

Cat ownership and the Risk of Fatal Cardiovascular Diseases. Results from the Second National Health and Nutrition Examination Study Mortality Follow-up Study.

Abstract

Background: The presence of pets has been associated with reduction of stress and blood pressure and therefore may reduce the risk of cardiovascular diseases.

Methods: Relative risks (RR) of all deaths, death due to myocardial infarction (MI), cardiovascular diseases (MI or stroke), and stroke during a 20 year follow-up were determined by Cox proportional hazards analysis for categories of cat or dog ownership among participants after adjustment for potential confounding variables.

Results: Previous or present use of cats as domestic pets was reported by 2435 (55%) of the 4435 participants. After adjustment for differences in age, gender, ethnicity/race, systolic blood pressure, cigarette smoking, diabetes mellitus, serum cholesterol, and body mass index, a significantly lower RR for death due to MI was observed in participants with past cat ownership (RR, 0.63; 95% confidence interval [CI], 0.44 to 0.88) compared with those without cats as pet at any time. There was also a trend for decreased risk for death due to cardiovascular diseases among participants with past cat ownership (RR, 0.74; 95% CI, 0.55 to 1.0).

Conclusions: A decreased risk for death due to MI and all cardiovascular diseases (including stroke) was observed among persons with cats. Acquisition of cats as domestic pets may represent a novel strategy for reducing the risk of cardiovascular diseases in high-risk individuals.

Keywords: cardiovascular diseases, cat ownership, national survey, stroke, myocardial infarction

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Pet ownership has been related to reduction in stress, autonomic responses to cold and cognitive tasks, and need for medical attention associated with life stressors.¹ Stress and its associated attributes have been related to the risk of cardiovascular diseases.² Therefore, it is reasonable to assume that any social factors including pet ownership that reduces stress will eventually reduce cardiovascular events. The data regarding pet ownership and physical health has not been consistent. Friedmann et al.³ demonstrated that pet owners with medical heart conditions had a higher survival after 1 year of follow-up. A post-hoc analysis of Cardiac Arrhythmia Suppression Trial,⁴ again demonstrated lower mortality at 1 year after recruitment with pet ownership. However, there is paucity of data regarding this relationship derived from general population with almost no study addressing the risk of stroke. We performed this study to determine the effect of pet ownership on fatal cardiovascular events in a nationally representative cohort of persons followed for mean period of 13.4±3.6 years.

Methods

At baseline evaluation of National Health and Nutrition Examination Study (NHANES II) Follow-up Study⁵, any participant who reported any kind of allergy was queried further whether they owned or currently own a cat or a dog. Events of ischemic stroke, intracerebral hemorrhage (ICH), and myocardial infarction (MI) during followup were determined by death certificate International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9 CM) diagnosis codes: 433, 434, 436, 437.0, or 437.1 (for ischemic stroke); 431 to 432 (for ICH); and 410 to 414 (for MI). Subarachnoid hemorrhage was not included because of the small number of events (n=3) observed in NHANES II participants. Potential confounding variables were age, sex, race/ethnicity (African American, whites, other), systolic blood pressure, serum cholesterol level (<200 mg/dL, ≥200 mg/dL), body mass index, diabetes mellitus, and cigarette smoking (never, former, and current) at baseline. Relative risks (RR) for stroke and stroke types, and MI for cat and dog ownership (past and current) were estimated after adjustment for the established cardiovascular risk factors using Cox proportional hazard analyses. All

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analyses were performed using SAS (SAS Institute Inc. 2004, Cary, NC).

Results

Of the total of 14,407 NHANES participants, 4435 (31%) were inquired about pet ownership and were traced during each completed wave of follow-up. A total of 3592 (81%) and 2435 (55%) of the participants were dog or cat owners (either past or current), respectively. Of these, 1932 (44%) and 1015 (23%) were current dog and cat owners, respectively. Tables 1 and 2 demonstrate the baseline characteristics of 4435 participants according to cat or dog ownership. Age, cholesterol, race/eth-

nicity and cigarette smoking were associated with cat ownership. Same characteristics in addition to gender and systolic blood pressure were associated with dog ownership. After adjustment for potential confounders, a significantly lower RR for death due to MI was observed in participants with past cat ownership (RR, 0.63; 95% confidence interval [CI], 0.44 to 0.88) compared with those without cats as pet at any time (see Table 3). There was also a trend for increased risk for death due to cardiovascular diseases among participants without cats (RR, 0.74; 95% CI, 0.55 to 1.0). No protective effect of past and current cat ownership was observed for RR of stroke or stroke subtype. Dog ownership (see Table 3) was not associated with a reduced risk for death due to MI, or death due to

