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ORIGINAL RESEARCH

Exploring the popularity of raw meat-based diets for dogs and cats: A cross-sectional opinion survey in Spain

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Abstract

Background: Research on the general public's knowledge and usage patterns of pet food, particularly regarding raw meat-based diets (RMBDs), is limited in many countries, including Spain.

Methods: An anonymous cross-sectional web-based survey was conducted to assess the Spanish population's understanding and perceptions of RMBDs for cats and dogs.

Results: Of the 712 respondents, 46.77% were familiar with RMBDs, and 6% of pet owners reported using them. Dogs (7.61%) were more likely to be fed an RMBDs than cats (3.23%). While 66% of those familiar with RMBDs believed in their benefits, 96.40% recognised potential disadvantages. Concerns about risks to pets (63%) and those handling the food items (44.74%) were noted. Moreover, almost one in four owners (22.58%) who fed their pet an RMBDs lived with immunologically vulnerable people. Interestingly, confidence in veterinary advice was lower among owners using these diets.

Limitations: Limitations intrinsic to questionnaire studies, such as potential response bias, are acknowledged.

Conclusion: The study highlights the importance of improved veterinarian–client communication regarding pet nutrition, emphasising the need for veterinarians to play a more active educational role.

KEYWORDS
biologically appropriate raw food, diet, pet food, pet owners, raw meat-based diets

INTRODUCTION

Biologically appropriate raw food diets for pets have become increasingly popular in recent years.[1] Raw meat-based diets (RMBDs) consist mainly of raw meat (muscle, offal or bone) but may also include other raw ingredients, such as eggs, fish, vegetables or fruit. The most common commercial forms are frozen, dehydrated or fresh products.[2] Information about their preparation can be found from a variety of sources, such as websites, magazines and books, although they are becoming more common as commercial diet brands. Previous studies have described different reasons for their use by owners, either as a sole diet or in combination with other diets. Typically, these reasons are related to a lack of confidence in the components of commercial diets (e.g., additives, grains) and the overprocessing of foods, or a defense of the carnivorous nature of cats and dogs.[3–5] Proponents of raw feeding suggest that cooking reduces the nutritional value of meat by decreasing protein digestibility and destroying enzymes naturally present in food.[2,5]

A significant proportion of claims regarding the benefits of RMBDs are largely unproven and not based on scientific evidence. The reported health benefits of RMBDs include cleaner teeth, a shinier coat, general digestive health, improvements in energy, behaviour and immunity, and a reduction in inflammation-related diseases.[1,6] The main negative aspects of this type of diet are nutritional deficiencies that pets may suffer as a result of incomplete ration formulation and health problems for both animals and pet

owners (public health and zoonoses).[2] It is well known that one of the main problems with owner-prepared diets (raw or cooked) is nutritional alance.[7,8] In this sense, deficiencies of vitamins A, D and E, calcium, phosphorus, iodine, zinc and copper have been specifically reported in RMBDs.[1,9,10] Some authors suggest that these diets have an effect on blood values, describing lower serum alkaline phosphatase, inorganic phosphorus, cholesterol, folate, cobalamin and globulin concentrations in dogs fed an RMBDs compared to those fed commercial extruded kibble diets.[11,12] However, the blood profile appears to be an inappropriate tool for monitoring a dog's nutrition, with computer-assisted ratio calculation being the gold standard for detecting nutritional imbalances.[7]

With regard to potential health problems, it has been shown that raw products for both human and animal consumption may contain numerous pathogens, acquired during evisceration, processing or packaging processes.[2] These include bacteria, such as *Escherichia coli*, *Listeria* spp., *Salmonella* spp., *Campylobacter jejuni* and *Yersinia enterocolitica,* and parasites, such as *Toxoplasma gondii*, *Giardia* spp., *Echinococcus multilocularis*, *Taenia ovis* and *Trichinella* spp.[13–15] Beta-lactam resistance genes have been detected in colonies of *E. coli* and *Salmonella* spp. isolated from raw meat samples intended for RMBDs.[16,17] Furthermore, recent studies have indicated that handling raw pet food and dried pet treats intended for pets may be associated with instances of human foodborne illness.[18]

Some surveys have been conducted in various countries to assess pet owners' opinions on and knowledge of RMBDs. However, there is currently a lack of information on the Spanish population's attitudes towards and use of RMBDs. Therefore, this study was carried out with the aim of determining the level of knowledge of the Spanish population regarding RMBDs, including the attitudes of cat and dog owners towards RMBDs and the profile of owners using these diets. We hypothesised that a significant part of the Spanish population would be familiar with these diets. We also hypothesised that a small but significant percentage of pet owners use these diets and that their use is more common in dogs than in cats.

