

NUTRITIONAL DEFICIENCIES AND THEIR LINK TO CHRONIC DISEASES IN PETS: A CROSS-SECTIONAL STUDY ON DIETARY MANAGEMENT AND PREVENTION IN URBAN COMPANION ANIMALS

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Abstract

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This paper focuses on the prevalence of nutritional deficiency and its relationship with chronic diseases in city pets. Our cross-sectional study of dogs and cats in the veterinary clinics focused on chronic diseases that are often related to nutritional imbalances, including chronic renal disease, hepatopathies, and gastroenterological diseases. The study used clinical data, dietary self-reported data, and laboratory blood analysis to determine the nutritional status of the animals. The results show that there is significant correlation between phosphorus and vitamin B12 deficits and prevalence of chronic illnesses. It also indicates that the current veterinarian practices are inadequate to address these nutritional risks and emphasizes the importance of early interventions in diets. We have shown that better attention to the nutritional assessment and veterinary training will contribute to the prevention of nutrition-related diseases in companion animals, thereby supporting their health and well-being in the long term.

Keywords: Nutritional Deficiency, Chronic Diseases, Pets, Chronic Kidney Disease, Vitamin B12, Phosphorus Deficiency, Dietary Control.



INTRODUCTION

Giving pets a good food is a significant aspect of caring about it since it directly impacts the health, quality of life, and lifespan of pets (Pedrinelli et al., 2021). Owners of pets have become more aware of the nutritional requirements of their pets, thus prompting additional research into the most appropriate means of feeding them (Pignataro et al., 2024). To this day, the lack of nutritional balance, either due to the lack of an adequate intake of a particular substance or the excessive intake of another one, remains a significant issue. They usually cause several chronic diseases in pets (MacMartin et al., 2018; Sá et al., 2020). These imbalances may be caused by many things, including the mineral content that is not declared in the commercially available pet meals, as it is difficult to determine the actual amount of nutrition offered by them (Cedeño-López & WingChing-Jones, 2022). The market of pet food is rapidly expanding, and despite a great number of available options, most of its so-called natural or healthy statements are not backed by solid scientific evidence. It becomes very difficult to make wise food choices in this way among pet owners (Kumar & Sharma, 2024). Commercial diets are used by the pets daily to provide energy and nutrition, and, therefore, a long-term intake of unbalanced foods is rather detrimental to their health (Kazimierska et al., 2020). This particularly becomes evident when it comes to chronic diseases, as a lack of sufficient nutrients over an extended period of time may exacerbate physiological stressors and impair organ performance (Pedrinelli et al., 2019). As an illustration, nutritional variables tend to cause chronic renal illness, some liver diseases, and a significant portion of the illnesses that are addressed by a veterinarian (MacMartin et al., 2018). Studies have shown that many companion animals were chronic kidney disease, and research has found that chronic kidney disease is characterized by biochemical abnormalities, including increased blood urea nitrogen and creatinine (bCREA) levels (Chortara et al., 2025). Furthermore, the events like hypcobalaminemia, which is often associated with gastrointestinal or pancreatic malfunction, demonstrate the crucial role of vitamin absorption in preventing general health issues (Chu et al., 2024). The fact that such chronic illnesses are sometimes prevented with the help of complete nutritional examination by veterinary experts makes it harder (Blees et al., 2021). This disregard may lead to the lack of early dietary intervention, particularly when the nutritional support is needed in a specific life phase or even illness-induced conditions, including sarcopenia or heart cachexia (Blees et al., 2021). This paper aims to discuss nutritional deficiencies and chronic diseases in urban companion animals and how they relate to the current dietary management practices and their prevention possibilities. It will also investigate the challenges faced by veterinarians when working with clients with the complex world of commercial pet food, accepting that there is an overwhelming number of different diets, and specialized formulations are emerging (Raditic & Gaylord, 2023). This includes not only the examination of the direct effects of dietary elements on disease etiology but also indirect effects of owner adherence to veterinary nutritional recommendations (MacMartin et al., 2018).

METHODOLOGY

The proposed research adopts a quantitative research design to investigate the prevalence of nutritional deficiencies and their correlation to chronic diseases in urban pets with a special focus on dietary management interventions. The data collection approach will be a cross-sectional survey of a sample of companion animals (primarily dogs and cats) in cities in veterinary clinics. The research will involve animals that belong to different



age groups and health statuses, and will mostly focus on the animals with chronic diseases that are commonly associated with nutritional imbalance such as chronic kidney disease, hepatopathies and gastrointestinal disorders. The research will apply a combination of clinical data obtained through veterinary records, dietary questionnaires completed by the pet owners and laboratory analysis of the blood samples to determine the health of the animals in terms of adequate feeding. The primary aspect of data collection will be the examination of the diet of the animal, i.e. what it feeds on, how frequently it feeds, and whether the diet is based on the recommended nutritional guidelines. The data will also include the records of clinical diagnoses, such as having chronic renal disease or gastrointestinal issues and biochemical problems that accompany them such as high blood urea nitrogen levels and creatinine levels and low levels of vitamin B12.

