waste management (9%), registration in the system, birth certification, and microchipping of the animal (8%), amending existing laws (6%), and amending municipal contracts (4%). A schematic of the percentage of solutions from the results of expert interviews is shown in Fig 2.

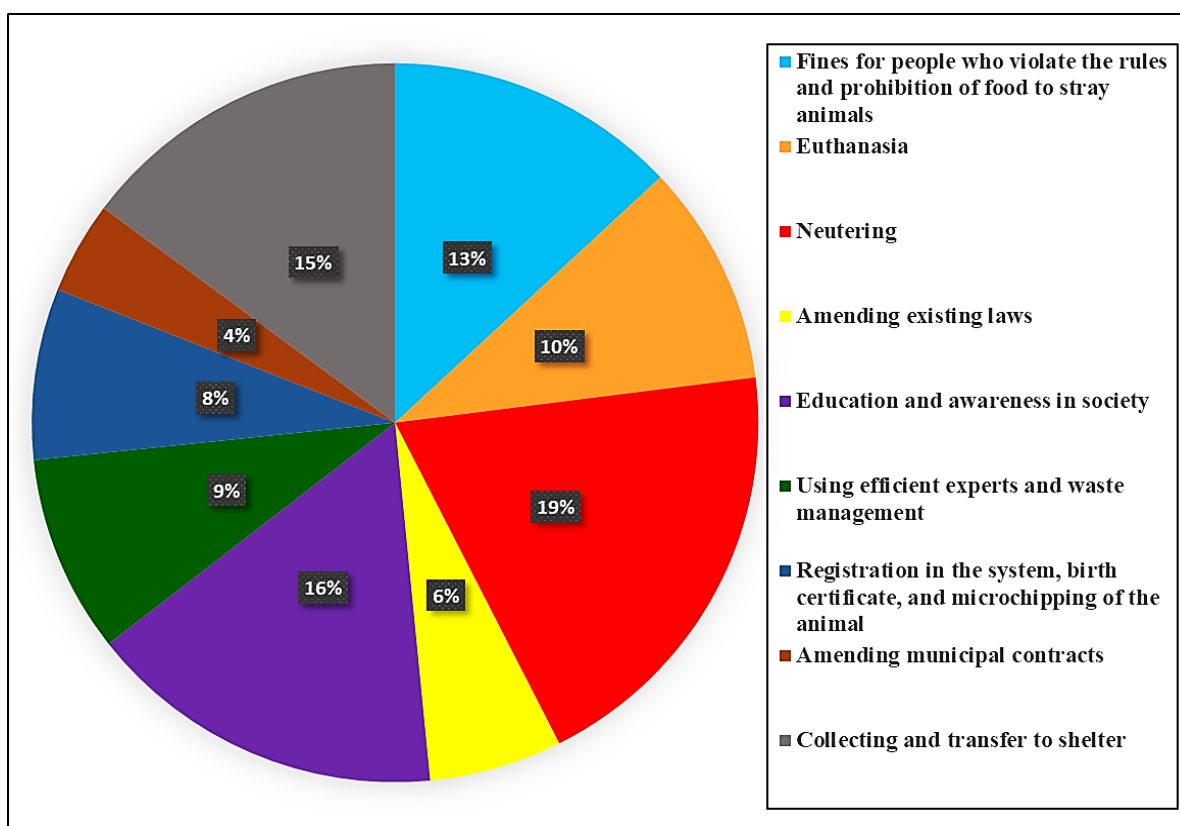


Fig. 2. Schematic of the percentage of suitable solutions for basic collection, control, and management of stray animals resulting from the interviews

3.1. Basic methods of collection, control, and management of stray animals in Tehran

According to the results of the expert interviews, the suggested solutions for managing stray animals are explained below.

