# PREVALENCE AND RISK FACTORS ASSOCIATED WITH OBESITY IN DOGS#

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**ABSTRACT**

In present study, a total of 210 adult dogs irrespective of age, sex and breed were screened to evaluate prevalence and associated risk factors related with obesity in dogs.The overall prevalence of obesity among screened dogs was 18.10%. The occurrence of obesity was affected by several risk factors such as keeping of more than one pet, number of households, activity level of dogs, living environment, feeding person, exercise status and duration of exercise, owners less awareness to obesity and dog obesity treatment awareness. Obesity was higher in dogs being fed frequently, home made diet and offered controlled feeding.

***Key words:*** Dog, obesity, prevalence, risk factor, body condition score

## Introduction

Amongst various canine disorders, obesity has emerging challenge at global level to the practicing veterinarians and pet-owners which requires newer methods of diagnosis and treatment approaches for its effective control as it impact on quality of life (Shah *et al*., 2017) and longevity (Pereira *et al*., 2018). Obesity could deteriorate the quality of life in pets as well shorten the life span (German, 2006) by predisposing to several other diseases such as osteoarthritis, laminitis (Marshall *et al*., 2009) chronic inflammation, hepatic lipidosis and diabetes mellitus (Rand *et al.,* 2004). Obesity in dogs may be associated with dysfunction in multiple organ systems (Radin *et al*., 2009), such as cardiopulmonary diseases (Kume *et al.,* 2009), glucose intolerance, oxidative stress (Laflamme, 2012) and other endocrine disorders (Zoran, 2010).

The widely accepted and practical method which used to quantifying body composition and body fat mass in companion animals is body condition scoring (BCS) using visual assessment and palpation adopting 9 point scale system (Laflamme, 1997). Many pet owners do not know if the dog is obese, or reason for causative conditions, or do not know why it is dangerous for health of their pets, so they do not spontaneously seek veterinary advice and thus, it becomes the duty of the veterinarian to increase the owners' awareness and knowledge about obesity and how the dog is kept at normal body condition, convince owner about ill effects of the obesity and its management and control. Therefore, it becomes imperative to increase the awareness of companion animal obesity as a serious medical concern within the veterinary profession.

## Materials and Methods

### Source and selection of animals

Two hundred and ten adult dogs of different breeds and both sexes presented for routine clinical examination/ or vaccination in canine out door of Veterinary Clinical Complex, College of Veterinary and Animal Science, Bikaner were screened for obesity. Dogs were considered as obese when body weight excess optimum weight for body size by fifteen per-cent (Laflamme, 2001). Body condition score were assigned as whole number value 1 to 9 at the time of visual examination and palpation system (Laflamme, 1997; Burkholder and Toll, 2000). Four classes of BCS were considered: BCS 1 to 3 (Lean dogs), BCS 4 to 5 (Ideal dogs), BCS 6 to 7 (Overweight dogs) and BCS 8 to 9 (obese dogs) by Ricci *et al*. (2007).

## Results and Discussion

### Prevalence of obesity

In the present study 210 dogs presented at Veterinary Clinical Complex, College of Veterinary and Animal Science, Bikaner were under taken and screened. The dogs were screened by body condition score system (Laflamme, 1997) and 210 dogs were categorized as lean, ideal, overweight, obese dogs. Out of 210 dogs 25 (11.90%) dogs were lean, 84 (40%) dogs were ideal body weight, 63 (30%) dogs were overweight and 38 (18.10%) dogs were obese. In the present study overall prevalence of obesity among screened dogs was 18.10%. Courcier (2013) reported overall prevalence of being overweight or obese was 25%. Lund *et al*. (2006), Remillard (2006) and Mao *et al*. (2013) reported 34%, 24-30 % and 44.40% incidence of obesity among dogs, respectively.

### Risk factors associated with obesity in dogs

#### Gender

The prevalence of obesity was found higher in females as compared to male dogs (Table 1). The findings of present study is in agreement with Colliard *et al.* (2006), Usui *et al.* (2016) and Honrado (2018) who also reported higher prevalence of obesity in female dogs than male dogs.