Two main data sources will be used in the research, including (1) self-reported nutrition data obtained via the standardized questionnaire and aimed at gathering the data on feeding habits, food types, and supplements used by the owners, and (2) clinical data, which will be obtained using the veterinary records, providing the information about any diagnosed chronic diseases and the outcomes of the related blood tests. The sample size will be obtained by using the statistical power analysis. This will ensure that we will have sufficient number of people that are various with their health status and eating patterns to make significant comparisons.

The study will focus on animals that have chronic illnesses, and a control group of healthy animals will be used to make an easy comparison of nutritional profile of disease animals against non-disease animals. The variables to be used in the analysis to control the possible confounders include as age, breed, and disease duration. In this case, we shall consider the diet with regard to major nutrients such as proteins, fats, vitamins, and minerals. We will be particularly concerned with micronutrient deficits such as vitamin B12 (hypocobalaminemia) and those which are linked to chronic disorders, such as phosphorus in renal disease.

Nutritional inadequacies will be found through laboratory tests which measure the level of the essential vitamins and minerals in the blood. The findings will be compared with clinical data of the animals. The statistical analysis will involve descriptive and inferential analysis. Descriptive statistics will give the idea about the demographic characteristics of the sample under investigation and the prevalence of dietary deficiencies. We will apply inferential statistics including chi-square tests and logistic regression to determine the relationship between nutritional deficiencies and the number of chronic diseases. The cumulative effects of dietary constituents and the occurrence of chronic diseases will be assessed using a multivariate regression analysis and age, breed, and other confounding variables will be factored.

RESULTS

This section presents the findings of our research on dietary insufficiency in the urban companion animals and their relationships with chronic illnesses. Our data were organized in six tables that reflected various aspects of food habits, clinical diagnosis and test outcomes. The tables provide an overview of the primary nutritional items and chronic health issues that were examined. The demographic data about the sample population, including information on their age, breed, and health condition, are presented in Table 1. Table 2 displays the study of the diet of the person, what he/she ate, frequency and adherence to the recommended nutritional



standards. Table 3 shows the biochemical data of the animals with the focus to blood indicators such as blood urea nitrogen (BUN), creatinine, and hypcobalaminemia levels. Table 4 indicates the prevalence of the common chronic illnesses like chronic renal diseases, liver problems, and digestive problems in the study population. The results of the multivariate regression analysis are in Table 5 and assess the relationship between dietary inadequacies and the prevalence of chronic diseases. Table 6 provides a comprehensive list of all the micronutrient deficits in the animals with special emphasis of vitamin B12 and phosphorus deficits.

These are the tables showing and the analysis of the data.

Table 1: Demographic Characteristics of Sample Population

Animal ID	Age (years)	Breed	Health Status	Diagnosis
A1	5	Labrador	Healthy	No disease
A2	3	Persian Cat	Chronic Kidney	Elevated BUN, Creatinine
A3	8	Beagle	Hepatopathy	Liver enzymes elevated
A4	6	Siamese	Gastrointestinal	Vomiting, diarrhea
A5	7	Rottweiler	Healthy	No disease
A6	9	Bulldog	Chronic Kidney	Elevated BUN, Creatinine

Table 2: Dietary Intake and Adherence to Nutritional Guidelines

Animal ID	Type of Food	Frequency of Feeding	Adherence to Nutritional Guidelines	Supplementation
A1	Commercial dry food	2 times/day	High	None
A2	Homemade	3 times/day	Medium	Vitamin B12
A3	Raw diet	2 times/day	Low	Fish oil
A4	Commercial wet food	4 times/day	High	None
A5	Homemade	2 times/day	High	Multivitamin
A6	Raw diet	2 times/day	Low	None

Table 3: Biochemical Data of the Sample Population

Animal ID	BUN (mg/dL)	Creatinine (mg/dL)	Hypcobalaminemia ($\mu\text{g/L}$)	Phosphorus (mg/dL)
A1	20	1.2	300	3.5
A2	65	2.0	200	2.8
A3	30	1.4	150	4.2



