THE EFFECTS OF BODY CONDITION ON SURVIVAL IN DOMESTIC CATS

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La survie d'environ 1400 chats a été étudiée pendant 4 années suivant leur identification en 1991-1992 dans une étude sur l'obésité féline. L'état corporel de ces chats, sélectionnés dans 27 cliniques vétérinaires privées du nord-est des USA a été déterminé par les vétérinaires à l'aide d'une échelle de #1 à #6 (#1=cachectique, #4=optimal, #6=obèse) par palpation et avec un jeu de silhouettes corporelles. La mortalité a été estimée par les dossiers médicaux et des enquêtes téléphoniques auprès des propriétaires.

Les chats avec un état corporel optimal avaient une probabilité de survie de 83%, comparée à 53% pour les chats obèses et seulement 43% pour les chats cachectiques (p<0.01). Sachant que l'âge influence fortement la mortalité et que l'état corporel varie avec l'âge, l'état corporel et la mortalité ont été étudiés dans trois groupes d'âge différents. Pour les chats de moins de 7 ans, la survie ne différait pas selon l'état corporel. Pour les chats de plus de 11 ans, la mortalité était significativement plus élevée chez les chats cachectiques que chez ceux ayant un état corporel optimal et pour les chats d'âge moyen (6-11 ans), la mortalité était plus importante chez les chats obèses que chez ceux ayant un poids optimal. Les résultats de cette étude suggèrent que l'état corporel a un effet significatif sur la mortalité. L'obésité augmente le risque de mortalité pour des chats d'âge moyen, alors que la cachexie est associée à une mortalité plus élevée des chats de plus de 11 ans.

INTRODUCTION

Obesity is perceived to be a problem in pets. In a survey representing 7.5 million US households, about 35% of cat owners considered obesity to be a primary problem (5). However, few published reports in the scientific literature concern feline body condition and risk of mortality. In humans, effects of obesity on mortality have been evaluated in prospective studies. People with body mass indices at both extremes of the spectrum (i.e. cachectic or obese) had higher mortality rates than those between the extremes(1). For dogs, circulatory and articular/locomotor problems were more frequent in those grossly obese(2), but the effects of body condition on mortality have not been reported for dogs or cats.

In a 1991-92 study, we found 25% of cats were overweight and 5% were obese (6) as assessed by their treating veterinarians. Risk factors associated with being overweight included living in an apartment, being mixed breed, male, neutered, inactive, and being fed certain specialty and prescription diets.

MATERIALS AND METHODS

A cohort study evaluating the effect of body condition on the risk of mortality in cats was conducted using cats identified in the 1991-92 study. The mortality experience of approximately 1400 of the original cats was ascertained during a period of up to 4.7 years following enrollment in the first study. Cats with diseases at the beginning of follow-up that might be associated with weight changes (e.g., hypothyroidism), with mortality (e.g., renal failure, cancer) or already having diseases of interest (e.g., diabetes mellitus) were removed from analysis.

The body condition of these cats, selected from 27 private veterinary clinics in the Northeastern U.S.A., was characterized by veterinarians using palpation and a series of silhouettes. The six silhouettes, depicting cats of increasing body condition, were scored 1 to 6, where #1=cachectic, #2=lean, #3=optimal lean, #4=optimal, #5=heavy and #6=obese. Mortality was assessed using cats' medical records and during telephone interviews with owners.

High Spearman correlation coefficients between body condition score and body weight (kg) and girth circumference (cm), and high correlations of scores both between and within observers, suggested that the scoring procedure was a reasonable method for evaluating body condition. Incidence density rates of death (mortality densities) were obtained by dividing the number of cats that died during the follow-up period by the amount of cat-time all cats were observed in the cohort. Incidence density ratios or rate ratios and their 95% confidence intervals were calculated to compare mortality rates between subgroups (e.g., obese to optimal body conditions)(3).

Survival curves for the different body conditions were estimated using the Kaplan-Meier product-limit method(4). The survival graphs were drawn using the epidemiologic software package, EGRET. The null hypothesis that two survival distributions were equal (or not) was tested with the logrank test using LIFETEST in SAS.

Since age was an important determinant of survival and was associated with body condition, survival curves for various body conditions were estimated within 3 age groups (< 6, 6-11 and > 11 years of age). The curves were based on cat-years of observation during that age interval. Using this approach a cat could contribute cat-years of follow-up for more than one age stratum. For example, a cat aged 4 years in the 1991-92 study that died at age 8 could contribute 1 cat-year to the age group < 6 years and 3 cat-years to the age group 6-11 years. Since it died in the 6-11 year age range, the death would become part of the numerator for the 6-11 year age-specific

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rate. This approach provided estimates of the risk of dying within a particular age range.

Associations between body condition and death were first evaluated without regard to possible confounding factors such as age, gender, etc. In order to control for age and other possible confounding variables (e.g., gender, neuter status), while evaluating the effect of body condition on survival, Cox proportional hazard model was used (4). Hazard ratios were calculated to evaluate the risk of death in one group (e.g., obese) compared to cats of "optimal" body condition. The software used was EGRET.

RESULTS

Cats with optimal body condition had an 83% probability of survival, compared to 53% for obese cats and only 43% for cachectic cats ($p < 0.01$). Since age has such a profound effect on mortality, and body condition varied by age, body condition and mortality were examined within three age groups. Among cats less than 8 years of age, there were no differences in survival by body condition. For cats over 12, cachectic cats had significantly higher mortality ($p \leq 0.05$) than optimal cats, and among middle -aged cats (8-12 years), obese cats had a significantly higher mortality as compared to cats of optimal condition.

The effect of body condition on the risk of specific causes of death was examined for causes where there were at least 15 deaths. Kidney disease, cancer (all types) and heart disease mortality were not associated with body condition. All analyses of specific causes of death were hampered by small numbers of deaths.

DISCUSSION

Results of this study suggest that body condition has a significant effect on feline mortality. Associations with being very thin among older animals seems to enhance risk of mortality. Whether poor body condition leads to higher mortality or is the result of undetected, underlying illness is not clear. Regardless, the data suggest that very thin cats should be of special concern to veterinarians, because of their greater risk of dying.

Middle-aged, obese cats also appear to have higher mortality than cats of optimal weight. Characterizing the underlying causes of death associated with the higher mortality was difficult because of the small numbers, and relatively short period of follow-up. In the large prospective human study among Framingham, MA, residents, relationships of body condition with mortality did not emerge until 2 decades into the follow-up. Large cohorts, with long-term follow-up will be necessary to better define the association of body condition with feline mortality.

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