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Epidemiological Data of Feline Neoplastic Diseases and Suggestions for Improvement of Data Collection

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Abstract

Several studies on neoplastic diseases of the feline species have been performed to date, both by collecting data on specific cancer types and achieving a more exhaustive epidemiological investigation on the occurrence of tumours and their distribution in the animal population based on age, sex, and breed. This descriptive review aims to summaries the current knowledge on the occurrence of cancer in cats, with reference to some recent studies performed with the collaboration between public and multiple private diagnostic laboratories and using the World Health Organization classification of neoplastic histotypes and the International Classification of Diseases for Oncology system to classify their topographical sites. This data collection system seems a good model for creating specific national and international databases based on vast and systematic case collection.

Keywords: Tumors; Epidemiology; WHO; Cancer

Introduction

Cancer is one of the most frequent causes of morbidity and mortality in companion animals and humans. Domestic cats and dogs share their environment with people and can be valuable bio-sentinels for environmental hazards and oncogenic factors in a One-Health perspective or model for human cancer [1,2]. Cats and dogs are the most diffuse companion animal species, and in some countries, domestic cats are more numerous than dogs. For example, the number of cats estimated by the pet food industry in Europe is 106,424,000 in front of 87,510,000 dogs [3]. To use the data from veterinary medicine as a source of surveillance for human health, it seems particularly important to create national and international animal cancer registries, including both canine and feline species. However, the epidemiological value of a cancer registry is related to collecting information on neoplastic diseases identified within a specific population, in an established period, with a precise geographical distribution, so it needs an efficient animal registration system. In various countries, dog registration has become mandatory in the last decades. Still, the enrollment of domestic cats is often done only voluntarily. The lack of precise demographic data can be a significant limitation to feline cancer registration. Another relevant problem is the lack of an international and standardized classification of neoplastic diseases in most of the studies performed to date. This review aims to update the current knowledge on the epidemiology of feline neoplastic diseases, summarizing the data published in scientific literature, finally suggesting an improved data collection method for further studies.

A single study from the 1960s performed in California [4], another from the 1990s conducted in Japan [5], and only a few recent researches, accomplished in different countries as the USA, Swiss, South Africa, and the UK, and Italy, report data on the occurrence of neoplasms in the feline species [6-11]. The oldest research performed in California was focused only on malignant cases [4], and the recent studies conducted in the USA and the UK were focused only on cutaneous tumours [6,8]. In contrast, the others encompassed all tumour types and anatomic sites [7,9-11], even if a first Italian study reports more details regarding the canine species [10].

Tumours of the Skin and Soft Tissues

On this literature's basis, the skin and soft tissues are the most frequently affected sites, ranging from 46,09% [7] to 56% [9] of the total cases. The tumors are prevalently malignant, but the prevalent histotypes is different among various studies. The Squamous Cell Carcinoma (SCC) is the most frequently diagnosed neoplasm in the studies conducted in South Africa and Italy, in contrast with data obtained in different countries. In both these papers, the authors formulated the hypothesis of a higher number of SCC cases related to the southern latitude with consequent prolonged exposure to Ultraviolet (UV) light [9,11]. SCC was also the most frequent cutaneous malignancy in the Japanese [5] and Californian studies [4]. Still, this last work did not consider benign neoplasms as 'basal cell tumors group' (including trichoblastoma and apocrine gland adenoma) that represent the most common cutaneous benign neoplasms. Comparing the data available in this literature, the percentage of Mast Cell Tumors (MCTs) appears higher in the most recent USA and Italian studies, respectively, representing 21,1% and 18,8% of the cutaneous neoplasms [6,11]. One of these research reports, for mast cell tumors, a significantly higher mean age of occurrence in females than in males [11]. Soft tissue sarcomas (a broad group of tumors of mesenchymal origin, including the feline injection-site sarcoma occurring at sites of injection of vaccines or other preparations, microchip implants or non-absorbable suture material) are the primary neoplasms of the soft tissues, the second most common location of tumoral development, sometimes considered together with the skin [9,10].

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Tumours of the Mammary Gland

In most studies encompassing all tumour types and all anatomic sites, the mammary gland (in some cases grouped with female sexual organs) is the third most commonly affected site, ranging from 8,51% [7] to 16,3% [10] of total cases, excluding neoplasms of unknown location, which represent 13,78% of tumours in the Swiss study [7]. Only the South African study results indicate a lower percentage of mammary neoplasms [9]. In contrast, in the Japanese survey, the mammary tumours represent 40% of total cases, indicating the mammary gland as the primary neoplastic location [5]. There is a prevalence of malignant neoplasms [5,7,9,11] and a predisposition for older female cats, with only rare cases in males [11].