3.1.1. Education and awareness for individuals

Stray animals pose significant public health problems and animal welfare concerns worldwide. Abandoned animals that live in large numbers can reproduce and increase the number of new stray animal populations

(Seimenis and Tabbaa, 2014). The public health program can design control measures for the stray animal population and the spread of common diseases between humans and stray animals among the human population. These cases can be through public awareness of the harmful presence of stray animals in a society, compliance with public and environmental health, control of disease carriers, educating people about common diseases between humans and animals, and taking measures to prevent and control the disease. Common

diseases between humans and animals with public health importance that can be transmitted to humans through stray animals include brucellosis, toxoplasmosis, rabies, campylobacteriosis, leishmaniasis, bartonellosis, salmonellosis, pasteurellosis, and leptospirosis. Control of stray animal populations can be achieved by using public health objectives to determine why animals are strays (Ghasemzadeh and Namazi, 2015). Education and awareness play an important role in controlling and reducing the number of stray animals. Awareness, training, and providing sufficient information about the consequences of feeding stray animals, maintaining environmental health, and separating waste are necessary. In this regard, utilizing television programs, conducting workshops for NGOs, creating social media contents, providing education for children, teenagers, and parents through neighborhood centers supervised by the municipality and veterinary workers, etc. are all effective ways to disseminate this information in Tehran city.

3.1.2. Fines for unnecessary feeding of stray animals and violators of rules

Due to the availability of abundant food sources, many stray dogs and cats enjoy living in the nearest areas of society. With the regular feeding of some lovers of these animals, these animals have become accustomed to living near humans. The role of animal lovers is central to this issue. Lovers of dogs and cats feed them near their residences, and the entrance of people's places of residence is considered the home of that animal for a stray animal. But when it comes to the problem of biting stray dogs, there is no guard at all and they cause many problems for people (Since, 2019). Currently, in Tehran, some people support and feed stray animals based on their interests and sense of animal love. When the animal is adequately fed, it is not dependent on the season and reproduces, and their number increases. So, these people feed them without knowing what negative effects their population increase will have on other wild species, the environment, the city, and society. On the other hand, by feeding and filling the bellies of stray dogs and cats, the natural behavior of animal's changes, and their population increases and disrupts the natural cycle of ecosystems. Making the habitats of other animals unsafe, disease transmission, food competition, and the creation of new species such as the wolfdog are different reasons that

the unnecessary feeding of stray animals should be stopped. Due to the lack of awareness in this field, these unnecessary feedings cause the stray animals to live a continuous life and increase their reproduction. This issue will cause many problems, for example, considering that some foods are not dry and are slaughterhouse waste, and these wastes themselves have very high environmental pollution, contributing to the spread of some dangerous diseases. On the other hand, feeding stray animals will increase disease transmission among the animals and even between humans and animals. Group feeding of animals causes them to gather and increases the possibility of spreading diseases, some viruses, and parasites among them. Therefore, conditions should be established to control the unnecessary feeding of stray animals. To change people's attitudes about feeding stray animals and requiring them to comply with the law, any action for planned feeding (providing food for animals) to stray animals is criminalized, and for people who If they commit the crime of feeding stray animals, a fine and imprisonment should be considered according to similar laws in some leading countries in this field. For example, in some European and American countries, feeding animals, both domestic and wild, is considered a crime. Because if the animal is wild, it should go through its natural stages of life without interference from humans. Also, if it is a domestic animal, a human must accept it as a guardian. For example, in England, people are fined 50 pounds by the police for feeding stray dogs, and in Canada, the fine amount even reaches 200 dollars. The Netherlands is considered a model for dealing with stray dogs, and currently, no stray dogs found on the streets of various cities in this country. At one point, the government of the Netherlands banned the feeding of stray dogs, funded for the neutering of dogs, and prosecuted the practice with great results. In this country, taking care of dogs also has strict rules. For instance, owners who leave their dogs on the street for any reason face jail time and a tax on dog maintenance. Moreover, pet owners who refuse to neuter and vaccinate their animals, a fine of 3 years in prison and a fine of 16000 dollars has been considered. So, based on the successful model of other countries in this field, can implement fines for people who violate the rules in Tehran. Also, Tehran's municipal, veterinary, and environmental organizations should consider fines by

identifying violators according to public reports, assigning forces to patrol the city and its surroundings, installing appropriate cameras, etc. As the number of animal attacks on people has recently increased in Turkey, the government has taken the attitude of revising laws and regulations regarding the better management of pets and strays. Regarding the fine for unnecessary feeding of stray animals by some people, the following suggestions can be made:

- Waste management and removal of food sources available to stray animals and proper management of waste disposal centers in Tehran should be done. For example, the fencing of the urban waste landfill is one of the essentials of animal population control, which causes stray animals to not be provided with the necessary food.
- Adhering to the responsibilities and duties of citizens such as separating waste, not emptying waste and construction refuse on the edge of the beltways, and most importantly putting waste out at the appointed time, can help greatly in reducing the population of stray dogs in Tehran.
- All trash cans in Tehran should have a suitable cover so cats and stray dogs cannot access them. Waste should be separated from the source in an organized manner for quick disposal, and efforts should be made to prevent food waste or leftovers from being given to stray animals.
- It has been customary to feed dogs for several years, otherwise, these animals would have lived next to humans for years and their population would have been balanced, and the stray dogs themselves would have fed on the extra food of humans. However, some profiteers have significantly increased the number of stray dogs in Tehran by giving account numbers and changing people's culture. Therefore, in the issue of feeding dogs, there should be necessary coordination between people and government agencies and essential training should be given to people regarding feeding. Until there are no problems and problems in terms of ethics and animal rights, and in terms of the excessive presence of dogs in society, this issue should be managed.

3.1.3. Microchipping and registering in the system and having the animal's birth certificate

One of the issues causing an increase in the number of stray dogs in cities including Tehran

is the presence of large domestic dogs such as Husky, German, Sarabi, etc., which should be identified by veterinary organizations and Municipalities to have a birth certificate. A dog with a birth certificate must be neutered, but unfortunately, 10 to 20 percent of dogs in Iran may have a birth certificate and are not neutered. A dog that is not neutered has a mating season and becomes aggressive. Whose owners mate their dogs with local stray dogs and give birth to between 8 and 9 puppies in each birth. This is the reason why stray dogs increased in the city. An electronic microchip is a small chip that has a unique identification number for the animal. An insert as an injection syringe will be used to implant the microchip under the skin. This number is read by a specially designed scanner and will enable animal identification in the corresponding system. For example, on April 18, 2013, the 24th Tallinn City Council enacted regulations for keeping dogs and cats in Estonia. According to its provisions, dogs and cats kept in the Tallinn administrative area must be microchipped and registered in the Tallinn Pet Registry. All dogs and cats older than three months must be registered (Kruk, 2021). Regarding the microchipping of stray and domestic animals and their registration in the system and their birth certificate, some of the following can be considered:

- All dogs must have an identification microchip; Pet owners must have their dog equipped with a microchip at the veterinarian, and when they take the dog out, it must have a collar and microchip with the owner's name and address. This shows the characteristics of the dog and the owner of the animal, and the owner of the animal must always have his microchip scanner with him.
- It is suggested to make it mandatory to implant electronic microchips in pets. The microchip must contain information such as the pet owner's name, address, emergency contact number, animal owner, age, breed, fur color, name and gender, etc. The purpose of microchipping pets is to provide a form of permanent identification. These microchips are devices that are identified and scanned using radio frequencies. The microchip is as small as a grain of rice and will not cause pain or discomfort when injected into the pet. It has a unique identification number and does not transmit any other information. A microchip implanted in a pet does not have an internal

battery or power source, so it remains in the pet without any complications or negative consequences until it is read by the microchip scanner. The information on this chip can be used to identify the owners of lost and abandoned pets.

- It is possible to proceed as in Belgium, where a veterinarian can microchip a pet and record the information of the owner of the pet and the pet in a central database. The cost of the microchip is about 50 euros and the registration is between 15 and 25 euros depending on the hourly rate of the clinic in this country. After completing the steps, a registration certificate (which will also be uploaded to the database) will be received. Cats must be registered before 12 weeks old and dogs before 8 weeks old.
- Once a pet is microchipped, the pet owner only needs to do three things: 1) Make sure the microchip is registered. 2) Have the vet scan the pet's microchip at least once a year to confirm that it is still working and detectable. 3) Keep the animal registration information updated.

