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Therapeutic Management of Canine Diabetes Mellitus using Combination of Insulin and *Momordica charantia* Capsules

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ABSTRACT: This study's goal was to find out the effect of *Momordica charantia* capsules, insulin hormone and a high-fiber diet on the treatment of diabetic dogs. The study included eight client-owned dogs with naturally occurring diabetes mellitus. All dogs were given restricted fat, high-fiber diets and daily subcutaneous insulin injections. *Momordica charantia* capsules were given orally to four dogs in the treatment group at a dosage of 200 mg/kg body weight (BW) every 12 hours along with insulin for 21 days after that only *Momordica charantia* capsules orally administration for two months. The control group of four dogs only received insulin therapy. The fasting blood glucose concentrations were significantly lower after taking *Momordica charantia* capsules (200 mg/kg body weight/day) for 2 months compared to the control group and before treatment. In conclusion, the use of glycemic control was enhanced more effectively by the use of the *Momordica charantia* capsules at 200 mg/kg BW/day when paired with a low-fat, high-fiber diet than by the use of insulin alone in diabetes treatment. The main challenge regarding herbal therapy in canine diabetes mellitus is that its effects are varied according to individual animal blood glucose concentration levels and also take a long time to show their results.

Keywords: Diabetes, Dogs, Glucose, Insulin, *Momordica charantia*.

INTRODUCTION

Diabetes mellitus is on the rise as a metabolic and endocrine disorder in animals. Swedish and Norwegian elkhounds have an increased chance of acquiring diabetes, and the condition virtually exclusively affects females in these breeds (Fall, 2009). Dogs of middle age and up are most at risk for developing diabetes, but the disease has also been found in younger animals (Catchpole *et al*., 2005). When diagnosed, most dogs with diabetes are middle-aged female who are overweight (Bruyette, 2001). Polydipsia, polyuria, and polyphagia are all signs of diabetes mellitus, a hormonal condition. Polyuria occurs because the significant osmotic activity of glucose in the distal tubules of the kidneys prevents water from being eliminated correctly, leading to dieresis (Benjamin, 2010). Joshi *et al*. (2022) stated that to study the efficacy of insulin therapy a total 12 dogs were selected having more than 150 mg/dl glucose level. These dogs were divided in to two groups, having six dogs in each group. The dogs of first group were treated with neutral protamine hagedorn (NPH) insulin subcutaneously @ 0.5 IU/kg body weight just before food BID and the dogs of second group were treated with insulin degludec (IDeg) subcutaneously @ 0.5 IU/kg body weight just before food OD. The repetition of insulin was decided on the basis of post treatment blood glucose level.

Fasting hyperglycaemia, proteinuria, elevated liver enzymes (ALP and ALT), neutrophilic leucocytosis, hypercholesterolemia increased urine specific gravity,

and glycosuria are all prominent clinico-pathologic characteristics of DM in dogs and cats. All of these, as well as azotemia, hyperkalemia, hyponatremia, hyperlipaemia, hyperamylasaemia, ketonemia, regenerative or degenerative left shifts, ketonuria, bacteriuria, hyperosmolality, haematuria, and pyuria, are common clinico-pathologic findings in DKA (Greco, 2018). The most helpful thing that can be done to better control glycemia is to correct obesity. There is evidence that dogs can develop insulin resistance due to obesity, and this is a significant contributor to the observed range of responses to insulin therapy among canine diabetics. In order to lose weight, most people need to cut back on their calorie consumption, eat less, and engage in more physical activity. It is recommended that overweight diabetic dogs consider switching to a weight loss diet. More insoluble fibre and less fat are found in weight reduction diets than in diabetes ones. This lowers the calorie density of the food. Until glycemia is under control and a normal body weight is achieved with a higher calorie density, lower fibre diet tailored for maintenance thin or malnourished diabetic dogs should not be fed a high fibre, low calorie dense diet (Yamka *et al*., 2006). Teshima *et al*. (2021) concluded that the use of sorghum and lentil as starch sources on moderate fibre diet for diabetic dogs seems to benefit their glycaemic control if they are fed every 12 hours and receive insulin therapy right after the meals.