MATERIALS AND METHODS

Data collection

Data were collected using an online questionnaire that was anonymous, public, freely accessible, without special incentives and targeted at only adult members of the public. Participants gave their informed consent by clicking the button provided to continue with the survey: 'By clicking the "Continue" button, you confirm that you have read the previous information, and that you voluntarily agree to participate in this survey'. The project was reviewed and approved by the institutional board of the Veterinary Teaching Hospital of the Complutense University of Madrid.

The participants were self-recruited using non-probabilistic snowball sampling, which started within a veterinary university setting due to ease of access. From there, the survey spread via institutional email from the Complutense Veterinary Teaching Hospital, as well as through professional networks (i.e., LinkedIn) and messaging platforms (i.e., WhatsApp and Telegram), allowing a broader reach. The information was collected using cloud-based questionnaire software (Google Forms) and transferred into a spreadsheet (Microsoft Excel). The questionnaire contained 26 closed-ended questions and was divided into three sections. The first section collected information about the respondents, including age, gender, area of residence (urban or rural), educational level, relationship to the veterinary profession and whether they lived with people with compromised or weakened immune systems.[3,19,20] The second section asked about the respondents' level of trust in veterinary advice and gathered information about the respondents' pets, including species (dog/cat), signalment (breed, sex, age, bodyweight and spay/neuter status) and feeding practices. Respondents were allowed to provide data for a maximum of two pets (dog, cat or both). No specific guidance was provided to owners of more than two pets regarding which pets to include in the survey; they were free to choose which two pets to provide data for based on their own discretion. The final section focused on pet owners' attitudes towards RMBDs (knowledge, advantages, disadvantages, improvement or deterioration of pets). Given the nature of the study, not all participants answered every question. Therefore, the number of responses for each question is reported in parentheses within the results section, and percentages were calculated based on the actual number of responses. The survey was open for a period of 2 months (25 February to 2 May 2020). The translated questionnaire is available as Supporting Information S1.

Statistical analysis

Based on the estimates for the dog and cat populations in Spain,[21] a power analysis was conducted to estimate the minimum sample size required to detect significant associations at a 0.05 significance level with 80% power (256 dogs and 128 cats). All the datasets were tested for normality using the Shapiro–Wilk test. Statistical associations between data were analysed using the chi-squared test or Fisher's exact test for categorical variables and the student's *t*-test or ANOVA test for continuous variables. The level of confidence in veterinary advice was analysed using Wilcoxon's signed-rank test. Statistical significance was set at a *p*-value of less than 0.05. The data were analysed using the commercially available statistical software SAS (version 9.4, SAS Institute).

TABLE 1 Demographics of survey respondents ($n = 712$)

Variable	% (*n*)
Age (years)	
<20	6.18 (44)
21–40	54.49 (388)
41–60	33.43 (238)
>60	5.90 (42)
Gender	
Female	74.30 (529)
Male	25.28 (180)
Other	0.42 (3)
Area of residence	
Urban	83.15 (592)
Rural	16.85 (120)
Education	
Yes	99.72 (710)
Primary school	1.40 (10)
Secondary school	1.82 (13)
Baccalaureate/high school diploma	5.48 (39)
Vocational training	7.86 (56)
University studies	83.15 (592)
None	0.28 (2)
People at risk in the household	
Yes (at least one)	30.76 (219)
Children <3 years old	5.90 (42)
Children 3–10 years old	10.39 (74)
Elderly >75 years old	1.26 (46)
Pregnant women	11.24 (9)
Chronically ill	6.46 (80)
None	69.24 (493)
Relationship with the veterinary profession	
Yes	39.61 (282)
1st, 2nd, 3rd year veterinary students	6.74 (48)
4th, 5th year veterinary students	12.64 (90)
Veterinarian not working in small animal practice	9.83 (70)
Small animal practitioner	10.39 (74)
No	60.39 (430)
Pet owner (dog, cat or both)	
Yes	72.33 (515)
No	27.67 (197)

RESULTS

Survey participants

A total of 712 respondents completed the survey (Table 1). The median age of the respondents was 33 years (range: 18–88), with the most representative group being aged between 21 and 40 years (54.49%; $n = 388$). The majority of respondents were female (74.30%; $n = 529$). There were respondents from both urban and rural areas, with the former being predominant (83.15%; $n = 592$). Regarding educational level, most of the respondents were university graduates (83.15%; $n = 592$). Two hundred and nineteen (30.76%) of the respondents lived in households with one or more persons whose immune system was either impaired or not yet fully developed (i.e., children under 10 years, elderly individuals over 75 years, pregnant women and people who are chronically ill). Of the 712 respondents, 515 (72.33%) owned pets (cat, dog or both).

Pet population

A total of 737 pets were included in this study: 70.42% ($n = 519$) were dogs and 29.58% ($n = 218$) were cats. Males (49.73%) and females (50.27%) were equally represented, and most of the pets were neutered (76.92%; $n = 560/728$), although the neutering rate was statistically significantly higher in cats (92.62%) than in dogs (70.25%; $p < 0.001$). The median age of the pets was 6 years (range: 0–19 years), and 48.5% were purebred, with the proportion of purebred pets being significantly higher for dogs (63.90%) than cats (13.76%; $p < 0.001$). Table 2 summarises the pet demographics.

