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a self-reported owner survey

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Abstract

Objectives This study used an owner-directed online questionnaire to collect data regarding their food and water provision for their pet cats. The survey was conducted in 2019.

Methods The anonymous online 30-question survey was available via vetprofessionals.com.

Results A total of 1172 cat owners fully completed the questionnaire. The respondents each owned a median of two cats (range 1–6). They reported being most strongly motivated to feed a particular ration because of palatability, observed and/or expected health benefits, or that the diet was/is perceived as 'natural'. The majority of owners (n = 946, 80.7%) fed their cats exclusively a commercially purchased complete wet food, dry kibble diet or mixture of both. Compared with a previous (unpublished) survey conducted by the same authors in 2013,1 there were substantial increases in the number of owners feeding therapeutic diets (26.6% vs 0.7%) and the inclusion of raw meat in cats' rations (15.6% vs 3.7%). The proportion of respondents providing at least one feeding station per cat was 83.1%, with significant use of enrichment feeding methods (29.1%).

Conclusions and relevance Veterinarians need to be aware of changing trends in cat feeding to provide owners with appropriate support. Veterinary advice was frequently sought by owners and can be used as an opportunity to improve cat health and welfare, particularly in multi-cat households, but was not often influential to client decision making.

Keywords: Diet; owner survey; water intake; nutrition

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Introduction

Nutrition and food intake play a fundamental, integral and indivisible role in health and disease.[1,2] There is an increasing recognition of the importance of patient nutrition in preventing and treating acute and chronic diseases in both veterinary and human medicine.[3–5] The World Small Animal Veterinary Association (WSAVA) has recommended that nutritional assessments of cats and dogs should be conducted at every veterinary appointment.[6] Many diseases, such as chronic kidney disease, certain hepatopathies, gastrointestinal disorders, skin diseases, diabetes mellitus and even hyperthyroidism, can be ameliorated through dietary intervention.[4,7] At the same time, the increasing prevalence of feline obesity, and the diseases linked to it, such as diabetes mellitus and osteoarthritis, remain urgent global concerns for the health and welfare of pet cats.[8,9]

Domestic cats (*Felis silvestris catus*) are obligate carnivores and have unusually high nutritional protein requirements, though this changes through the different life stages of the cat.[10] In the last decade, the number of people in resource-rich countries choosing to eat more

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plant-based dietary components has markedly increased; the perceived and proven health benefits along with ethical and moral viewpoints are some of the most commonly cited reasons for the long-term adherence to these lifestyles reported by self-identifying study participants.[11] A recent study looking at pet owner attitudes towards plant-based (vegan) diets for their pets showed that pet owners were more likely to be vegetarian (6.2%) or vegan (5.8%) than previously reported for members of the general population. However, there is concern with regards to feeding strictly plant-based foods to cats as an obligate carnivore species.[12] Another study looking at owner-reported health of American and Canadian owners of cats on meat- and plant-based diets showed that most cats (65%) were fed a meat-based diet and 18.2% were fed a plant-based diet.[12] The cat owner perception of the health and wellness of their cats did not appear to be adversely affected by being fed a plant-based diet and the owners did not perceive any body system or disorder to be at particular risk when feeding a plant-based diet to cats.[13] The feeding of restrictive diets (such as grain-free foods) and the provision of commercial or homemade raw meat-based diets (RMBD) to companion animals have increased substantially in popularity in recent years, not just in the UK, but globally.[14,15]