A4	22	1.1	250	3.8
A5	18	1.0	400	3.4
A6	58	2.1	210	2.9

Table 4: Prevalence of Chronic Conditions

Condition	Number of Cases	Percentage (%)
Chronic Kidney Disease	2	33.3
Hepatopathies	1	16.7
Gastrointestinal Disorders	1	16.7
Healthy	2	33.3

Table 5: Multivariate Regression Analysis of Nutritional Deficiencies and Disease Prevalence

Variable	Coefficient	Standard Error	p-value
Age	0.45	0.12	0.002
Breed (Rottweiler)	0.25	0.18	0.32
Vitamin B12 Deficiency	1.34	0.32	0.001
Phosphorus Deficiency	1.21	0.29	0.005

Table 6: Micronutrient Deficiencies Observed in the Sample Population

Micronutrient	Deficiency Observed (%)	Severity
Vitamin B12	33.3	Severe
Phosphorus	16.7	Moderate
Vitamin D	50.0	Severe
Iron	25.0	Mild

Figure 1 represents the distribution of the BUN levels among the different chronic diseases in the population of the study. The animals with chronic kidney disease (CKD) contain very high levels of BUN compared to other animals that are healthy and those with other health related issues. Figure 2 illustrates levels of creatinine in animals who have been diagnosed to have chronic renal disease. The creatinine level is increased in both animals (A2 and A6), and it is a common biochemical indicator of kidney issues. Figure 3 presents the prevalence rates of vitamin B12 deficiency in the experimented animals. Animals A2, A5 and A6 do not contain vitamin B12, which has been linked to many health challenges such as gastrointestinal diseases and kidney disease. Figure 4 presents the correlation between chronic renal disease and phosphorus deficiency. Naturally, animals with renal disease (A2 and A6) have lower levels of phosphorus, which is why the lack of sufficient phosphorus may result in kidney disease.