Feeding practices

Most dogs and cats were fed commercial dry food (79.29%), followed by wet food (23.18%), grain-free diets (11.93%), homemade cooked food (9.46%), RMBDs (6.31%) and other diets (1.51%) (Figure 1). Regarding dietary preferences, a greater proportion of cats (44.70%; $n = 97/217$) than dogs (14.06%; $n = 72/512$) were fed commercial wet food ($p < 0.001$). In addition, homemade meals were given more often to dogs (11.52%; $n = 59/512$) than to cats (4.61%; $n = 10/217$; $p = 0.003$). Similarly, the number of dogs fed RMBDs (7.61%; $n = 39/512$) was significantly higher than the number of cats fed such diets (3.23%; $n = 7/217$; $p = 0.026$). Dogs that were fed an RMBDs had a higher bodyweight than those fed other types of diets (18.20 ± 12.49 kg; $p = 0.035$).

Respondents' attitudes towards RMBDs

A total of 46.77% ($n = 333/712$) of the respondents were aware of RMBDs, with the internet being the main source of information (Table 3). Respondents who knew about RMBDs were significantly younger (median: 28 years; range: 19-66) than those who did not (median: 42 years; range: 18-88; $p < 0.001$). Women were more likely to know about RMBDs than men ($p < 0.001$). People with a university degree were also more likely to be aware of RMBDs than those without such a qualification ($p < 0.001$). No difference in RMBDs awareness was found between those living in urban areas and those living in rural areas ($p = 0.980$). There was a statistically higher number of respondents

TABLE 2 Characteristics of the dogs ($n = 519$) and cats ($n = 218$) owned by the survey respondents

Variables	Dogs	Cats	All pets
Age (median [range]; years)	6 (0–16)	5 (0–19)	6 (0–19)
Weight (median [range]; Kg)	17 (1.5–78)	4 (1–12.5)	9 (1–78)
Purebred	($n = 518$)	($n = 218$)	($n = 736$)
Yes, % (n)	63.90 (331)	13.76 (30)	49.05 (361)
No, % (n)	36.10 (187)	86.24 (188)	50.95 (375)
Sex	($n = 511$)	($n = 217$)	($n = 728$)
Male, % (n)	49.90 (255)	49.31 (107)	49.73 (362)
Female, % (n)	50.10 (256)	50.69 (110)	50.27 (366)
Neutered	($n = 511$)	($n = 217$)	($n = 728$)
Yes, % (n)	70.25 (359)	92.63 (201)	76.92 (560)
No, % (n)	29.75 (152)	7.37 (16)	23.08 (168)

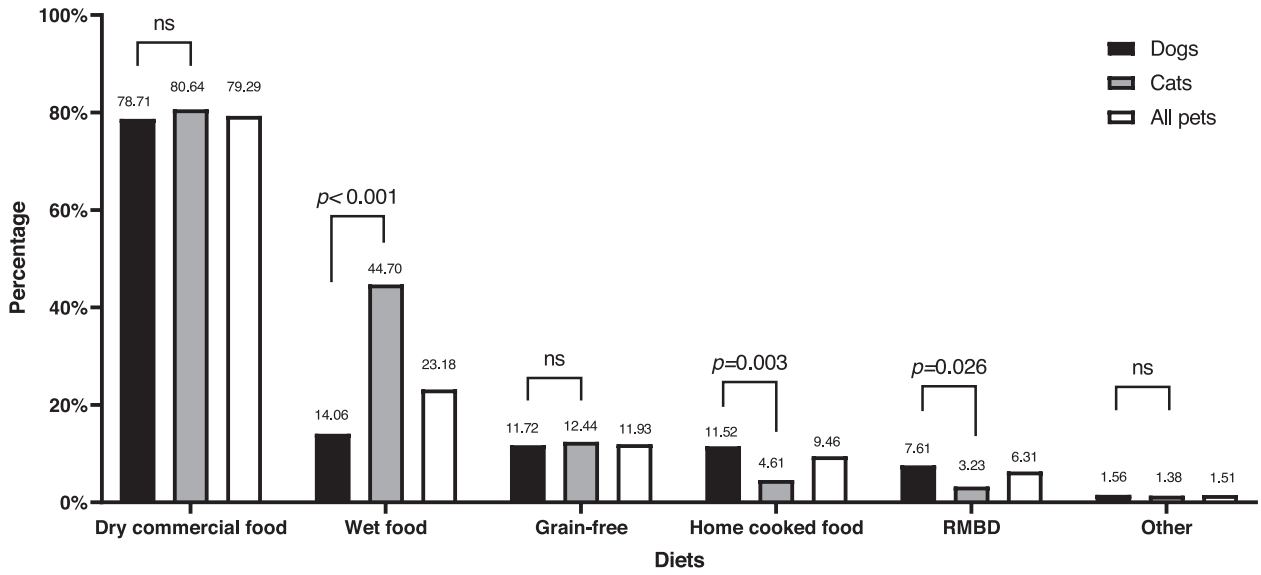

FIGURE 1 Diets fed to the cats and dogs owned by survey respondents. RMBDs, raw meat-based diet