The domestic cat is, like all *Felidae* except lions (*Panthera leo*), typically a socially solitary hunting animal.[16,17] There are, however, exceptions where more than one cat comes together in aggregated groups known as colonies; for example, a group of cooperating females raising kittens. In domestic settings, this is often the case as owners are housing multiple cats in multi-cat households.[18] The latter can be a challenging and stressful situation, even for such an adaptable species. Problems can arise where there is tension between individual cats over the availability of resources, of which food and water are fundamental. If insufficient resources are provided, specifically such as too few feeding stations or water bowls for the number of cats in the household, this can lead to a chronic state of stress for one or more of the individuals involved, increasing the incidence of problematic behaviours such as urine spraying, displacement behaviours such as sleeping or grooming, as well as disease states such as feline stress cystitis.[17] Feeding and water resources have been targeted by questions in this survey as the feline welfare charity International Cat Care define these as essential pre-conditions to a successful cohabiting multi-cat household.[18,19] As an approximate guide, there should be at least the same number of resource stations (eg, food bowls, water bowls or litter trays) per cat (as a minimum) and ideally one additional one.[19]

Nutrition has a critical role in the health and wellbeing of pet cats; however, patterns of feeding are, anecdotally, changing rapidly, with little being known about how cat owners feed their pet cats and how this may be changing in the context of social changes around human diet and nutrition. A study looking at changes in pet feeding practices between 2008 and 2018 reported that nowadays, most pets (79% of dogs, 90% of cats) were offered conventional (ie, cooked) food; however, only 13% of dogs and 32% of cats were fed conventional foods exclusively.[20] The authors found that many pets were offered homemade (64% of dogs, 46% of cats) and/or raw (66% of dogs, 53% of cats) foods.[20] Another study looking at feeding practices of pet owners in the USA and Australia showed more than 90% of pet dogs and cats were fed commercial foods for most of their diet, but non-commercial foods (such as table scraps, raw foods and home-prepared diets) comprised at least 25% of the diet for 17.3% of dogs and 6.3% of cats.[21] Most of the pets receiving raw foods in this study lived in Australia. In this study, only 2.5% of pets were fed a therapeutic diet.[21]

Another important nutrition topic is where owners seek guidance on the nutrition of their pets. A study based in the USA and Canada evaluating the attitudes and intentions of pet owners towards nutritional guidance received from veterinarians showed that clients are concerned about the effectiveness of veterinary nutrition recommendations but cat owners were more likely than dog owners to consider the nutritional guidance they receive from veterinarians effective for their pets' diet.[22] The previously mentioned study looking at feeding practices of pet owners in the USA and Australia showed that veterinarians are the most common source of information about pet health, nutrition and other pet care for dog and cat owners.[21]

The primary goal of this study was to examine the prevalence of different feeding practices, including commercial wet, dry and raw meat-based, cooked meat and veterinary therapeutic diets in pet cats. The secondary aim was to establish owner motivations for the way they feed their pet cats, including where they source dietary advice from and the factors they consider important with respect to feline nutrition.

Materials and methods

The study was performed using an online questionnaire-based survey (see the file in the supplementary material) conducted in 2019. The questionnaire comprised 30 questions relating to different aspects of feline nutrition and husbandry. A similar survey (unpublished) had first been developed in 2013 and used by the authors; based upon feedback from a pilot group of colleagues of the authors and respondents of the 2013 survey, the current 2019 questionnaire was updated before being published in the final form (as provided).

The participants of the study had to be cat owners aged over 18 years. The only exclusion criterion was an incomplete set of responses to the questions. The questionnaire was hosted on the Vet Professionals website in

full compliance with General Data Protection Regulation (GDPR) (EU) 2016/679. This study was approved by the Human Ethical Review Committee (HERC) at the Royal (Dick) School of Veterinary Studies, University of Edinburgh, UK.

The Vet Professionals database of cat owners contains approximately 2000 cat owners, primarily from the UK (60–70%) but it is populated by participants from around the world. Surveys were promoted via emails to the database members, as well as on social media platforms (Facebook and Twitter) and promotion by the feline welfare charities International Cat Care and Cats Protection.

Statistical analysis

All complete questionnaire responses were included in the study analysis. Anonymised owner answers were collated using Microsoft Excel. Descriptive data are reported as actual counts and the percentage of respondents.

Results

A total of 1172 complete responses were received. Responders were distributed globally, with 27 countries represented. Most replies came from the UK (n = 480, 41.0%), followed by the European Union (EU; n = 292, 24.9%), Australia (n = 140, 11.9%), the USA (n = 68, 5.8%) and Canada (n = 22, 1.9%). This accounted for more than 85% of respondents.

