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A Study to Evaluate the Effectiveness of Cinnamon on Blood Glucose among Drivers with Type II Diabetes Mellitus at Dhanalakshmi Srinivasan Group of Institutions, Perambalur

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Abstract: ***Background: Diabetes Mellitus contributes to a considerable increase in morbidity and mortality rates which can be reduced by early diagnosis and treatment. Aim: To evaluate the effectiveness of cinnamon on reduction of blood glucose level among drivers with Type II Diabetes Mellitus. Design: A Quasi experimental pretest posttest control group design. Setting: Dhanalakshmi Srinivasan Group of Institutions. Participants: 40 drivers with Type II diabetes Mellitus. Selection criteria: Drivers diagnosed with Type II Diabetes Mellitus and Fasting Blood Glucose level more than 140mg/dl. Methods: 40 drivers with Type II Diabetes Mellitus 20 in experimental and 20 in control group were selected. Blood glucose level was assessed using glucometer before and after consumption of cinnamon powder. Results: The results had shown that in pretest majority 7(35%) of the drivers were in grade I level, 2(10%) were in grade II, 3(15%) were in grade III level and 8(40%) of drivers were in grade IV level. Whereas in post test majority 13(65%) were in grade I, 3(15%) were in Grade II, 2(10%) were in Grade III, and 2(10%) were in Grade IV level in experimental group. Whereas in control group, pretest 5(25%) of drivers were in grade I level, 6(30%) were in grade II level, 4(20%) were in grade III and 5(25%) were in grade IV level. Whereas in post test 2(10%) were in grade I, 9(45%) were in Grade II, 2(15%) were in Grade III, and majority 7(30%) were in Grade IV level. The mean post test score on level of blood glucose level in the experimental group 150.4 (SD 30.28) was significantly lower than the mean post test score on level of blood glucose in control group 195.85 (SD 36.26). Unpaired't' value 4.3232 (table value = 2.09) which is significant at P< 0.05 level. It shows that there is a significant difference found in the posttest scores on the level of blood glucose among experimental group drivers with type II Diabetes Mellitus. Conclusion: Cinnamon was effective on reduction of blood glucose level among drivers with type II Diabetes Mellitus. Clinical applications: Cinnamon is one of the oldest and most widely used natural supplements for reducing blood glucose. Cinnamon acts as insulin sensitizer which basically means it helps insulin to do its job of controlling blood glucose.***

1. Introduction

Diabetes mellitus is a disease known during period of 1500 BC and it was described by Ebers Papyrus of ancient Egypt. The term diabetes mellitus is derived from the Greek word diabetes meaning to go through or a siphon and the word mellitus is derived from the Latin word mel meaning honey describing the sweet odor of urine. **(Prasad G, Babu. G, 2000)**

Diabetes mellitus is a group of diseases characterized by high blood glucose concentrations resulting from defects in insulin secretion, insulin action or both. Diabetes mellitus is a disease of metabolic dysfunction, most notably abnormal glucose metabolism, accompanied by characterized long term complications. It contributes to a considerable increase in morbidity and mortality rates which can be reduced by early diagnosis and treatment. **(David M. Nathan, 2006)**

Type I diabetes accounts for 5% to 10% of all diagnosed cases of diabetes. Although it occurs at any age, even in the eighth and ninth decades of life, most cases are diagnosed in people younger than 30 years of age with a peak incidence at around ages 10 to 12 years in girls and ages 12 to 14 years in boys. Type II diabetes may account for 90% to 95% of all diagnosed cases of diabetes and is a progressive disease that, in many cases, is present long before it is diagnosed. **(Marrion J.Franz, 2008)**

People with diabetes experience significant illness and even death from a variety of long term effects of elevated blood glucose levels. Diabetics are more than ten times as likely to have cardiovascular diseases and at significantly greater risk for peripheral vascular ophthalmic and kidney diseases than those without diabetes. Diabetes is also related to an increased risk of stroke, heart failure, blindness, limb amputation, birth complications and sexual dysfunction. **(Elliot Jacob, 2012)**

2. Need for the Study

Diabetes mellitus is likely to become one of the most prevalent and economically important diseases of the 21st century largely owing to an increasing incidence of type II diabetes mellitus in the developed nations and many of the developing nations. Diabetes mellitus is set to become one of the world's biggest health problems owing to the projected increase in new cases. **(Ian N.Scobic, 2006)**

According to World health organization survey report, 25.8 million people or 8.3% of the people in United States have diabetes, in which 18.8 million was diagnosed and 7.0 million people were undiagnosed. 11.3% of all people in the age group 20 years or older have diabetes, 26.9% of all people in age group 65 years or older have diabetes, 11.8% of all men aged 20 years or older have diabetes and 10.8% of all women aged 20 years or older have diabetes. **(National Diabetes Face Sheet, 2011)**

Diabetes remains the 7th leading cause of death in United States in 2010, with 69,071 death certificates listing it as the underlying cause of death and total of 234,051 death certificates listing diabetes as an underlying or contributing cause of death. **(American Diabetes Association, 2014)**

Diabetes mellitus is a major problem that significantly affects the health of Australians. In 2012-2013 about 4.2% of people had diabetes. About 2,367 people were newly diagnosed with diabetes in 2011 which equated to 11 cases per 100,000 people. **(Australian Institute of Health and Welfare, 2014)**

Hypotheses

H_1: There is a significant difference in pre and post test level of blood glucose among drivers with Type II diabetes Mellitus in experimental and control group.