TABLE 3 Sources of information about feeding pets a raw meat-based diet (RMBDs) ($n = 333$)

	% (n)
Internet	49.25 (164)
Veterinarian	35.43 (118)
Friend/family member	29.73 (99)
Book, magazine or printed source	28.23 (94)
RMBDs trade representative	11.71 (39)
Breeder	4.20 (14)

who had some relationship with the veterinary profession that were familiar with RMBDs, compared with respondents not associated with the veterinary profession (79.07%; $n = 223/282$ vs. 25.06%; $n = 110/439$; $p < 0.001$).

Among those who were aware of RMBDs, 65.77% ($n = 219/333$) reported that these diets had at least one advantage over other types of diet. The most reported advantage was a higher animal protein content (Figure 2a). No statistically significant associations were found between perceived advantages of RMBDs and gender ($p = 0.114$) or area of residence ($p = 0.110$). On the contrary, individuals who did not have a university education were more likely to perceive benefits of RMBDs (84.37%; $n = 27/32$) than university-educated respondents (63.79%; $n = 192/301$; $p = 0.020$). Similarly, respondents with no affiliation with the veterinary profession were more likely to perceive advantages of RMBDs (82.73%; $n = 91/110$) than those who were affiliated with the veterinary profession (57.4%; $n = 128/223$; $p < 0.001$).

Whether RMBDs were perceived to have benefits differed significantly depending on the sources of information about RMBDs used by respondents. In particular, respondents who received information about RMBDs from a friend or a family member were more likely to perceive benefits (73.74%; $n = 73/99$) than respondents who received information from other sources (62.39%; $n = 146/234$; $p = 0.046$). Similarly, the perceived benefits of RMBDs were significantly lower when the source of information was a veterinarian or magazines, books or articles (58.47%; $n = 69/118$ and 54.25%; $n = 51/94$, respectively) compared with other media (69.77%; $n = 150/215$ and

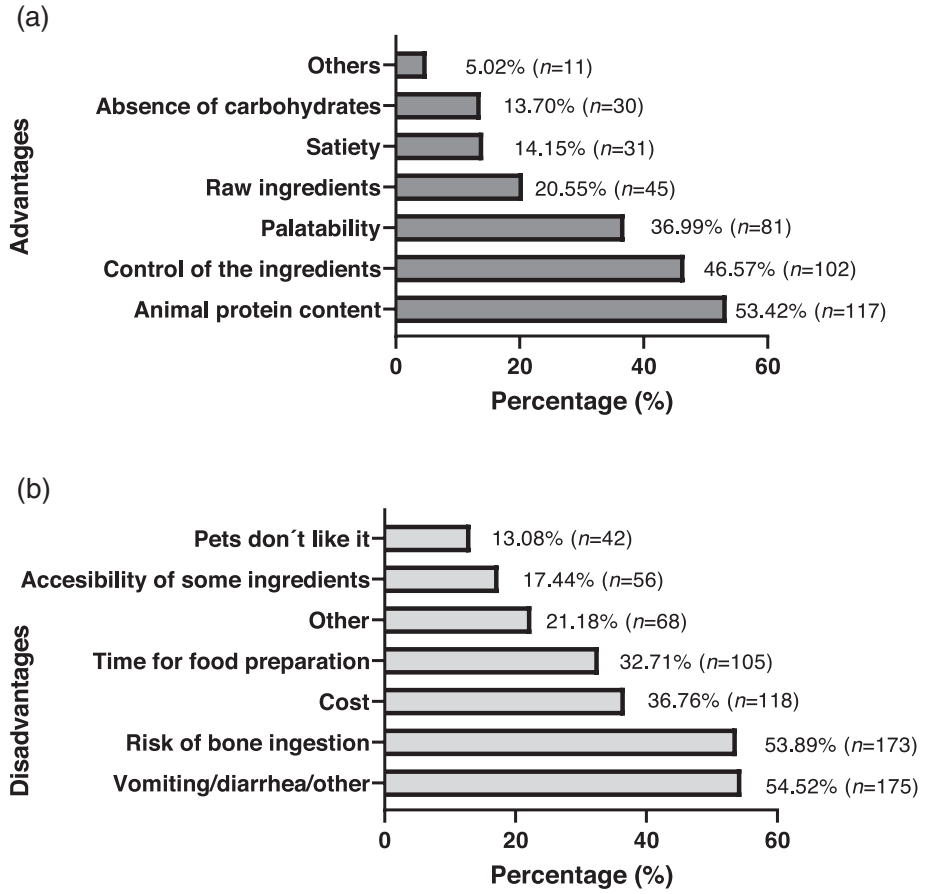

FIGURE 2 Respondents' opinions on the (a) advantages and (b) disadvantages of raw meat-based diets ($n = 219$)

70.29%; $n = 168/239$, respectively; $p = 0.038$ and 0.005, respectively).