3.1.4. Collection, transfer to the shelter, and neutering

There are different methods to control the population of stray animals depending on the location and nature of the animals. These methods include contraception, neutralizing traps, poisoning, euthanasia, and shooting. Each of the mentioned methods has its advantages and disadvantages regarding applicability, ease of implementation, cost, effectiveness, ethics, and animal welfare issues. The primary and often quickest method used especially stray dogs in some countries is their extermination by euthanasia. This solution is being done by various methods such as direct shooting, poisoning, etc. However, the killing of animals in most countries has provoked the reaction of environmental activists that this practice is not ethical (Abdulkarim et al., 2021). Every year, 3 thousand dogs are euthanized in England, and it is suggested to euthanize animals in Tehran that have symptoms of illness or physical abnormalities, especially dogs and cats with symptoms based on rabies. The next approach

that is carried out in most countries in the control of stray animals is the TNR approach or trap-neutering-return and collection in shelters. In the TNR approach, trapping animals is done using metal traps, nets, darts, and medicinal baits, and its purpose is to prevent the reproduction of stray animals and thus reduce their number over time (Spehar and Wolf, 2020). In a similar study, Tilley et al. (2023) examined population estimates and the impact of the TNR program on stray dog populations in Hong Kong. On average, 75% of the stray animal population was detoxified and reached the threshold of successful TNR studies. The results also showed that TNR can help control stray dog populations and provide guidance for future programs in Asia and Hong Kong. The neutering stage is important not only in terms of animal ethics and pain tolerance by them, but also economically. Neutering of animals is done in two general ways surgical and non-surgical. In the surgical method for neutering of the female animal, four methods are performed: removal of the ovaries, removal of the uterus, complete removal of the uterus and ovaries, and closing of the fallopian tubes. But in a male animal, either the testes are completely removed (castration) or a vasectomy (closing the tubes) is performed. In general, surgical neutering has a relatively high cost is performed for pets, and can be performed for both male and female animals. Non-surgical neutering is mainly performed for male animals, but there are also methods for female animals involving the use of hormonal drugs such as progestins, androgens, or gonadotropin-releasing hormone (GnRH) analogs and intravaginal spermicides, mechanical barriers, and Intrauterine devices (IUD). In the non-surgical neutering method, there is no need for surgery and anesthesia, and there are several methods, including direct injection of substances such as zinc gluconate and calcium chloride into the testicles of the male animal, and the use of a neutering rubber ring (Fig. 3a), burdizzo neutering (Fig 3b), and traditional and experimental methods of neutering (Scully et al., 2015; Bjornvad et al., 2019; Vendramini et al., 2020).