The majority of respondents (63.2%) reported owning more than one cat (range 1–6, median 2). Most owners (n = 687, 58.7%) provided the same number of food bowls as cats, and 287 (24.5%) provided at least one more food bowl than the total number of cats in the household. However, a significant minority (n = 198, 16.9%) provided fewer food bowls than the number of cats living in the house.

Three types of diet were reported to be offered most frequently by the survey respondents with some feeding more than one type of diet (Table 1). The most frequent was to offer a mixture of non-therapeutic cooked commercial wet and dry foods (n = 704, 60.1%). Therapeutic diets (n = 311, 26.6%) were the second most reported diets used by respondents, and commercial non-therapeutic dry kibble-only diets (n = 189, 16.1%) were third. The other reported ration types were each reported as being supplied by fewer than 10% of respondents. These comprised the following: a combination of commercial cooked wet food with dry kibble and raw meat (n = 66, 5.6%); commercial cooked wet diet (n = 53, 4.5%); homemade RMBD (n = 43, 3.7%), commercial RMBD (n = 40, 3.4%), mixed homemade and commercial RMBD (n = 13, 1.1%), commercial cooked wet food and RMDB (n = 12, 0.9%), commercial cooked dry kibble and RMDB (n = 11, 0.9%), commercial dry kibble and cooked meat (n = 5, 0.4%), commercial wet food and cooked meat (n = 2, 0.2%) and homemade cooked meat-only diet (n = 1, 0.1%). Overall RMBD was given as a dietary component by 173 (14.8%) respondents.

Table 1 Types of ration offered by the 1172 survey respondents to their cats

Diet	Responses
Single component	
Commercial dry	189 (16.12)
Commercial wet	53 (4.52)
Therapeutic diet only	48 (4.10)
Home-produced raw meat-based diet	43 (3.67)
Commercial raw meat-based diet	40 (3.41)
Home-produced cooked meat	1 (0.09)
Mixed dietary components	
Commercial wet and dry	704 (60.07)
Commercial wet and dry and raw meat	66 (5.63)
Commercial wet and raw meat	12 (1.02)
Commercial dry and raw meat	11 (0.94)
Commercial dry and cooked meat	5 (0.43)

Data are n (%)

Enriched feeders, such as puzzle feeders, were reportedly used by 29.1% (n = 341) of cat owners, while 21.2% (n = 248) hid food around the house for their cats to find. Treats were given alongside the main ration by 98.2% of owners (n = 1150). More than half of the cats were not known to be hunters, with 650 (55.5%) respondents stating their cats never hunted, 486 (41.5%) reporting their cats did hunt and the remaining 36 (3%) being unsure. The vast majority, 445 (91.6%), of hunting cats reportedly caught birds and/or rodents (eg, mice, rats and squirrels), while the remaining 41 cats caught variable combinations of other animals, including bats, rabbits, hares, moles, moths and other insects.

The sources of information on the nutritional needs of pet cats obtained by survey responders are shown in Table 2. The sources include gaining information from their veterinarians, other veterinary practice staff, such as vet nurses/technicians and reception or administrative staff, online including social media, friends and family who own or have owned cats, pet shop staff and cat breeders.

Therapeutic diets were used by 311 (26.6%) respondents in this survey, of which 33 (10.6%) fed multiple such diets; for example, a renal diet alongside a urinary diet. The most frequently used therapeutic diets were reportedly used to help manage chronic kidney disease (CKD; n = 133, 42.8%), followed by cats with feline stress cystitis (n = 117, 37.6%), cats with diagnosed or suspected chronic enteropathies, such as inflammatory bowel disease or small intestinal lymphoma (n = 51, 16.4%), other urinary tract diseases (eg, urolithiasis) (n = 30, 9.6%), weight

Table 2 Sources of information used by respondents to inform their choice of ration offered to their cats (some respondents gave more than one source)