When considering the disadvantages, 96.40% ($n = 321/333$) of those familiar with RMBDs considered them to have at least one disadvantage. Gastrointestinal signs and/or other health problems, along with the risks associated with bone feeding, were the most commonly reported negative consequences (Figure 2b). Additional disadvantages reported under the 'other' option included risk of infectious and zoonotic agents (11.21%), nutritional imbalance (7.48%), storage problems (1.87%) and ethical reasons (0.62%). No statistically significant associations were found between the perceived disadvantages and respondents' gender ($p = 0.393$), area of residence ($p = 0.906$), educational level ($p = 0.329$) or whether they were affiliated with the veterinary profession ($p = 0.119$).

Regarding the potential risk to pet health, 63.44% ($n = 210/331$) of respondents who were aware of RMBDs believed that dogs and cats could potentially get sick from eating them. However, 19.03% ($n = 63/331$) had not read or heard anything about this, 16.62% ($n = 55/331$) thought it was not possible and 0.91% ($n = 3/331$) considered it unimportant. Concerning educational level, 68.56% ($n = 205/299$) of respondents with a university education considered RMBDs a threat to pet health, compared to 15.62% of those with other educational backgrounds ($n = 5/32$; $p < 0.001$). Of those affiliated with the veterinary profession, 81.45% ($n = 180/221$) identified that RMBDs could cause pets to become ill, compared with 27.27% ($n = 30/110$) of those not affiliated with the veterinary profession ($p < 0.001$). Furthermore, 94.28% ($n = 66/70$) of small animal practitioners who completed the survey indicated that pets could get sick from eating RMBDs. No significant associations were found with gender or area of residence ($p = 0.255$ and 0.375, respectively).

Almost half of the respondents who were aware of RMBDs (44.74%; $n = 149/333$) believed that there could be some personal risk associated with handling it. Individuals who had such concerns were comparatively younger (median: 26; range: 19-66) than those who did not share these concerns (median: 35; range: 19-65) ($p<0.001$) or had never considered them (median: 26.50; range: 19-60) ($p<0.001$). The percentage of respondents who were not affiliated with the veterinary profession (83.64%; $n = 92/110$) who either believed there was no risk or had never considered the possible risk associated with handling this type of pet food was significantly higher than that of survey respondents who were affiliated with the veterinary profession (41.26%; $n = 92/223$; $p < 0.001$).

TABLE 4 Most common factors infuencing owners' choice to feed their pet a raw meat-based diet ($n = 31$)

	% (*n*)
Lack of trust in commercial pet food	38.71 (12)
Negative experiences with commercial pet food	32.26 (10)
Other (inappetence for kibble, health improvement, less food processing)	29.03 (9)
Fewer health problems than with commercial pet food	22.58 (7)
Total rejection of commercial pet food	12.90 (4)
More natural for a carnivorous pet	9.68 (3)

Owners using RMBDs

Of all the pet owners who completed the survey, 6.02% ($n = 31/515$) fed their pets an RMBDs. No statistically significant associations were found between the type of diet used and gender ($p = 0.358$), area of residence ($p = 0.306$), level of education ($p = 0.753$) or relationship with the veterinary profession ($p = 0.084$). Individuals who fed their pets an RMBDs had significantly lower mean scores regarding their confidence level in veterinarians (3.29 ± 0.56) than those who did not feed their pets an RMBDs (3.53 ± 1.91; $p = 0.014$). Moreover, 22.58% ($n = 7/31$) of owners who used RMBDs lived with people with weakened or compromised immune systems. The main reasons for choosing this diet over others were a lack of confidence in commercial pet food (38.71%) and negative health experiences with it (32.26%) (Table 4).

This type of diet was used for between 1 and 3 years by 38.71% ($n = 12/31$) of the respondents, 29.03% ($n = 9/31$) used it for more than 3 years, 25.81% ($n = 8/31$) used it for between 6 months and 1 year, and 6.45% ($n = 2/31$) used it for less than 6 months. The majority of these owners reported that their pets experienced health improvements, such as a shinier coat (67.74%; $n = 21/31$), cleaner teeth (61.29%; $n = 19/31$) and skin improvement (58.06%; $n = 18/31$) (Figure 3a).

On the contrary, just 16.13% ($n = 5/31$) reported that their pets experienced health problems when fed an RMBDs. These health issues included constipation (12.90%; $n = 4/31$), diarrhoea (3.22%; $n = 1/31$) and vomiting (3.22%; $n = 1/31$) (Figure 3b).