A native of the tropics and subtropics, *Momordica charantia* belongs to the *Cucurbitaceae* family. The fruit has been eaten as a vegetable for thousands of years, and the plant itself has been used to cure diabetes mellitus in traditional medicine. Phytochemicals such as proteins, polysaccharides, flavonoids, triterpenes, saponins, ascorbic acid, and steroids have been found in *Momordica charantia*, which are responsible for the plant's many biological activities. These include its antibacterial, antihyperglycemic, antitumor, antiviral, immunomodulation, antidiabetic, antioxidant, antiulcer, anthelmintic, antifertility, antilipolytic, hepatoprotective, anti-inflammatory and anticancer activities due to presence of various phytochemicals including polysaccharides, proteins, triterpenes, flavonoids, ascorbic acid, saponins and steroids have been found in this plant (Jia *et al*., 2017). Makena *et al*. (2020) concluded that *Momordica charantia* L. fruit and genistein were able to enhance beta cell function and prevent lipid accumulation and insulin resistance in type II diabetic rats.

MATERIALS AND METHODS

The canines taken for study were brought to the "Veterinary Clinical Complex (VCC) of Department of Veterinary Medicine, Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur and Government Veterinary Polyclinic Hospital, Panchbatti, Jaipur" during April, 2022 to September, 2022. Permission was taken from Institutional Animal Ethics Committee (IAEC), PGIVER, Jaipur, RAJUVAS, Bikaner for conducting research as per reference of letter No. F.( )/ PGIVER/ IAEC/ 2022/ 21, dated 4/06/2022 CCSEA (Committee for Control And Supervision of Experiments on Animals) Approval Number.

A. Screening of animals

Two hundred dogs of varying age, sex, and breed were analysed for the presence of the symptoms polydipsia, polyphagia, obesity, polyuria, weakness, weariness, rapidly growing bilateral cataracts, and fast weight loss. An on-site glucometer was used to test the blood glucose levels of dogs thought to have diabetes mellitus. Dogs were included in the current study if their random blood glucose level was greater than 140 mg/dl and if their fasting blood glucose level was greater than 140 mg/dl following a 12-hour fast (Deepa *et al.*, 2014; Jatav, 2015; Chaudhary, 2021).

B. History and Clinical Examinations

Relevant information regarding history of breed, age, sex, water intake (frequency and volume), frequency of food, frequency of urine output, rapid weight loss, obesity, rapidly developing bilateral cataracts, weakness or fatigue, previous ailment and clinical manifestations, if any were taken from the owners. Clinical examination was performed to observe and record the different parameters of each canine as per the methods described by Ettinger and Feldman (2010). Observations were made regarding general symptoms and clinical observations including rectal temperature, respiration rate, heart rate and mucous membrane in each canine. Total number of canines having glucose level higher than 140 mg/dl were eight canine in our study. These canines were split up into two groups of four. Insulin was subcutaneously administered to Group I dogs at the rate of 0.25 IU/kg BW before meals twice in a day. Insulin and *Momordica charantia* (200 mg/kg body weight, twice daily) were given orally to the dogs in Group II. The blood sugar level after therapy was used to determine how often insulin would be administered. Treatment success in diabetes-affected dogs was evaluated after 0, 7, and 21 days of treatment.

Haematological analysis of samples were performed from whole blood to estimate following haematological parameters manually in diseased and healthy canines haemoglobin (g/dl), "Total erythrocyte count ($\times 10^6$/µl), total leukocyte count ($\times 10^3$/µl), packed cell volume" (%), differential leukocyte count like neutrophils (%), lymphocytes (%), monocytes (%), eosinophils (%).

Biochemical parameters *viz*. Serum Glucose, Serum Triglyceride, Serum Alanine Aminotransferase (ALT), Alkaline Phosphatase (ALP), Serum Total Cholesterol, Serum Creatinine, Blood Urea Nitrogen (BUN), Total Protein and Serum Aspartate Transaminase (AST) were estimated using "Turbo Chem. 100" (Automatic blood Biochemistry Analyzer), in the "Department of Veterinary Physiology and Biochemistry of Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur."

- **Blood Glucose:** This was calculated using a diagnostic kit and the GOD-PAP technique. Values were given in milligrammes per millilitre.
- **Alanine Transaminase (ALT):** Diagnostic kit was used to ascertain plasma ALT (SGPT) activity

according to IFCC guidelines. The values were represented as IU/L.