Source of information	Respondents (n = 1172)
Veterinary surgeon	411 (35.1)
Veterinary nurse	357 (30.5)
No advice sought	266 (22.7)
Online forum on social media	51 (4.4)
Other cat owners (eg, friends and family)	32 (2.7)
Nutrition website (other than social media)	14 (1.2)
Charity website	13 (1.1)
Pet store retail staff	12 (1.0)
Non-clinical veterinary practice staff; eg, reception staff	11 (1.0)
Cat breeder/person I acquired my cat from	10 (0.9)
Pet food manufacturer	7 (0.6)

Data are n (%)

Table 3 Reasons (beyond palatability) owners report feeding particular diets to their cats

Reason for choice of ration	Respondents (n = 1172)
Nutritional benefit	655 (55.9)
Ingredients are perceived as 'natural' and/or 'appropriate'	233 (19.9)
Diet is high in protein	127 (10.8)
Avoid grain and other 'inappropriate' ingredients	77 (6.6)
Cost	48 (4.1)
Veterinary request	32 (2.7)

Data are n (%)

reduction (n = 16, 5.1%), diabetes mellitus (n = 9, 3.0%), dental disease (n = 6, 2%) and one (0.3%) cat where an iodine-restricted diet was used to treat hyperthyroidism.

The survey asked respondents about where they source their cat's food. The most frequent source was at supermarkets (n = 525, 44.8%) followed by provision via online delivery services (n = 210, 17.9%), veterinary practices (n = 207, 17.7%) and pet-specific retail outlets (n = 158, 13.5%). The respondents were asked if they had ever read the label of contents of the pet food they purchased; most said that they always (n = 548, 46.8%) or sometimes (n = 432, 36.9%) read the ingredients label, while 191 (16.35%) reported never reading the contents of their chosen ration.

Less than one-quarter (n = 284, 21.1%) of respondents reported never adhering to the packaging guidelines when feeding their cats (this includes those 44 respondents who feed homemade diets where there are no packet guidelines to follow). Nearly half of survey respondents (n = 473, 40.4%) sometimes complied with guideline feeding based on the food manufacturers' recommendations on the packaging, with the remaining 24.2% (n = 284) always feeding as per the food guidelines on their chosen ration.

Respondents were asked about the motivations for their choice of cat food beyond just palatability (Table 3). The options of flavour of the food were not a major influence for respondents, with 498 (42.5%) ranking it as unimportant, 458 (39.1%) as only slightly important and 217 (18.5%) as neither important nor unimportant. No respondents ranked flavour as 'highly important' in their decision over choice of ration. The most reported motivation was for good nutritional quality and health benefits. More than half (655, n = 55.9%) of all owners chose foods based on their perception of nutritional benefit, which was the main consideration of nearly two-thirds (65.0%) of the subset of owners who fed RMBD.

In addition, those who fed RMDM diets were asked why they chose that type of diet for their cats, and 30.1% reported that it was due to seeing a health improvement in their (initially healthy) cat once it/they had been started on raw food. These included owner-observed benefits, such as improved dental hygiene, weight management/loss, improved hydration due to increased moisture content of the food, increased energy levels, firmer stools and improved coat/skin condition.

The second largest owner motivation (across all respondents) was the chosen diet had to be considered by owners to be 'natural'; 233 (19.9%) owners reported this as their main reason for providing a particular diet. The third most important motivation for owners feeding a given diet was that they wanted to avoid giving cats grains, as well as less biologically appropriate ingredients, such as vegetables (n = 77, 6.6%).

The two least commonly given reasons for the diet choices were the cost of the food, with only 4.1% (n = 48) of owners reporting that this was important, or to comply with advice from their vet, which was reported as a reason by just 2.7% (n = 32) of owners.

Nearly all survey respondents were aware of the need to feed cats complete diets rather than supplementary diets, which are foods that individually are not sufficient to meet all the nutritional requirements because they have no supplements added (n = 1113, 95.0%), and that cats needed life stage-specific diets that change with age (n = 992, 84.6%), with nearly half of respondents (42.5%) feeding a diet specific to their cat(s) neuter status.