DISCUSSION

Raw diets for dogs and cats have become increasingly popular in recent years. As this trend continues to grow, more pet owners are exploring this alternative dietary approach to support the wellbeing of their pets.[3,22] However, scant information exists on these attitudes and practices in Spain, and this study provides the first description. The key findings, aligning with our initial hypotheses, indicate that 46.77% of surveyed pet owners were aware of RMBDs, with 6% reporting using them. Dogs (7.61%) were more frequently fed RMBDs than cats (3.23%). Notably, 22.58% of RMBDs users cohabitated with vulnerable individuals, underscoring the importance of highlighting the potential risks of this dietary approach in such contexts.

The survey results indicate a higher participation of women than men. This pattern is consistent with the findings of previous surveys conducted by Morelli et al. and Morgan et al.,[3,4,6] although the underlying reasons remain unclear. One potential limitation of our study is the distribution of the survey within a veterinary-related environment, comprising veterinary professionals and students. These respondents constituted a significant portion of the total, possibly introducing bias into the study population. In this sense, it is worth mentioning that there has been a significant increase in the number of women studying veterinary medicine in Spain.[23] This could be an explanation for the significant representation of young, university-educated women in our survey. One of the most important demographic findings from the surveyed owners was that almost 31% lived in a household with children, pregnant women, elderly adults and people with chronic illnesses. This percentage is similar to the 28% ($n = 62/218$) reported by Morelli et al.[3] These people are at higher risk for foodborne illness and should therefore minimise their exposure to undercooked or raw meat products, which are commonly contaminated with a wide range of pathogens.[2,13,14,24] In fact, even in the absence of direct handling of these diets, animals fed raw food diets may also be a potential cause of illness in these susceptible individuals due to environmental shedding of zoonotic and/or antimicrobial-resistant bacteria and parasites.[13,17,25] As such, it has been strongly discouraged for dogs involved in pet therapy programmes to interact with people with compromised immune systems.[26]

Regarding the pet population data, there were more dogs (70.42%) than cats (29.58%) in the households of the respondents. A limitation of the study lies in the questionnaire's restriction to collecting data on a maximum of two pets per owner, although these percentages are in line with the pet demographics in Spain, where approximately 61.4% and 38.61% of the population own a dog or cat, respectively, according to the pet census of the National Association of Pet Food Manufacturers.[21]

Dry commercial foods are still by far the most used diets for Spanish pets. However, new trends such as grain-free (11.93%), homemade cooked food (9.46%) or RMBDs (6.31%) are noticeable. This is similar to the situation in neighbouring Portugal, where a recent study showed that even though most owners fed their pets with commercial diets, 19% of pets were fed alternative diets,[27] or in France, where this percentage escalates to 38%.[28] However, the percentages observed in dogs from the Iberian Peninsula (Spain and Portugal) are slightly lower than those observed in other countries, such as the UK, where approximately 70% of pets were found to be fed RMBDs.[29] The proportion of dogs fed a raw or home-cooked diet was higher than that of cats, possibly due to a more direct association with wild canid diets.[1,2,8] Dogs fed an RMBDs weighed more than those fed the other diets. These

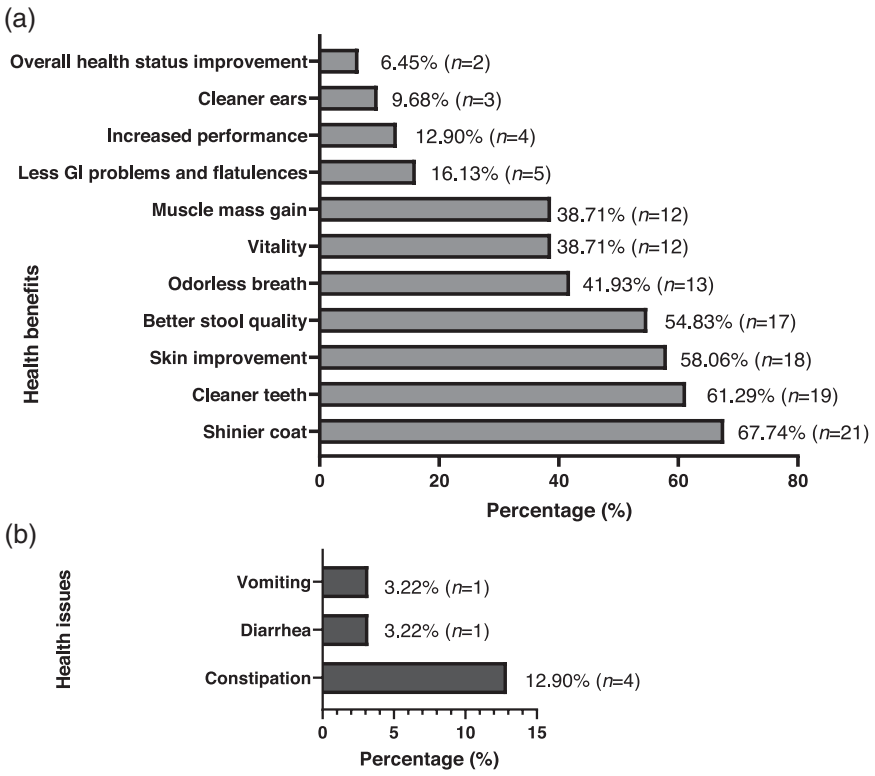

FIGURE 3 (a) Health benefits and (b) health issues reported by owners feeding their pet a raw meat-based diet ($n = 31$)

findings have been observed previously in other studies where the profile of dogs fed raw diets was defined by medium to large young dogs.[3,6,30]