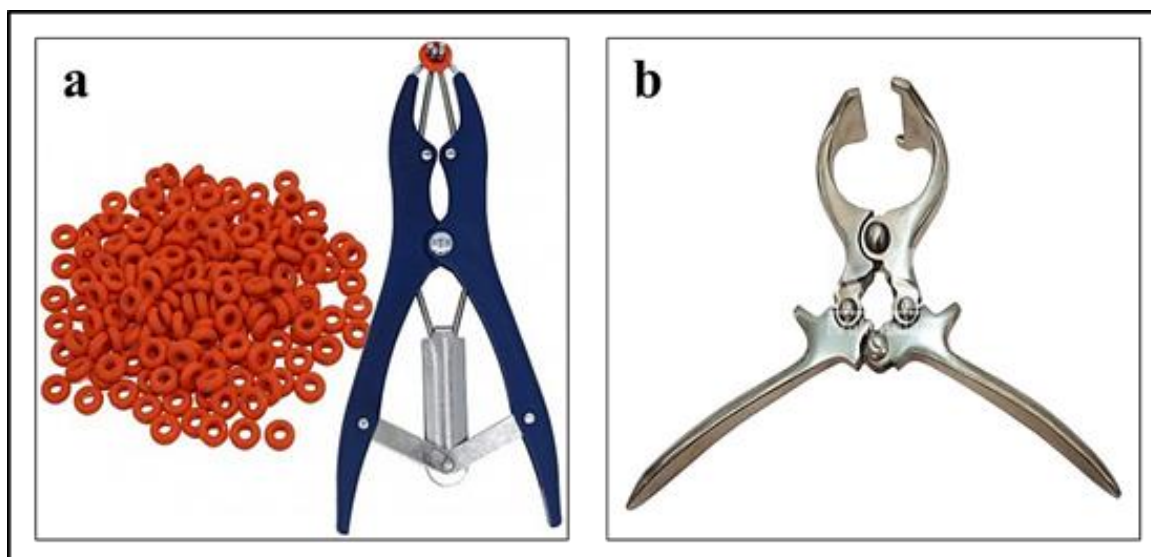


Fig. 3. (a) Rubber ring for male animal neutering, (b) Burdizzo neutering

Studies of menstrual cycles and pregnancy duration in dogs and cats show that the maturity of a female dog usually occurs around the age of six months. But the smaller breeds mature earlier so that some breeds show the first signs of puberty at the age of 4 months. On the other hand, in larger breeds, maturity may take up to two years. After puberty, the estrus cycles begin, which may happen every three months for smaller breeds once a year for larger breeds, and usually, on average, every six months. These cycles are regular at the beginning of puberty and become more irregular with the passage of time and the age of the female dog. It is important to mention that the reproductive power of a healthy and unsterilized dog decreases with time, but continues until the end of life. This is while the male dog is almost always ready for mating and fertility. On the other hand, the sexual maturity of a female cat takes place between 4 and 12 months, depending on the weight and breed, and on average at 6 months. In terms of reproduction, cats are seasonally polyestrous, in other words, female cats are not able to reproduce all year round, and with the increase in the length of the day, the cat's sexual season begins, which in the northern hemisphere and Iran coincides with the beginning of spring until the end of summer and autumn. Due to the existence of different climates in Iran, in tropical areas domestic cats (which are always kept at home) may experience the sexual cycle throughout the year. The prominent difference between the female cat's sexual physiology and the female dog's is that if the female cat is unable to mate during estrus, she will enter the estrous cycle again

after a short period. A female dog needs to mate once for fertility, however, a female cat needs to mate several times for ovulation. The release of the ovum from the ovary in the cat is mechanical and depends on the act of mating. Most of them need 3 to 4 mating in 24 hours for ovulation. 5 to 6 ova may be released. A female cat may become pregnant after several stages of mating with a male cat (Yates and Leedham, 2019; Walter et al., 2019; Binder et al., 2021). The third approach in the management of stray animals in Tehran involves capturing them alive, collecting them, and transferring them to shelters. In most countries, animals are captured alive and anesthetized using darts and syringes. Shelters, governed by animal laws, are used to collect and house these animals. Some of these countries keep stray dogs and cats in shelters for life. However, most countries keep stray animals for a limited period to find the owner of abandoned or lost domestic dogs (by microchip scanning), to entrust the guardianship of dogs and cats to families who wish to have animals as pets, after this period, the animals are euthanized. It is also possible that if for any reason the family with a pet does not want to keep the animal, it can be delivered to these shelters. Because the release, neutering, and reproduction of pets are criminalized in all countries. In a study by Simmons and Hoffman (2016), they investigated the factors that influence the decisions of rescue organizations and animal shelters to adopt dogs from remote locations. Specifically, the following aspects of remote transfer programs have been investigated: (1) Logistics of remote dog transfer; (2) Factors affecting the choice of dog,

(3) Medical requirements; (4) Partnerships formed between source and destination organizations; and (5) Withdrawal from remote dog transfer programs by people affiliated with destination organizations. This study showed that many logistical considerations play a role in transfer decisions and the formation of healthy partnerships between source and destination organizations. Participants expressed their organization's willingness to accept dogs of various sizes, coat colors, and ages, but organizations often had restrictions on the breeds they accepted. The findings of the study showed that some organizations have quarantine policies and pre-transfer medical requirements, while others do not. In the city of Tehran, there is a legal shelter in Aradkoh in the south of Tehran, which is managed by Tehran Municipality. Some other shelters are managed privately by some people and self-governing people in the name of animal protection are not under the supervision of the veterinary department and are managed illegally. Based on this, mechanisms for controlling stray animals can be presented as follows:

- Abandoning pets should be criminalized, and if a microchipped pet is caught and taken to a shelter, the owner of the animal must pay a fine in addition to the costs of taking care of the animal and taking care of it in the shelter.
- Since the release of animals is criminalized, it is necessary to establish a mechanism to accept stray animals in animal shelters and provide the necessary information in this case. Also, increasing the number of animal shelters in the Tehran metropolis should be done under the supervision of the municipality.
- Examining the rules governing shelters in Iran shows many shortcomings in management and planning. The results of the investigations showed that the guidelines for controlling the population of stray dogs were compiled by the Ministry of Interior in 2008. In this instruction, it is stated that one of the important health and social problems in many cities and villages of the country is the presence of stray dogs. Although the dog is considered one of the old friends of mankind and more than thousands of years have passed since the domestication of this animal and its useful role in human life with the knowledge of some diseases that can be transmitted between animals and humans and endanger human

health. Today, the free presence of dogs without owners in the streets is not accepted anywhere. It is necessary to take basic measures regarding the basic control of these animals, in this direction and based on the provisions of Article 55 of the municipal law, which is to prevent the spread of human and animal diseases, etc., and to collect stray animals and dispose of sick animals. It is the duties of the municipality and referring to Article 10 of the Constitution, Organizations, and Organizations of Municipalities approved in 2008, this manual aims to implement the provisions of this legal article and solve the problems of municipalities and municipalities in the country. Neutralization of the population of stray dogs by the organization Municipalities and districts of the country and in the framework of the central headquarters of the control of the population of animals that carry disease to humans has been compiled with the cooperation and approval of other members. The purpose of this guideline is to control the disease that can be transmitted between animals and humans by identifying the center of a gathering of stray dogs and controlling their population by choosing the appropriate method and raising the level of public awareness regarding the observance of health principles when dealing with nuisance animals (with priority for stray dogs). However, it is enough to build shelters and neutering animals. Therefore, it is necessary to address the structure of these places (in terms of economic and functional structure).

- Stray dogs that are collected from the city and transferred to the shelter must first be scanned for a microchip if the dog has a registered microchip, the owner of the animal must be identified, vaccinated, and neutered, and in addition to all costs for living and maintaining, a fine should be charged from the person.
- The suggested time for keeping a stray animal is limited to 14 days. During this time, if the animal has intrinsic value, it will be sold to the applicants. After 14 days from the time the animal entered the shelter, the animal should be euthanized.
- It is recommended to seriously review the structure and rules related to shelters and stray animals, such as the structure of attracting participation, contracts, strategies, and goals. Also, conditions can be established for the training, internship, and use of students and

graduates of animal-related fields such as veterinary medicine in the field of neutering of stray animals. In general, it is possible to show a schematic of the steps proposed for the

principles of collection, control, and management of stray animals in Tehran City, based on successful countries in this field, in Fig. 4.



Fig. 4. Schematic of the proposed steps for the basic collection, control, and management of stray animals in Tehran City, following the example of successful countries

4. Conclusion

In this study, the basic methods of collection, control, and management of stray animals in Tehran City were investigated to control and reduce the population of stray animals, including dogs and cats. According to the existing conditions, suitable solutions were obtained for Tehran City by examining the laws of successful developed and developing countries and specialized interviews with 40 people in different fields. Some of the appropriate solutions include neutering, education and awareness in society, collecting and transfer to shelters, fines for people who violate the rules and prohibition of food for stray animals, euthanasia, using efficient experts and waste management, and registration in the system, birth certification, and microchipping of the animal, amending existing laws, and amending of municipal contracts. Cultivation and education and providing sufficient information regarding the consequences of feeding stray animals, maintaining environmental health, and separating waste are necessary. So that the required training and information can be done through television programs, holding related workshops, creating content on social media, and training children, teenagers, and parents. In

general, for the basic methods of collecting, controlling, and managing stray animals in Tehran City, appropriate shelters should first be built to collect, transport, and keep stray animals. Then the system should be developed to register the animals and scan the microchip, if the dog has a registered microchip, it is necessary to identify the owner of the animal and to vaccinate and neuter the animal. Also, if the animal is a stray and without any owner, it should be kept in a shelter for 14 days. In this time frame, if the animal has intrinsic value, it will be sold to the applicants.

Otherwise, the animal should be euthanized. It is also suggested that the structure and rules related to shelters and stray animals such as contracts, strategies, and goals should be seriously revised until better management in the field of collection, control, and management of stray animals in Tehran City and reduced possible hazards for the health of human and environment.

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