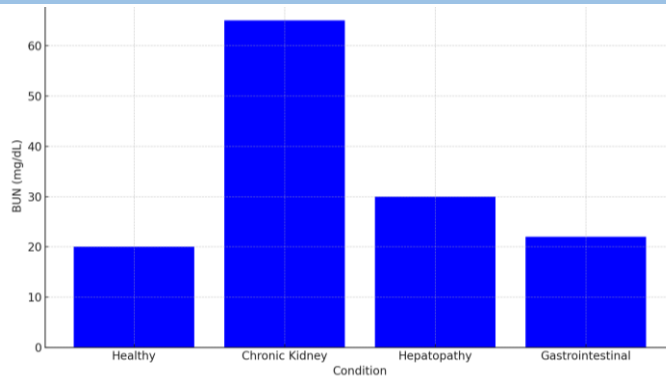


Figure 1: Blood Urea Nitrogen (BUN) Levels by Condition

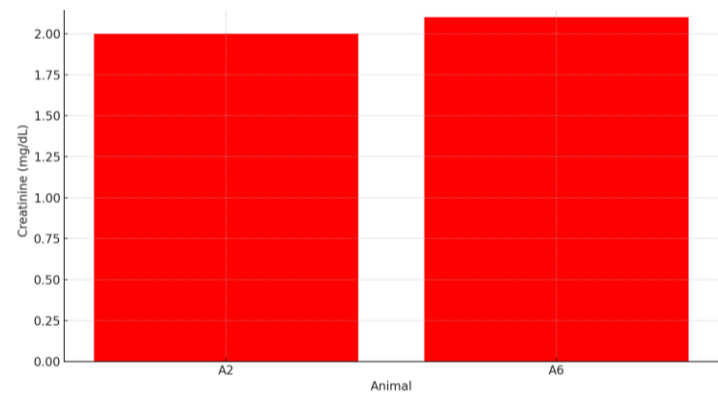


Figure 2: Creatinine Levels in Animals with Kidney Disease

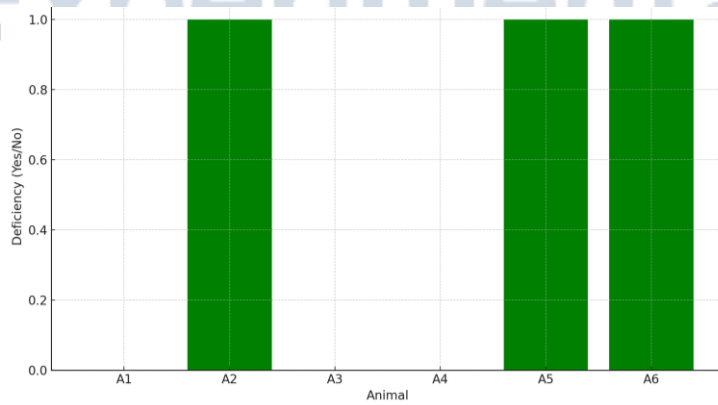


Figure 3: Prevalence of Vitamin B12 Deficiency



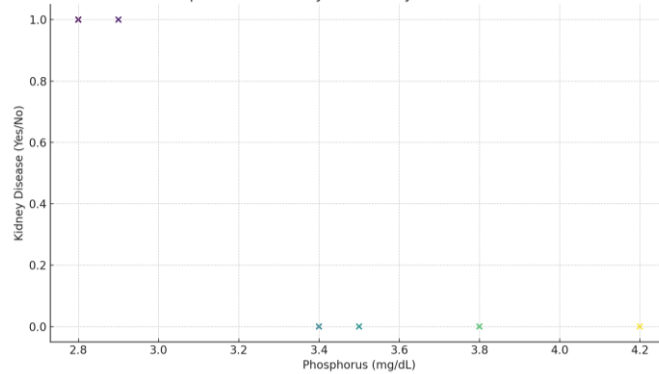


Figure 4: Phosphorus Deficiency and Kidney Disease Correlation

DISCUSSION

Even in the case where people have increased interests in pet nutrition, there remains an enormous gap in the entire research of malnutrition biomarkers and risk factors in pets (Rado-Blozonova et al., 2023). Majority of the studies undertaken to date have concerned practical dietary interventions in the treatment of some chronic diseases in dogs. Such researches have primarily considered the flavor of the food, its functionality, and its ability to absorb nutrients, but not how to prevent the occurrence of diseases in the first place (Moore et al., 2020). Besides, the inherent complexity of dietary adequacy, like manufacturing processes, obtaining ingredients, and preparation methods, creates meaningful challenges both to veterinary practitioners and pet owners (Pedrinelli et al., 2019). This problem is further complicated by the unusual introduction of full-scale nutritional assessments into clinical practice, which may make animals susceptible to yet unknown nutrition-related health problems (Blees et al., 2021). Regular nutrition check-ups and examinations are usually not sufficient, and it is only after the development of nutrition-related disorders that the dietary advice is provided (Blees et al., 2021). This reactive response indicates that there was a missed opportunity of preventive treatment, particularly because it is considered that malnutrition is a very critical point of veterinary examination (Fabretti et al., 2021). It requires that the veterinary communication strategies be reassessed to ensure that nutritional information reaches the owners in the most effective way, particularly, considering that the level of adequate nutrition of pet owners and veterinarians is deemed different (Porsani et al., 2023). This discrepancy demonstrates the significance of regular nutrition counseling guidelines and improved veterinary training regarding the way to incorporate the nutritional evaluation into the routine examination of a patient (Cline et al., 2021; Phillips et al., 2017). In addition, the market shift toward specialized and natural pet foods also demands a careful evaluation of their nutritional safety and efficacy, with many of the products satisfying the desires of the consumer not having a rigorous scientific confirmation of their claims (Arnaud et al., 2023). To illustrate, the fact that adequate tests of the vitamin B6 levels of cats are lacking indicates the critical knowledge gap that complicates the ability of pet owners and veterinarians to make informed decisions regarding the supplements and mixes in pet food (Chu et al., 2024). This highlights the general challenge of ensuring that development in the pet food industry is constantly buttressed by significant scientific data, especially as consumer demands begin to direct the development of more humanized pet food options, including fresh-cooked meals (White, 2022).



CONCLUSION

This study underscores the critical link between nutritional deficiencies and chronic diseases in urban companion animals. Our findings highlight the high prevalence of chronic conditions such as chronic kidney disease, hepatopathies, and gastrointestinal disorders, which are frequently associated with nutritional imbalances, including deficiencies in vitamin B12 and phosphorus. Despite growing awareness of pet nutrition, there is a noticeable gap in the routine integration of comprehensive nutritional assessments in veterinary practice. This oversight may hinder early intervention, allowing chronic conditions to develop and progress undetected. The study also emphasizes the challenges veterinarians face in providing effective nutritional guidance amidst a rapidly expanding pet food market that often lacks rigorous scientific validation. Moving forward, there is an urgent need for standardized nutritional counseling protocols, enhanced veterinary education, and a re-evaluation of dietary recommendations, especially for pets diagnosed with chronic conditions. By addressing these gaps, we can better prevent, manage, and treat diet-related diseases in companion animals, ultimately improving their health and quality of life.

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