RMBDs were familiar to 46.77% of the respondents, who were predominantly women and younger individuals. In addition, awareness of this diet increased with increasing educational level. Regarding the veterinary environment, veterinary students in their first years (1st, 2nd and 3rd years) are likely to have less knowledge about RMBDs than their counterparts in their final years (4th and 5th years), possibly due to differences in their acquired skills and educational background. On the other hand, small animal practitioners are more familiar with this type of diet because they have more interactions with pet food and are aware of its effects on animal welfare and health.

Almost half of the participants in our study who were aware of RMBDs discovered them through the internet. It is noteworthy that the majority of websites do not inform pet owners about food safety instructions or the risks associated with these diets.[31] The survey by Morgan et al.[4] showed that pet owners rely on online sources for decision making, and this result is also highlighted in another survey by Connolly et al.,[32] which also reported that veterinarians are rarely consulted about pet nutrition. However, veterinarians were the second main source of information in our study. When analysing the sources of information, it should be noted that diets are generally viewed more favourably when they are recommended or advocated by friends or relatives. However, the perception of their benefits is lower when the main sources of information are books or scientific papers and veterinarians. According to a recent study,[33] most pet owners were at least somewhat willing to change their pet's diet based on a recommendation from a veterinarian. These data suggest that communication between veterinarians and pet owners on nutritional issues should be improved and become more fluid to make veterinarians the most trusted source of advice.

Respondents with a lower level of education or those outside the veterinary field considered RMBDs to have advantages over other types of pet food, primarily because of the increased animal protein content and better monitoring and understanding of the pet's diet. These findings are consistent with those described by Freeman et al.,[2] Morelli et al.[3] and Morgan et al.[4] Moreover, a lack of confidence in commercial pet foods is often due to a lack of knowledge about the ingredients or manufacturing processes of dry and other commercial pet foods.[3] Conversely, individuals with higher levels of education were more likely to perceive disadvantages in RMBDs. Most respondents who reported disadvantages cited an increased incidence of vomiting, diarrhoea or other health problems, as well as an increased risk of bone ingestion. The cost or the time required to prepare these diets are also issues highlighted by the respondents, especially those using RMBDs. These findings are in agreement with those of Morelli et al.,[3] who also highlighted the challenge of obtaining specific ingredients for the diet.

Only 44.74% of the respondents considered that RMBDs posed a risk to human health. Of these, the vast majority were people associated with the veterinary profession. As other previous studies have found, most people without specific knowledge tend to believe that there is no risk to their animals or to themselves.[31,34] Most owners are aware of warnings about foodborne pathogens but are more concerned about reports of dogs getting sick from eating food than when it happens to people.[35] They interact

closely, allowing their pets to lick them or sleep in the same bed, but hygiene practices are not always adequate.[35]

We found that 6.02% ($n = 31/515$) of pet owners surveyed fed their pets an RMBDs. Notably, among those respondents, 22.58% ($n = 7/31$) lived with immunocompromised or at-risk individuals, who are more likely to become ill due to pathogen exposure. This percentage is slightly lower than that described by Morelli et al.[3] where 28% of owners using RMBDs lived with people at risk. A recent study showed that 0.2% of households feeding their pets an RMBDs reported transmission of pathogens from the raw pet food to a human family member.[36] Similarly, another study[37] showed that foodborne pathogens were transmitted to 0.55% of people living in or in contact with households that were feeding their pets raw or minimally processed diets. Thus, in addition to the risk to pets, these diets may also pose a risk to their owners.

This diet is gaining popularity in other countries, such as the United States and the UK, where higher percentages have been observed.[1,4,30] In our study, two-thirds of the people using an RMBDs had been using it for less than 3 years, showing its growing popularity. It is remarkable that we did not find any articles, opinions or perception surveys describing the situation in Spain, so this work would be the first reference.

The main reasons for choosing RMBDs are similar to those described in previous surveys: a lack of confidence in commercial pet foods, a potential improvement in the pet's health and respect for the carnivorous nature of dogs and cats.[3,4] RMBDs may appear similar to ancestral or wild animal diets, but it is critical to consider the adaptations that have occurred in companion animals since domestication, particularly with regard to the digestibility of nutrient sources such as starch.[38,39] Axelsson et al.[40] conducted a study comparing the genome of wolves and domestic dogs, which revealed differences in 10 genes involved in starch digestion and fat metabolism. These findings indicate changes associated with domestication.