#### Age

Higher incidence of obesity was found in 5-7 years of age

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group followed by 3-5 years, and lowest in age group more than 9 years (Table 1). Higher incidence of obesity in dogs of 5-7 years of age group is in agreement with the findings of Scarlet *et al*. (1994) and Lund *et al*. (2006) who reported that middle age is a possible risk factor for obesity. McGreevy *et al*. (2005) and Usui *et al.* (2016) reported that the incidence of obesity was increase up to certain age (middle age) followed by decrease in obesity rates in older dogs, which can be due to decrease in the metabolic activity of animals.

**Breed wise occurrence**

Highest incidence of obesity was recorded in Labrador Retriever followed by cross bred and lowest was recorded in Saint Bernard and Rottweiler (Table 1). The findings of this study are in agreement with Edney and Smith, (1986) who reported the breed predisposition to obesity in breeds such as Labrador Retrievers, Cairn Terriers, Cocker Spaniels, Long Haired Dachshunds, Shetland sheepdogs, Basset Hounds, Cavalier King Charles Spaniels and Beagles. The breeds such as Labrador Retriever, Cairn Terrier, Cavalier King Charles, Scottish Terrier, Cocker Spaniel are prone for obesity due to their genetics.

**Reproductive status**

The findings of reproductive status is shown in Table 1 which were similar with Spain *et al.* (2004) who reported 27% obesity in neutered dog population. Lund *et al*. (2006) reported that neuter male and spayed female had highest prevalence of overweight and obesity, however intact male had the lowest prevalence of overweight and obesity. Usui *et al.* (2016) reported that neutered dogs were 1.4 times more likely to be overweight than intact dogs. Neutering reduces the concentration of androgens and estrogens that act on satiety factors in central nervous system leading to increased appetite in neutered dogs. Therefore neutered dogs are more prone to obesity (Crane, 1991).

**Number of pets owned by owners**

The occurrence of obesity was found more in dogs that were owned as more than one pet as compare to that were owned as single pet (Table 1). The findings of present study are in accordance with Antoniou (2018) who reported the higher prevalence of obesity in dogs that have more than one petin the household in comparison to one pet in the house. The possible reason of the present investigation might be due to multiple-dog households indicate a lack of attention to each dog's health and weight status.

**Owners' awareness about their dog weight**

From above point it can be concluded that majority of owners of obese dogs were overall not aware about obesity (Table 1). The findings of present study were in line with Antoniou (2018) who reported that obesity is related to dog owner's attitude and found that 69.83% of dog owners were not aware of their dog's body weight.

**Owners' awareness about risk of obesity**

From the data shown in Table 1 it can be concluded that the risk of obesity was more in dogs of which owners were unaware about risk of obesity.

**Owners' awareness about body condition score**

According to present study maximum owners were unaware about obesity and body condition score (Table 1). The findings of present study were in accordance with Courcier *et al.* (2010), who reported higher prevalence of obesity in less educated people as compared to the dog owners who were more educated.

**Body condition score assessed by owner**

When owners of the dogs were asked to estimate the BCS of their dogs it was found that the most of owners categorized their dogs in ideal body weight category (Table 1). These findings suggested that most of the owners of obese dogs underestimate the BCS and body weight of their dogs. The findings of present study were similar to Colliard *et al.* (2006) and Gurpreet (2019).

**Activity level of dogs**

According to present study maximum obese dogs were lethargic and inactive and sleeps majority of the day time and rarely playful when exercised (Table 1). The present findings of study agree with Holmes *et al*. (2007) found that obese dogs have low level of activity.

**Type of feeding**

Obesity was more common in dogs that were offered controlled feeding as compared to dogs that were accessed free feeding (Table 1). The present findings are in agreement with Gurpreet (2019) who found higher prevalence of obesity in dogs offered controlled feeding than free feeding. Sallander *et al.* (2010) reported dogs with good appetite had greater chances of becoming obese compared with the dogs with poor appetite.

**Types of food**

From this study, it was concluded that dogs that were fed only home-made diet were at high risk of obesity followed by the dogs that were fed with both home- made and ready made pet food (Table 1). The present study findings are in harmony with previous studies and Lund *et al.* (2006), German (2010), Mao *et al*. (2013) reported that the dogs fed with homemade food items, observed to have higher incidences of obesity than those fed on proprietary canned dog meals or commercial diets.