- **Alkaline Phosphatase (ALP):** The ALP activities in the plasma were measured with a diagnostic kit based on the IFCC standard. There was an IU/L notation for the numbers.
- **Blood Urea Nitrogen (BUN):** This was determined using a diagnostic kit and the Urease-GLDH technique. Values were given in milligrammes per millilitre.
- **Creatinine:** This was calculated using a diagnostic kit and a variation of Jaffe's approach. Values were given in milligrammes per millilitre.
- **Serum Aspartate Transaminase (AST):** The AST (SGOT) activities in the plasma were measured using the AST (SGOT) kit*, according to the IFCC-recommended protocol. There was an IU/L notation for the numbers.

C. Statistical Analysis

The 't' test was used for statistical analysis, as is customary according to accepted statistical procedures (Snedecor and Cochran 2004). SPSS 20.00 was used to conduct independent 't' tests comparing group and period means for various parameters.

RESULTS AND DISCUSSION

Clinico-Physiological Parameters

The basic parameters of health i.e., heart rate, rectal temperature, respiration rate and mucous membrane were observed in each animal.

1. Rectal temperature (ºF): On day 0, 7 and 21 mean value of rectal temperature in groups I and II were 101.36±0.28, 101.83±0.34, 100.99±0.21 degrees Fahrenheit and 101.080.82, 102.23±1.12, 101.86±0.78 degrees Fahrenheit respectively. There was no statistically significant difference (p=0.251) in the mean rectal temperatures between the two groups. Rectal temperatures varied from 100.9 ºF to 102.33 ºF over the study period, with no statistically significant differences between the groups. These results corroborate those of (Ettinger and Feldman 2010), who also observed a normal rectum temperature. Kapoor (2019) discovered that the average rectal temperature of canines with diabetes mellitus was 101.33± 0.23 ºF.

2. Heart Rate (per minute): On day 0, 7 and 21, participants in Group I had heart rates of 82.00±2.43, 85.44±2.27, and 89.61±1.62, participants in Group II had heart rates of 87.26±1.21, 83.00±1.46, and 83.22±1.82. There was no statistically significant difference in mean heart rates between the groups. Between the days, there was again no significant difference (p=0.811). Average heart rates were between 80 to 87.5 beats per minute across all groups and time points, with no statistically significant differences between them. Kapoor (2019) reported an heart rate of 94.75±1.38 beats per minute. However, increased heart rate was noted (Bhat *et al*., 2013).

3. Respiration rate (per minute): On day 0, 7 and 21 Group I had a mean respiration rate of 21.73±0.37, 21.73±0.20 and 22.73±1.06, whereas Group II had mean values of 21.40±0.77, 22.33±1.12 and 14.55±0.87. Mean respiration rate (per minute) did not differ significantly between groups, and it ranged from 14.55 to 22.73 per minute throughout the various time points. The respiratory rate (per minute) recorded by Kapoor (2019) was 27.50±1.10, which is within the normal range established by (Ettinger and Feldman 2010).

4. Mucous membrane (color and correlation): Half of the dogs (4/8) had normal mucous membranes while the other half (4/8) had hyperemic mucous membranes. Dehydration led to a hyperemic mucous membrane. The treatment restored the normal mucous membrane colour. Physical examination revealed pink, moist conjunctival mucous membranes, as reported by Kapoor (2019).

Heamatological Parameters

1. Haemoglobin

On days 0, 7, and 21, the mean haemoglobin concentrations (g/dl) in group I and group II were 13.35±1.12, 13.55±0.81, and 14.08±0.84, and 14.59±0.52, 14.51±0.64, and 15.13±0.64, respectively. The mean haemoglobin levels did not differ significantly between groups I and II. It was also not statistically significant between days (p=0.666). The haemoglobin values between the groups ranged from 13.35 to 15.13 g/dl. According to Hess *et al*. (2001), 24% of canines were anaemic. Kapoor (2019) investigated the haematological profile of diabetic canine patients. The respective mean values for haemoglobin (Hb), packed cell volume (PCV), total erythrocytes count (TEC), and total leukocyte count (TLC) were 14.40±1.24 g/dl, 44.56±3.38%, 6.69±0.52× 10^{12}/L, and 15.00±2.14× 10^{9}/L. There was no statistically significant difference between the mean values of Hb, PCV, TEC, and TLC between diabetic and healthy canines.