Our findings indicate that owners who feed their pets RMBDs observed improvements in their pets' appearance, such as shinier coats, cleaner teeth and improved skin, which is consistent with the Morelli et al.[3] study. According to the Raw Feeding Veterinary Society, pets fed RMBDs also experience improved health status. In fact, one article[41] found a positive effect of raw veal bone consumption on dental hygiene through reducing dental plaque. Other studies have found that raw diets may have beneficial effects on clinical signs associated with food-responsive enteropathies, allergies and dermatological problems, as well as enhancing the immune system.[2,9,42] However, not enough prospective or retrospective studies have been published to demonstrate that these improvements are solely due to the consumption of raw foods, or what the long-term effects may be.[43]

The potential health problems developed (such as constipation, diarrhoea or vomiting) also coincide with those cited by Morelli et al.,[3] although a higher percentage of respondents in the Morelli et al. study reported these problems than in our study (45% vs. 16%). As mentioned above, there is scientific evidence that the use of RMBDs may pose a risk to the health of pets and their owners due to the potential presence of parasites or pathogenic bacteria.[13–15,17,34] In some cases, freezing alone is not sufficient to eliminate these pathogens and cooking at specific times and temperatures is required. This means that not only do RMBDs pose a health risk to both pets and their owners, but they also play a potential role in the transmission of antibiotic resistance genes. Furthermore, there are other potential hazards associated with RMBDs. These include bone ingestion, which can lead to tooth fractures, obstructions and gastrointestinal complications.[3,9] Increased levels of thyroxine due to ingestion of residual thyroid tissue, which could result in clinical signs of hyperthyroidism, have also been reported.[43,44] An increased dysbiosis index has also been described in dogs fed an RMBDs compared with those fed commercial diets.[45] As a result, important international organisations, such as the Nutrition Committee of the World Small Animal Veterinary Association and the British Veterinary Association, recommend against feeding RMBDs to dogs and cats.

Animal nutrition training is an essential point for clinicians, as consultations for dietary changes are common. Additionally, these consultations should include new feeding trends, such as 'natural' diets, vegetarian diets and RMBDs, as discussed in this study. During these consultations, it is important for veterinarians to adequately reflect the possible negative effects of these diets, based on scientific evidence, and create a relationship of trust between veterinarians and pet owners so that veterinarians become the primary source of information regarding pet nutrition.

Our study revealed several important findings regarding the awareness, perceptions and practices related to RMBDs among Spanish cat and dog owners. Due to the high number of respondents, the results of this study provide a potentially representative snapshot of the population's opinion on this feeding trend, although the biased demographic characteristics should be taken into consideration, with the study population characterised by younger age, a predominance of females and a higher representation of university students and individuals with ties to the veterinary field. A significant proportion of our survey respondents demonstrated awareness of RMBDs. However, the reliance on online resources as a primary source of information underscores the need to advocate for veterinary consultation to ensure evidence-based decision making among pet owners. Our survey respondents generally felt that RMBDs have more disadvantages than benefits. Concerns about potential health risks to both pets and people were prevalent, especially among younger individuals with higher levels of education and closer ties to the

veterinary field. Notably, a small but significant proportion of pet owners (6%) reported using RMBDs, and these were primarily dog owners. This underscores the need for further research to explore the health implications of such dietary choices. Our study also highlights a public health concern, as nearly one in four households using RMBDs may have individuals at increased immunological risk, enhancing the importance of disseminating scientifically supported information about the potential health effects of raw food diets.

AUTHOR CONTRIBUTIONS

Conceptualisation: David Díaz-Regañón, Celia Llorca and Mercedes García-Sancho. *Literature review and questionnaire development*: David Díaz-Regañón, Celia Llorca and Mercedes García-Sancho. *Investigation*: David Díaz-Regañón, Celia Llorca and Mercedes García-Sancho. *Data formatting and analysis*: David Díaz-Regañón and Mercedes García-Sancho. *Writing—original draft preparation*: David Díaz-Regañón, Celia Llorca and Mercedes García-Sancho. *Writing—review and editing*: Ángel Sainz, Fernando Rodríguez-Franco, Alejandra Villaescusa and Patricia Olmeda. *Project administration*: Mercedes García-Sancho. All authors have read and agreed to the published version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

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DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available upon request from the corresponding author. The data are not publicly available due to privacy restrictions.

ETHICS STATEMENT

No ethical approval was required for this procedure, neither in the national nor in the EU legal system, as the enrolment was voluntary and the participants consented to anonymous use of the information collected as per regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016, and Organic Law 3/2018, of 5 December, on the Protection of Personal Data and the Guarantee of Digital Rights.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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