Table 1. Baseline and clinical characteristics of participants according to past and current cat ownership (NHANES Mortality Follow-up Study)

		No history of cat ownership	Past cat ownership	Present cat Ownership
Baseline evaluation				
Number of participants		2,000	1,420	1,015
Age (mean years ± SD)**		52 ± 15	50 ± 15	47 ± 15
Systolic blood pressure (mean mmHg ± SD)		131 ± 23	131 ± 23	130 ± 23
Serum Cholesterol (mean mg/dl ± SD)**		224 ± 48	222 ± 49	219 ± 48
Body mass index (mean ± SD)		25.8 ± 5.0	25.0 ± 5.2	25.6 ± 5.2
Gender	Women	1150 (58%)	839 (59%)	594 (59%)
Race/ethnicity	Caucasian	1703 (85%)	1287 (91%)	964 (95%)
	African-American	257 (13%)	115 (8%)	42 (4%)
	Others	40 (2%)	18 (1%)	9 (1%)
Cigarette smoking	Current	673 (34%)	492 (35%)	389 (38%)
	Past	468 (23%)	375 (26%)	240 (24%)
	Never smoked	859 (43%)	553 (39%)	386 (38%)
Diabetes mellitus	Diabetic	97 (5%)	118 (5%)	52 (5%)

Symbols used: *p-value<0.05, ** p-value <0.01
Abbreviations used: NHANES, National Health and Nutrition Examination Study; SD, standard deviation.

Table 2. Baseline and clinical characteristics of participants according to past and current dog ownership (NHANES Mortality Follow-up Study)

		No history of dog ownership	Past dog ownership	Present dog ownership
Baseline evaluation				
Number of participants		843	1,660	1,932
Age (mean years ± SD)**		55 ± 15	52 ± 16	47 ± 14
Systolic blood pressure (mean mmHg ± SD)		133 ± 25	132 ± 22	129 ± 22
Serum Cholesterol (mean mg/dl ± SD)**		228 ± 47	224 ± 50	218 ± 48
Body mass index (mean ± SD)		25.9 ± 5.5	25.6 ± 5.0	25.9 ± 5.0
Gender	Women	296 (35%)	724 (44%)	832 (43%)
Race/ethnicity	Caucasian	679 (81%)	1482 (89%)	1793 (93%)
	African-American	143 (17%)	153 (9%)	118 (6%)
	Others	21 (2%)	25 (2%)	21 (1%)
Cigarette smoking	Current	233 (28%)	538 (32%)	783 (41%)
	Past	179 (21%)	466 (28%)	438 (23%)
	Never smoked	431 (51%)	656 (40%)	711 (37%)
Diabetes mellitus	Diabetic	38 (5%)	91 (5%)	86 (4%)

Symbols used: *p-value<0.05, ** p-value <0.01
Abbreviations used: NHANES, National Health and Nutrition Examination Study; SD, standard deviation.

Table 3. Multivariate-adjusted relative risks of fatal myocardial infarction, cardiovascular diseases, stroke, and ischemic stroke according to past and current cat and dog ownership.