2. Differential Leucocyte Count (DLC)

(i) Neutrophils (%). Neutrophil counts (percent) on day 0, 7, and 21 were 80.30±3.57, 79.40±3.18, and 80.73±1.29 in group I and 78.00±1.16, 74.00±2.16 and 76.40±1.16 in group II, respectively. Neutrophil counts were significantly low ($p<0.05$) between the two groups, but not between the two groups. Herrera *et al*. (2007) investigated canine diabetes and assessed 40 dogs. In conjunction with the shift to the left, they discovered neutrophilia and alterations in the number of other leukocytes. Similar results were observed by Valilou and Lofti (2011), who found that neutrophils (82.3%) were higher in diabetic canines than in the control group (72.38%, 22.79%, and 2.05%), while lymphocytes (14.59%) and monocytes (1.81%) were lower. The upregulation of tumour necrosis factor and Interleukin 6 in response to pathogen associated molecular protein (PAMP) motifs is a likely cause of neutrophilia in diabetic patients. These cytokines induce leukocytosis and neutrophilia in diabetic patients due to their chemotactic nature (Declue *et al*., 2012). Kapoor (2019) found that diabetic dog neutrophils were not significantly elevated. These findings were also consistent with those of (Xu *et al*., 2013), which demonstrated an increase in TLC and neutrophils in diabetic canines. The cause of Neutrophilia in diabetic

dogs was the chemotactic nature of the cytokine that induces Leukocytosis and Neutrophilia.

(ii) Lymphocyte (%). The mean lymphocyte percentage on day 0, 7, and 21 were 14.00±2.36, 15.18±2.55, and 13.73±2.14 in group I and 21.44±0.61, 22.73±1.43, and 22.40±0.41 in group II. There was no difference in lymphocyte counts between the groups. It was also not statistically significant between days (p>0.05). Herrera *et al.* (2007) investigated canine diabetes and assessed 40 dogs. They discovered lymphocytosis as well as variations in the number of other leukocytes. In contrast to the study, the mean lymphocyte count in diabetic dogs was substantially lower than in healthy dogs. Similar results were observed by Valilou and Lofti (2011), who discovered that neutrophils (82.3%) were higher and lymphocyte (14.59%) and monocyte (1.81%) counts were lower in diabetic canines than in the control group. Differential leucocyte count revealed 77.04±3.37% neutrophils, 19.58±3.16% lymphocytes, and 3.38±0.38% monocytes, according to Kapoor (2019). TLC and neutrophil counts were marginally elevated in diabetic canines. Compared to the healthy group, the mean values of lymphocytes and monocytes were not significantly lower in diabetic dogs.

(iii) Monocyte (%). The average percentages of monocytes on day 0, 7 and 21 were 4.14±1.18, 3.00±0.79, and 3.63±1.23 in group I and 2.22±0.39, 3.22±0.55, and 2.83±0.50 in group II. The difference in monocyte counts between group I and group II was insignificant. It was also not statistically significant between days (p>0.05). In contrast to the study, (Valilou and Lofti 2011) found that neutrophils (82.3%) were higher in diabetic canines than in the control group (72.38%, 22.79%, and 2.01%), while lymphocyte (14.59%) and monocyte (1.81%) were lower. In accordance with the study, (Abakpa *et al*., 2017) discovered that the white blood cells (WBC) in diabetic groups post-induction and post-treatment increased in a non-significant manner.

(iv) Eosinophil (%). On day 0, 7, and 21, the mean Eosinophil (%) values for group I and group II were 3.00±0.75, 3.33±0.55 and 3.00±0.75 and 2.44±0.51, 3.73±1.03, and 2.77±0.86 respectively. The count of eosinophils did not differ significantly between groups I and II. It was also not statistically significant between days (p<0.05). Herrera *et al*. (2007) recorded eosinophilia and eosinopenia as Leukogram alterations in canines with diabetes mellitus.