**Feeding frequency**

According to Table 1 it can be concluded that higher risk of obesity was reported in dogs that were fed several time in a day. The findings of present study are in line with Kienzle *et al*. (1998), Bland *et al*. (2009) and Mao *et al*. (2013) they reported that several feeding times were associated with higher rates of obesity in dogs.

**Exercise status**

The obesity was more common in dogs that were not taken out for exercise (Table 1). The findings of present study were in agreement with Courcier *et al*. (2010) and Bland *et al*. (2009) who observed that obese dogs received less exercise than non-obese dogs. German *et al*. (2017), Antoniou (2018) and Fisher *et al*. (2013) also reported that exercise is beneficial for weight loss.

Table 1: Risk factors associated with obesity in dogs (based on questionnaire)

| S. No. | Parameters | Variable | No. of dogs (N-210) | Thin (N-25) (BSC-1-3) | Ideal (N-84) (BSC 4-5) | Over weight (N-63) (BSC 6-7) | Obese (N-38) (BSC-8-9) |
|---|---|---|---|---|---|---|---|
| 1 | Gender | Male | 95 (45.23%) | 8 (32%) | 49 (58.33%) | 22 (34.92%) | 16 (42.10%) |
| | | Female | 115 (54.76%) | 17 (68%) | 35 (41.67%) | 41 (65.08%) | 22 (57.89%) |
| 2 | Breed type | Pure | 180 (85.71%) | 21 (84%) | 72 (85.71%) | 55 (87.30%) | 34 (89.47%) |
| | | Cross | 30 (14.28%) | 4 (16%) | 12 (14.29%) | 8 (12.70%) | 4 (10.53%) |
| 3 | Reproduction Status | Intact | 180 (85.71%) | 13 (52%) | 81 (96.43%) | 56 (88.89%) | 30 (78.94%) |
| | | Neutered | 30 (14.28%) | 12 (48%) | 3 (3.57%) | 7 (11.11%) | 8 (21.05%) |
| 4 | Age | 1-3 Year | 48 (19.2%) | 6 (12.5%) | 30 (62.5%) | 8 (16.67%) | 4 (8.33%) |
| | | 3-5 Year | 55 (22%) | 5 (9.09%) | 26 (47.27%) | 16 (29.09%) | 8 (14.55%) |
| | | 5-7 Year | 46 (18.4%) | 4 (8.70% ) | 12 (26.09%) | 18 (39.13%) | 12 (26.09%) |
| | | 7-9 Year | 35 (14%) | 6 (17.14%) | 9 (25.71%) | 10 (28.57%) | 10 (28.57%) |
| | | >9 Year | 26 (10.4%) | 4 (15.38%) | 7 (26.92%) | 11 (42.31%) | 4 (15.38%) |
| 5 | Owners' awareness about their dog weight | Yes | 95 (45.24%) | 09 (36%) | 54 (64.29%) | 23 (36.51%) | 9 (23.68%) |
| | | No | 115 (54.76%) | 16 (64%) | 30 (35.71%) | 40 (63.49%) | 29 (76.31%) |
| 6 | Number of pets | One | 119 (71.42%) | 18 (72%) | 57 (67.86%) | 29 (46.03%) | 15 (39.47%) |
| | | >1 | 91 (40.48%) | 7 (28%) | 27 (32.14%) | 34 (53.97%) | 23 (60.52%) |
| 7 | Owners' awareness about risk of obesity | Yes | 125 (59.52%) | 17 (68%) | 55 (65.48%) | 39 (61.90%) | 14 (36.84%) |
| | | No | 85 (40.48%) | 8 (32%) | 29 (34.52%) | 24 (38.10%) | 24 (63.16%) |
| 8 | Owners' awareness about body condition score | Yes | 21 (10%) | 0 (0%) | 8 (9.52%) | 5 (7.93%) | 8 (21.05%) |
| | | No | 189 (90%) | 25 (100%) | 76 (90.47%) | 58 (92.06%) | 30 (78.94%) |
| 9 | Body Condition Score accessed by owner | Under weight | 25 (11.90%) | 16 (64%) | 9 (10.71%) | 0(0%) | 0 (0%) |
| | | Normal | 127 (60.48%) | 9 (36%) | 55 (65.48%) | 35 (55.56%) | 28 (73.68%) |
| | | Obese | 58 (27.62%) | 0 (0%) | 20 (23.81%) | 28 (44.44%) | 10 (26.31%) |
| 10 | Activity level of dogs | Active | 140 (56%) | 15 (60%) | 77 (91.67%) | 37 (58.73%) | 11 (28.94%) |
| | | Inactive | 70 (28%) | 10 (40%) | 7 (8.33%) | 26 (41.27%) | 27 (71.06%) |
| 11 | Type of feeding | Control feeding | 162 (77.14%) | 19 (76%) | 69 (82.14%) | 47 (74.60%) | 27 (42.86%) |
| | | Free feeding | 48 (22.86%) | 6 (24%) | 15 (17.86%) | 16 (25.40%) | 11 (17.46%) |
| 12 | Types of food | HMD | 75 (35.71%) | 11 (44%) | 27 (32.14%) | 22 (34.92%) | 15 (39.47%) |
| | | HMD+MPD | 50 (23.81%) | 7 (28%) | 17 (20.24%) | 15 (23.81%) | 11 (28.94%) |
| | | MPD | 36 (17.14%) | 4 (16%) | 16 (19.05%) | 10 (15.87%) | 6 (15.78%) |
| | | Table Scraps | 27 (12.86%) | 1 (4%) | 14 (16.67%) | 8 (12.70%) | 4 (10.52%) |
| | | Snacks Treats | 13 (6.19%) | 0 (0%) | 7 (8.33%) | 5 (7.94%) | 1 (2.63%) |
| | | other | 9 (4.29%) | 2 (8%) | 3 (3.57%) | 3 (4.76%) | 1 (2.63%) |
| 13 | Feeding frequency | Once/day | 23 (10.95%) | 5 (20%) | 9 (10.71%) | 7 (11.11%) | 2 (5.26%) |
| | | Twice/day | 53 (25.24%) | 7 (28%) | 23 (27.38%) | 13 (20.63%) | 10 (26.31%) |
| | | Thrice/day | 66 (31.43%) | 4 (16%) | 36 (42.85%) | 18 (28.57%) | 8 (21.05%) |