Participants	Sample size	No. of events	Event rate per 100	Age-adjusted RR (95% CI)	Multivariate adjusted RR (95% CI)	p-value
Myocardial infarction						
Participants without any cat ownership	2000	115	6%	Reference	Reference	Reference
Participants with past cat ownership	1420	46	3%	0.65 (0.46-0.9)	0.63 (0.44-0.88)	0.008
Participants with current cat ownership	1015	37	4%	1.01 (0.70-1.5)	0.87 (0.60-1.3)	0.4572
Participants without any dog ownership	843	52	6%	Reference	Reference	Reference
Participants with past dog ownership	1660	70	4%	0.82 (0.57-1.2)	0.76 (0.53-1.1)	0.1455
Participants with current dog ownership	1932	76	4%	1.3 (0.90-1.8)	1.1 (0.76-1.6)	0.6270
Cardiovascular diseases						
Participants without any cat ownership	2000	133	7%	Reference	Reference	Reference
Participants with past cat ownership	1420	62	4%	0.75 (0.56-1.0)	0.74 (0.55-1.0)	0.0501
Participants with current cat ownership	1015	45	4%	1.0 (0.74-1.5)	0.92 (0.65-1.3)	0.6378
Participants without any dog ownership	843	60	7%	Reference	Reference	Reference
Participants with past dog ownership	1660	92	6%	0.93 (0.67-1.3)	0.87 (0.63-1.2)	0.4077
Participants with current cat ownership	1932	88	5%	1.3 (0.93-1.8)	1.1 (0.79-1.6)	0.5563
All strokes						
Participants without any cat ownership	2000	18	1%	Reference	Reference	Reference
Participants with past cat ownership	1420	16	1%	1.5 (0.74-2.9)	1.5 (0.75-2.9)	0.2607
Participants with current cat ownership	1015	8	1%	1.4 (0.74-2.9)	1.3 (0.54-2.9)	0.5884
Participants without any dog ownership	843	8	1%	Reference	Reference	Reference
Participants with past dog ownership	1660	22	1%	1.7 (0.75-3.8)	1.6 (0.69-3.5)	0.2867
Participants with current dog ownership	1932	12	1%	1.4 (0.57-3.5)	1.2 (0.47-2.9)	0.7247
Ischemic stroke						
Participants without any cat ownership	2000	16	1%	Reference	Reference	Reference
Participants with past cat ownership	1420	12	1%	Not adequate sample size	Not adequate sample size	Not available
Participants with current cat ownership	1015	8	1%	Not adequate sample size	Not adequate sample size	Not available
Participants without any dog ownership	843	6	1%	Reference	Reference	Reference
Participants with past dog ownership	1660	18	1%	1.9 (0.74-4.7)	1.7 (0.65-4.2)	0.285
Participants with current dog ownership	1932	12	1%	2.0 (0.73-5.3)	1.7 (0.61-4.5)	0.3212
All cause mortality						
Participants without any cat ownership	2000	405	20%	Reference	Reference	Reference
Participants with past cat ownership	1420	255	18%	1.0 (0.85-1.2)	1.1 (0.85-1.2)	0.9925
Participants with present cat ownership	1015	174	17%	1.3 (1.1-1.5)	1.1 (0.93-1.3)	0.2373
Participants without any dog ownership	843	191	23%	Reference	Reference	Reference
Participants with past dog ownership	1660	341	21%	1.1 (0.88-1.3)	0.97 (0.81-1.2)	0.7634
Participants with present dog ownership	1932	302	16%	1.2 (1.0-1.5)	1.0 (0.85-1.2)	0.8140

Abbreviations: RR, relative risk; CI, confidence interval.

Multivariate analysis is adjusted for differences in age, gender, ethnicity/race, systolic blood pressure, cigarette smoking, diabetes mellitus, serum cholesterol, and body mass index.

cardiovascular diseases.

Discussion

We found an independent association between cat ownership and risk of fatal MIs in the present cohort study. The protective effect may be related to a spontaneous relaxing effect with buffering effect on autonomic reactivity to acute stressors, and/or classical conditioning of relaxing response.^{1,6,7} We cannot exclude that this effect may be an indirect effect i.e. personalities of cat owners may have traits that are protective towards cardiovascular diseases independent of cat ownership. The study did not allow us to quantitate cat exposure in terms of years, intensity of physical interaction, and nature of interaction (tactile or visual). We only found the relationship between past cat ownership and fatal cardiovascular events. It is possible that cat ownership at an early age in life may be more protective than at a later age when sub clinical cardiovascular disease has already occurred. We did not see a protective effect of cat ownership on the risk of stroke. It maybe the number of stroke events may be too small to adequately assess the relationship. Furthermore, the role of cardiovascular reactivity in precipitating an event is less established in stroke than MI. A similar effect was not seen with dogs. It is presumable the dogs vary considerably in characteristics thereby the effect is not homogenous. The data was acquired only for participants who reported any allergic response. It remains unclear whether the relationship between cat ownership and cardiovascular disease would be similar among persons without any allergic response. In a previous analysis from the NHANES II mortality follow-up study, no association was found between allergen skin reaction at baseline and subsequent mortality although data was not examined according to pet ownership status.⁸ We used primary ICD-9-CM codes from death certificates to identify events. On the basis of results of previous studies, we think that hospital discharge or death certificate diagnoses are sufficiently accurate to justify their use in present study.⁹⁻¹¹ Probably more important, the validity of ICD-CM diagnoses does not differ by strata defined by pet ownership. The results need to be confirmed in other studies with better and controlled quantification of cat exposure. A previous study among hypertensive persons randomized to pet adoption or control group demonstrated lower blood pressure reactivity to stress at 6 months.¹² While no data exists for protective effect on cardiovascular events, acquisition of cats as domestic pets may represent a novel strategy for reducing the risk of cardio-

vascular diseases in high-risk individuals.

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