3. Total Leukocyte Count (TLC) (µL). Total leukocyte counts (TLC) (thousands/cu.mm) on day 0, 7, and 21 were 14.06±1.10, 14.61±0.80, and 14.58±1.04 in group I and 11.54±1.57, 11.88±1.49, and 11.78±1.55 in group II, respectively. Total leukocyte counts (TLC) on day 0 were significantly different between groups I and II (p=0.05). It was not statistically significant between days (p=0.952). According to the study by Abakpa *et al*. (2017), white blood cells (WBC) are significantly elevated in diabetic groups following induction and treatment. The differential leucocyte count revealed 77.04±3.37% neutrophils, 19.58±3.16% lymphocytes, and 3.38±0.38% monocytes, according to Kapoor (2019). TLC and neutrophil counts were non-significantly elevated in diabetic canines. Compared to the healthy group, the mean values of lymphocytes and monocytes were not significantly lower in diabetic dogs. These observations were consistent with the findings of (Xu *et al*., 2013), which demonstrated that diabetic canines had higher TLC and neutrophils.

4. Packed cell volume (PCV) (%). On day 0, 7, and 21, the mean PCV (percent) for group I and II was 41.73±1.36, 42.36±1.45, and 42.33±1.70 and 45.75±2.03, 46.08±2.41, and 47.02±2.41 respectively. PCV was not significantly different between the groups (p=0.071). It was also insignificant between days (p = 0.83). Kothari and Bokariya (2012) reported anaemia and PCV in diabetic canines and attributed due to dehydration. Consistent with the findings of Jena *et al*. (2019), PCV levels in diabetic dog groups did not change markedly.

BIOCHEMICAL PARAMETERS

1. Blood glucose (mg/dl). On day 0, 7, and 21, group I and group II mean blood sugar levels (in milligrammes per deciliter) were 258.06±29.35, 310.31±31.34 and 264.09±34.22 and 250.63±30.67, 373.28±12.84, and 384.76±17.08, respectively. On day 21, there was a significant difference in blood glucose values (p=0.00). It implies that group I has a relatively higher level of insulin effectiveness when combined with *Momordica charantia*. *Momordica charantia* accelerates the renewal process of cell in STZ-induced diabetic rats (Karunanayake *et al*., 1990; Ahmed *et al*., 1998; Ahmed *et al*., 2004), promotes glucose uptake into L_6 muscle cell (Cummings *et al*., 2004; Ahmed *et al*., 2004), controls glucose absorption into brush border membrane vesicle in the jejunum of streptozotocin induced diabetic rats (Ahmed *et al*., 2004). According to Yibchok-anun *et al*. (2006), the protein extract from *Momordica charantia* promotes the secretion of insulin from perfused rat pancreas. Thus, the *Momordica charantia* capsules may exert their effects via one or more of the mentioned mechanisms, enhancing the efficacy of insulin therapy in diabetic dogs.

2. Serum Glutamic Pyruvic Transaminase (SGPT) (ALT) (IU/L). Serum glutamic pyruvic transaminase (SGPT) (IU/L) mean values on day 0, 7, and 21 in groups I and II were 31.80±7.84, 31.10±5.47, and 32.55±5.18 and 89.71±16.48, 79.85±4.42, and 78.52±5.02 respectively. The effects of various treatments and their interactions on SGPT levels were studied. When SGOT values were compared between the groups, it was discovered that they were very significant (p<0.01). Between the days of monitoring, neither group's conditions significantly changed. According to Hiblu *et al*. (2015), other illnesses such hepatic necrosis and hypertrophy may also be present in diabetic dogs. Since the mean activities of ALT, AST, and ALP were 41.1±5.11 IU/L, 48.8±4.19 IU/L, and 86.7±4.5 IU/L, respectively, the results concur with those provided by Kapoor (2019). Compared to healthy dogs, the levels of alkaline phosphatase, alanine transaminase, and aspartate aminotransferase are much higher in diabetic dogs. These imply that the liver is involved in diabetes mellitus. Alkaline phosphatase and

alanine aminotransferase are frequently elevated in diabetic dogs (Jena *et al*., 2019).

3. Serum Glutamic Oxaloacetic Transaminase (SGOT) (AST) (IU/L). Serum glutamic oxaloacetic transaminase (SGOT) (IU/L) mean values on day 0, 7, and 21 in groups I and II were 36.53±4.38, 43.62±5.04, and 48.18±6.12, and 54.87±2.67, 55.81±3.67, and 62.63±2.20, respectively. The effects of various treatments and their interactions on the levels of SGOT were studied. The group differences on day 0 were incredibly significant (p=0.00). There were no significant variations between day 0, 7, and 21 when the observation was analysed by number of days. The observation is consistent with Behrend *et al*. (2018) study, which found that diabetic dogs frequently had elevated levels of alkaline phosphatase and alanine amino transferase.

