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Canine Lymphoma: Retrospective Analysis of the Histopathological Registry of the Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche "Togo Rosati"

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INTRODUCTION

Neoplasms of the lymphatic system, and in particular lymphoma, represent the most common hematopoietic tumors in dogs and share many similarities with human non-Hodgkin lymphomas (NHLs), both in terms of clinical behavior and cyto-histopathological and immunophenotypic characteristics [1]. Epidemiological data on the incidence of NHLs place them among the top ten cancers by frequency in Italy, equally for men and women, equal to about 3% of all neoplasms. The analysis of incidence trends confirms a substantial stabilization of the increase in new cases in recent years.

In veterinary medicine, unfortunately, the acquisition of reliable epidemiological data is difficult, due to the few animal tumor registries present throughout the national territory. The scientific literature on the subject provides fragmentary values showing that lymphoma is, even in the canine species, a very represented neoplastic disease, with incidence rates of 22.9 in females and 19.9 in males [2].

AIMS

The aims of our observational retrospective study were to analyze the territorial distribution of canine lymphomas in Umbria region and to identify potential risk factors.

METHODS

A ten-year dataset of canine lymphoma cases examined at the histopathological diagnostic laboratory of the Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche "Togo Rosati" was evaluated. The study cohort included 4946 dogs, divided into two groups: 202 dogs diagnosed with lymphoma (group K) and 4744 dogs without neoplastic conditions (group NT). Dogs diagnosed with neoplasms other than lymphoma were excluded. Data were collected on individual characteristics including age, sex, breed, body size, geographical location, housing conditions, and dietary habits. Descriptive analysis was carried out using mean and standard deviation (±sd) or median and interquartile range (IQR) and n (%). Normality distribution for quantitative variables was assessed by the Shapiro-Wilk Test. The association between categorical data was investigated by Pearson χ^2 or Fisher's exact test and the Student's t-test for independent data or analogue non-parametric test (Wilcoxon rank sum test). Complementary log-log (cloglog) model was applied to identify the mutually adjusted effect among K/NT groups and the independent variables. A statistical significance was set at the level of ≤0.05. All analyses were performed using Stata software v18.0 MP (StataCorp, College Station, USA), GraphPad Prism 10 and geospatial mapping conducted with QGIS 3.40.4.

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RESULTS

Among the 4946 dogs, females were 51.3%, and the mean age was 8.7±3.5 years. A significant lower age was revealed in K group (8.7±3.5 years) vs NT group (9.4±3.3 years), with p=0.004. A statistically association was found between dietary habits and lymphoma group (p<0.001). No significant relationships were observed regarding sex, breed, housing conditions, or urban versus rural habitat. Cloglog model shows that the occurrence of lymphoma diagnosis increased, independently of other variables, for each increment of 1 year of age (OR 1.05, 95%CI: 1.01-1.09, p=0.017), with a mixed diet (OR 2.83, 95%CI 1.04-7.70, p=0.041) and be included in the risk breeds (OR 1.36, 95% CI 1.00-1.86, p=0.05). Among diagnosed cases, the most frequent topographical sites were spleen (27.2%), and lymph nodes (26.2%), followed by gastrointestinal tract (20.3%) and skin (20.8%). Geospatial analysis revealed case clusters within several municipalities in the Umbria region, which could be suggestive of environmental exposure patterns requiring further investigation.

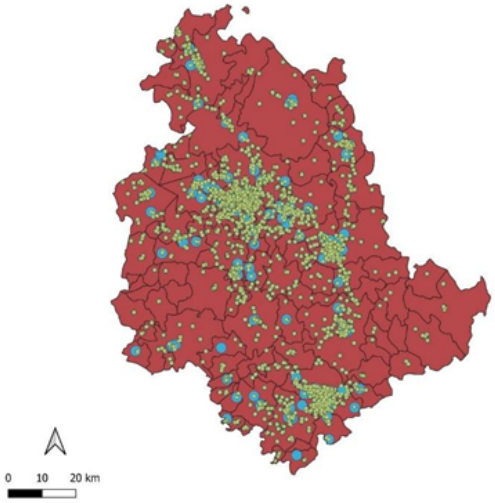

Fig. 1 Distribution of dogs diagnosed with lymphoma (group K, blue dots) and dogs without neoplastic conditions (group NT, green dots).

CONCLUSIONS

Previous studies have shown that specific chemical exposures are associated with the risk of contracting lymphoma in dogs, such as commercially applied herbicides, the domestic use of paints and some solvents. Environmental exposures have also been associated, including proximity to industrial areas, waste incinerators, polluted sites, exposure to radiation, electromagnetic fields and secondhand smoke. As with dogs, exposure to these factors is associated with an increased risk of lymphoma in humans [3]. The study of the behavior of spontaneous dog tumors and the possible role played by intrinsic risk factors (e.g. sex, breed, etc.) and extrinsic risk factors (e.g. environmental factors) in the determinism of the tumors themselves, can therefore provide useful indications for the prevention of neoplasms affecting humans and constitute an integrated system of permanent epidemiological surveillance.

This study stresses the value of veterinary tumor registries and the potential of dogs as spontaneous models for human cancer epidemiology. It also confirms the importance of dietary and environmental risk factors in the development of lymphoma in dogs, reinforcing the need for targeted preventive strategies and more structured surveillance systems.

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