At least one indoor drinking resource (such as a water bowl) was provided by 99.4% (n = 1165) of responders. Of these, 458 (39.3%) had more than one bowl per cat in the house, 428 (36.7%) had the same number of water bowls as cats and 279 (23.9%) had fewer bowls than cats.

Nearly one-third (n = 357, 30.5%) of cat owners reported raising the food bowl(s) (n = 134, 11.4%), water

bowl(s) (n = 82, 7.0%) or both (n = 141, 12.0%). The most frequently cited reasons for raising food and/or water bowls were as follows: to prevent access to the food or water by co-habiting dog(s) (n = 53, 4.5%) or children (n = 2, 0.1%); the design of the bowl/unit (n = 47, 4.0%); because the cat(s) were considered elderly and/or had suspected or confirmed osteoarthritis (n = 39, 3.32%); the preference of the cat(s), as perceived by the owners (n = 38, 3.2%); it was more convenient for the owners (eg, to avoid tripping on bowls) (n = 24, 2.0%); or for the management of health conditions including megaoesophagus (n = 2, 0.1%) and brachycephaly in one (0.1%) Persian cat.

Discussion

This study reports the findings of an online questionnaire answered by adult cat owners conducted online in 2019. Complete the responses were received from 1172 owners from countries across the globe, with the most represented areas being the UK, EU, Australia, USA and Canada. Most (>85%) of the respondents resided within such high-resource countries, which may have influenced the way their cats were fed, compared with cats in lower-resource countries. It is therefore likely that in this cohort, the cost of cat food was given as a lesser consideration than in other parts of the world.

The survey found that most cats lived in multi-cat households. While the wildcat ancestors of domestic cats are solitary animals, some individuals can become accustomed to group living in both natural and artificial situations.[16] Both feral and companion cats have been found to form small colonies and share resources; however, there is a high risk that having multiple cats sharing limited resources within the house can generate stress.[23] Within this study population, 63.2% of responders had more than one cat, with an average of two cats. Nearly one-quarter (23.9%) of these responders provided fewer water bowls than the number of cats and 16.9% provided fewer food bowls than the number of cats. The cats living in these conditions can be considered to be at increased risk of conflict and of the negative consequences of living under chronic stress.

The provision of water sources adequate to the number of cats in an environment is considered a key factor in both providing for the cat's welfare but also reducing intercat conflict.[19] There is also some evidence in the human literature that increasing water intake may reduce decline in kidney function, which may be particularly important for cats with CKD.[24]

In comparison to a previous Vet Professionals survey conducted in 2013,[25] the greatest fold increase in feeding practices was recorded in owners feeding therapeutic diets, which was reported by 26.6% of current respondents, which was up from 0.7% (a 38-fold increase) in 2013.[25] The reason for such an increase is not immediately clear but may represent greater owner engagement with their pets' nutrition.

Raw meat was used as all or part of their cats' ration by 15.6% of the survey responders. This represents a marked increase compared with a previous Vet Professionals survey, which found that only 3.7% of respondents fed their cats RMBDs.[25] An RMBD was reported as being used more frequently by pedigree cat owners than owners of non-pedigree cats. Commercial RMBDs are anecdotally reported to confer a number of health benefits over cooked diet. These reported (but unproven) changes include the following: owner-reported improved coat quality and better dental health, as well as the (owner-observed) alleviation of chronic gastrointestinal signs for some cats with chronic enteropathies.[26] These improvements were also noted by a significant number of respondents in the current study, as 'health benefit' was the most significant consideration behind diet choice among all owner groups. To date, however, these claims have not been demonstrated definitively in published studies or trials, so the evidence remains at Level 5 on the British Medical Journal Grading of Recommendations, Assessment, Development and Evaluations (GRADE) system.[27] There are also attendant risks with preparing, storing and feeding RMBD; the most commonly cited of which is the occurrence of microbiological contamination with a range of pathogens, including several with zoonotic potential. In studies of the zoonotic infectious agents sometimes present within thawed RMBDs, *Salmonella* species have received the most attention.[27–30] It is therefore critically important that clients choosing to feed cats RMBDs are well educated on the possible risk of contamination, and how these foods must be handled properly and carefully at all times. The American Animal Hospital Association and Canadian Veterinary Medical Association have published statements discouraging the inclusion of raw or undercooked animal-source protein in dog and cat diets.[31]