4. Alkaline Phosphatase (IU/L). The effects of various therapies and their interactions on serum alkaline phosphatase levels (IU/L) were investigated, and the mean serum alkaline phosphatase (IU/L) values on day 0, 7, and 21 were, respectively, 34.71±2.47, 34.32±2.56, and 35.87±2.30 and 34.28±0.68, 35.14±1.43, and 38.06±2.52 in both group I and II respectively. There was no statistically significant difference between the groups when compared (p>0.05). Since neither group's alkaline phosphatase levels were lowered. In contrast to our research, Kapoor (2019) found that the mean alkaline phosphatase activity was 86.7 ±4.5 IU/L. In a study on canine diabetes mellitus, Jena *et al*. (2019) discovered an alkaline phosphatase level of 514.88±21.36 IU.

5. Blood Urea Nitrogen (BUN) (mg/dl). Blood urea nitrogen (mg/dl) mean values on day 0, 7, and 21 in groups I and II were 17.83±1.32, 18.89±1.16, 18.42±1.23 and 22.52±1.42, 22.71±0.92, 22.78±1.26 respectively. The effects of various treatments and their interactions on serum blood urea nitrogen (mg/dl) levels were studied. Between the groups, the BUN level was extremely significant (p <0.01). After therapy, the BUN level dropped, and group I fared better than group II. There was no statistically significant difference between the days when compared on a daily basis. The study found that serum creatinine and BUN levels in diabetic dogs are considerably different from those in healthy dogs. Azotemia, elevated serum creatinine, and BUN are signs of renal failure in diabetic dogs (Huang, 2012; Jena *et al*., 2019). In a study by Kapoor (2019) on diabetic dogs, the blood urea nitrogen concentration was determined to be 25.3±2.64 mg/dl.

6. Serum creatinine (mg/dl). Serum creatinine levels (measured in mg/dl) were examined to determine the effects of various treatments and how they interacted with one another. The mean serum creatinine levels (measured in mg/dl) on day 0, 7 and 21 were, respectively, 0.77±0.14, 0.80±0.16, 0.74±0.04 and 0.77±0.04, 1.03±0.14, 1.04±0.06 in both group I and II respectively. When the groups were compared, no significant difference between the groups was found (p>0.05). According to Jena *et al*. (2019) study, serum creatinine and BUN levels are considerably higher in diabetic dogs compared to healthy dogs. Azolemia, a rise in serum creatinine, and a rise in BUN levels are signs of renal failure in diabetic dogs. She located the amount of creatinine was 1.80± 0.03 mg/dl. Haematological markers changed, despite haemoglobin levels being non-significantly different across groups (p=0.271). Between the groups, neutrophil levels were considerably lower (p<0.05). It implies that there was little change in the value of neutrophils. The difference in total leucocyte count (TLC) between the groups was significant (p<0.05). Between the groups, packed cell volume (PCV) was not significantly different. Biochemical indicators changed, and blood glucose levels between groups were extremely significant (p<0.01), causing changes. Biochemical indicators changed, and blood glucose levels between groups were extremely significant (p<0.01), causing changes. Between the groups, SGPT was significantly significant (p<0.01). Day 0's SGOT showed a highly significant difference (p=0.00). Between the groups, there was no difference in alkaline phosphatase (p>0.05). Although there was no significant difference in the groups' BUN levels (p>0.05), there was in the groups' creatinine levels (p<0.01).

CONCLUSIONS

In combination with insulin and *Momordica charantia* capsules at a dosing rate of 200 mg/kg/day effectively reduced blood fasting glucose concentration. *Momordica charantia* capsules demonstrated an insulin-mimetic action and could enhance glycaemia management in naturally occurring diabetes when combined with insulin therapy and a low-fat, high-fiber diet.

FUTURE SCOPE

In future there is a possibility of study of oxidative stress parameters in diabetes mellitus affected canines and also scope of study of effects of other indigenous herbal plants like *Gymnema sylvestre, Allium sativum, Ficus bengalensis* etc.

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Conflict of Interest. None.

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