**Duration of exercise**

From Table 1 it can be concluded that the duration of exercise was significantly affected obesity. The present study in agreement with Bland *et al*. (2009) who reported that animals exercised less were more prone to obesity. Handl and Iben (2012) reported that prevalence of obesity correlated with a low level of exercise. Higher energy food intake with short duration of exercise led to positive energy balance leading to excessive fat accumulation in dogs (Mao *et al*., 2013).

**Number of households**

Highest occurrence of obesity was found in dogs that were reared by families having member's 1-2 persons (Table 1).The present study in line with Gurpreet (2019) who reported significant difference in obesity in dogs kept by households with different number of individuals. Bland *et al.* (2009) reported that dogs reared in houses with more number of people was less prone to obesity as more number of people lead to playful environment resulting in greater expenditure of energy.

**Living environment**

Higher prevalence was found in dogs that lived in double story buildings and apartments (Table 1). Robertson (1999) reported that confined indoors has been found to be a risk factor for feline overweight/obesity. The present study in line with Colliard *et al*. (2006) they reported that 62.2 % of obese dogs lived in apartment buildings being at greater risk of overweight/obesity than (37.7%) lived in houses and stated that the type of housing has also been significantly associated with canine overweight/obesity.

**Feeding person**

The highest prevalence of obesity was found in dogs for that the feeding person was fixed (Table 1). The findings of present study are in contradiction with Antoniou (2018) who reported that 46% of the participants with obese dogs have stated that they are the only ones taking care of their dogs while 54% have other persons in their households taking care of their dogs as well.

**Owner's opinion for weight loss diet**

In present study, maximum dog's owners were agreed with weight loss diet and few were not agreed with weight loss diet (Table 1).

**Owners' about obesity treatment**

In present study maximum dog's owners were disagreed with treatment awareness of obesity while some were agreeing (Table 1). These findings are in correlation with Antoniou (2018).

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