Of potential concern, 4.9% of respondents feed their cats a purely home-prepared diet, which was mostly limited to just raw meat. Home-prepared diets are known to be extremely difficult to balance in terms of micronutrients, vitamins and minerals for safe long-term consumption[32]; for example, taurine deficiency-related dilated cardiomyopathy, severe neurological signs due to thiamin (vitamin B1) deficiency, and musculoskeletal deformities in young cats and kittens as a result of secondary nutritional hyperparathyroidism due to inappropriate home-prepared diets comprising only muscle meat, which has also been supported by recent studies where recipes for home-cooked diets have been analysed and found to be exposing animals to nutritional deficiencies.[33–36]

A variety of sources were used by respondents to find out information about feline nutrition. Importantly, two-thirds (65.6%) went to clinical staff (veterinary surgeon,

veterinary nurse or veterinary technician) for advice. This is in line with a recent study carried out in the USA and Australia that showed that veterinarians are the most common source of information about pet health, nutrition and other pet care for dog and cat owners.

Beyond palatability, perceived health benefits were the main factors that influenced the owners' choice of diet provision for their cat(s), followed whether a diet was considered 'natural' and did not contain ingredients thought to be inappropriate for cats; for example, vegetables. In this response, veterinary advice ranked among the lowest importance for owners, which is in conflict with previous findings and responses to other questions. A possible reason for this discrepancy may have been that owners consider following veterinary advice to be in the best health benefit of their cat, which means that these two answers may have significant crossover. On the other hand, another study from Canada and the USA showed that clients are concerned about the effectiveness of veterinary nutrition recommendations, which indicates a key area of future work for the profession and educational campaigns. Dietary advice presents veterinary surgeons with an opportunity and demonstrably effective mechanism by which to engage with owners in order to help them make more informed decisions for the health of their cats.

Study limitations

There are a number of limitations relating to the methodology of this study. One such limitation is that the questionnaire was only answered by a self-selecting population of respondents. It is possible that the owners who chose to engage with research questionnaires via Vet Professionals represent highly dedicated, knowledgeable and bonded cat owners, some of whom are known to be veterinary surgeons and veterinary nurses, which may influence their feeding practices. It is unlikely that this represents a truly cross-sectional population of cat owners; however, the methodology has been well established and used in a number of recent studies.[37–39]

In addition, there is the potential for reporting bias in the results whereby respondents give answers that they feel are more 'correct' or are the answers that they 'should' give rather than truthful replies. The imposition of strict anonymisation methods is transparent and in part aimed to reassure respondents that they can give honest answers to try and mitigate the possible effect of any such bias on the study results.

Conclusions

The majority of respondents lived in resource-rich countries and had an average of two cats per household, and a minority of owners did not provide sufficient food and/or water bowls for the number of cats that they own. Most owners fed cats a mixture of commercially purchased wet and dry kibble diets. The majority of owners in this study were aware that cats need to be fed a complete diet appropriate for their life stage. Veterinary advice was the lowest ranked reason for diet selection, cited below the cost of food, which suggests that a lot of work needs to be done by the veterinary profession to engage with cat owners in this critical area of feline health and welfare.

Supplementary material The following file is available as supplementary material: owner questionnaire.

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Ethical approval This work did not involve the use of animals and therefore veterinary ethical approval was not specifically required for publication in *JFMS*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

Informed consent This work did not involve the use of animals (including cadavers) and therefore informed consent was not required. Owner consent for publication was given by all study participants.

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