Tumours of the Alimentary Tract

The percentage of tumors involving the alimentary tract is comparable in most studies, ranging from 7,47% [7] to 7,9% [11] of cases, following in frequency those of the skin, soft tissues and the mammary gland, even if the most recent Italian research indicates the lymphoma as the more represented entity [11] in contrast with the Swiss study reporting the adenocarcinoma as the most common neoplastic category [7], probably because of the inclusion of the liver and pancreas with alimentary tract.

Lymphoid Tumours

Another important group is those of lymphoid neoplasms. These tumours are frequently seen both in the lymph nodes and in other organs (nasal cavity/middle ear location group, alimentary tract, and different sites), ranging from 8% [5] to 11,48% [11] of cases. Vaccinated cats were associated with decreased odds (OR 0.7, 95% CI 0.5 to 1.0) than unvaccinated cats, although the type of vaccination received was not statistically significant. Breed and environmental factors studied were not associated with a diagnosis of lymphoma [12]. It was recently demonstrated a significantly higher mean age of occurrence in females than in males, as for mast cell tumours [11].

Visceral MCTs

MCTs can also be located in visceral organs and are the most common cause of splenic disease in cats. The neoplastic infiltrate can also involve multiple other tissues. There is no consensus on significant prognostic factors [13]. MCTs of the gastrointestinal tract, even if rare, rank as the third most common intestinal tumours in cats, following lymphomas and adenocarcinomas, and have aggressive behaviour, primarily if poorly differentiated and described as feline intestinal sclerosing MCT [14-16].

Tumours of Oral Cavity/Pharynx and Ear

The oral/pharyngeal neoplasms range from 2,5% [10] to 7,3% [11] of cases, considering the oral cavity together with the pharynx. In this location, there is a prevalence of malignant neoplasms, and the most frequent cancer is the SCC, followed, as described in a recent 6-year retrospective study in Portugal focused on feline oral cavity lesions, by mesenchymal neoplasms such as peripheral nerve sheath tumours, representing 8,1% of cases and fibrosarcomas: 4,5%, and odontogenic tumours: 8,1% [17]. In addition, the ceruminous gland adenocarcinoma is the most frequently diagnosed neoplasm of the ear [11].

Orbital Neoplasms

The orbital tumours are less represented than those in previously described sites, and grouped with neoplasms of "other locations".

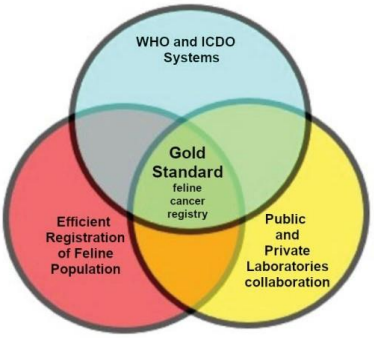

Figure 1: An improved method for a "Gold Standard" feline cancer registry needs an efficient registration of the feline population, standardized classification of neoplastic entities and their location, using WHO and ICDO systems, and collaboration between public institutions and private laboratories to avoid that cases diagnosed by private laboratories can escape to public data collection.

However, a recent study updated the literature regarding types of orbital neoplasia seen in cats collecting 81 cases (from 2004 to 2019). This study reports a high number of round cell tumours: 47%, prevalently lymphomas, followed by epithelial tumours: 38%, represented mainly by SCC, mesenchymal tumours: 14%, prevalently unspecified sarcoma, and neurologic origin tumours: 1%, represented by meningioma [18].

Discussion and Conclusion

Of the cited studies on the occurrence of cancer in cats, only those performed in Switzerland and Italy used the World Health Organization (WHO) classification of tumour histotypes and the coding system International Classification of Diseases for Oncology (ICDO) to classify the neoplastic topographical sites [7,10,11], which is highly desirable to promote comparable data collection avoiding confusion related to different nomenclatures. In addition to this, the most recent Italian work [11] was performed with the collaboration between public and multiple private diagnostic laboratories, improving the study's comprehensiveness since the cases diagnosed by private diagnostic laboratories risk escaping to public data collection without such essential collaboration. So, this system seems a good model for creating specific national and international databases with a vast and systematic case collection. Another possible further improvement may be establishing an efficient feline population's registration system for a greater epidemiological value of the animal cancer registries and One-Health surveillance for environmental hazards and oncogenic factors (Figure 1).

Authorship

The corresponding author confirms that all authors have contributed significantly and that all authors agree with the manuscript's content and have agreed with the submission in its present form.

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