H_2: There is a significant effectiveness of cinnamon on blood glucose among drivers with Type II Diabetes Mellitus in experimental group.

H3: There is a significant association between the post test level of blood glucose among drivers with Type II Diabetes Mellitus with their selected demographic variables in experimental group and control group..

3. Review of Literature

3.1 Studies related to Diabetes Mellitus

Canders. et al., (2014) was conducted a study on the prevalence of type II diabetes mellitus and impaired glucose tolerance (IGT) among 866 Indians, living in the Chatsworth area of Durban. The study group was selected by cluster sampling and the participants underwent a modified glucose tolerance test (GTT). The result was shown that the overall prevalence of diabetes mellitus was 11% and of IGT 5.8%. Out of 368 men, 7.6% were found to have diabetes mellitus and 7.1% IGT; the prevalence of diabetes mellitus was much greater among women (13.5%), while there was less IGT (4.8%). The study was concluded that Obesity is commonly associated with both diabetes mellitus and IGT, particularly among women.

Díaz-Rodríguez MI. (2014) was conducted a cross sectional study on the prevalence of diabetes amongst the family members of known diabetes. Totally, 513 families with one family member from each family responded and family member with diabetic mother, diabetic father, and or parents being diabetic were considered separately. The result of the study shown that the prevalence of diabetes among males was 7.69, females were 10.38% and the prevalence was 18.24%, in the age group 40-60 years, which was quite high compared with other age groups. The study concluded that males are more prone to develop diabetes.

3.2 The studies related to Cinnamon

Wainstein J et.al., (2011) was conducted a study on dietary cinnamon supplementation and changes in systolic blood pressure in subjects with type II diabetes. In this study adult subjects 30 years of age or older with type II diabetes were randomized to treatment with 1,200 mg/day cinnamon or matched placebo. Blood pressure, hemoglobin A1c, lipid profile, physical examination, and blood and urine chemistry were measured at baseline and at the 12-week follow-up end-of-treatment visit. In total, 59 subjects (40.7% female; mean age, 63.05±10.85 years) were recruited. Systolic blood pressure (SBP) declined from baseline values by 3.4±11.4 mm Hg in the cinnamon group and increased by 1.9±10.2 mm Hg in the placebo group (P=.06). Results of the present study in humans suggest that the by-treatment difference in change-from-baseline SBP was a function of regression to the mean rather than a treatment-associated change.

Akilen R et.al., (2010) was conducted a study on glycolated haemoglobin and blood pressure lowering effect of cinnamon in type II diabetes patients. The aims was to determine the blood glucose lowering effect of cinnamon on HbA1c, blood pressure and lipid profiles in people with type 2 diabetes. 58 type 2 diabetic patients (25 males and 33 females), aged 54.9 ± 9.8, treated only with hypoglycemic agents and with an HbA1c more than 7% were randomly assigned to receive either 2g of cinnamon or placebo daily for 12 weeks. After intervention, the mean HbA1c was significantly decreased (P<0.005) in the cinnamon group (8.22% to 7.86%) compared with placebo group (8.55% to 8.68%). A significant reduction in fasting plasma glucose (FPG), waist circumference and BMI was observed at week 12 compared to baseline in the cinnamon group. The study concluded that Cinnamon supplementation could be considered as an additional dietary supplement option to regulate blood glucose and blood pressure levels along with conventional medications to treat type 2 diabetes mellitus.

3.3 Studies related to effectiveness of Cinnamon on level of blood glucose in type II Diabetes Mellitus

Shenq H, et.al., (2012) was conducted a study on improvement of fasting glucose level with type II Diabetes mellitus after consumption of cinnamon extract. The study hypothesized that cinnamon should be effective in improving blood glucose control in Chinese patients with type 2 diabetes. A total of 66 patients with type 2 diabetes were recruited and randomly divided into 3 groups: placebo and low-dose and high-dose supplementation with cinnamon extract at 120 and 360 mg/d, respectively. Fasting blood glucose levels were significantly reduced in patients in the low- and high-dose groups, whereas they were not changed in the placebo group. The study concluded that indicates that cinnamon supplementation is able to significantly improve blood glucose control in Chinese patients with type 2 diabetes.

Vafa M. et.al., (2012) was conducted a study on effects of cinnamon consumption on glycemic status in type II diabetes patients. The objective was to evaluate the effects of the daily intake of three grams cinnamon over eight weeks on glycemic status in type II diabetic patients. 44 patients with type II diabetes were randomly assigned to take either a 3 g/day cinnamon supplement (n=22) or a placebo (n=22) for eight weeks. Weight, height, body fat mass and systolic and diastolic blood pressure were measured at baseline and after intervention. The fasting blood glucose, insulin, HbA1c, total cholesterol, LDL C, HDL C, Apo lipoprotein A I and B were measured at

baseline and endpoint. The result showed that in the treatment group, the levels of fasting blood glucose decreased significantly compared to baseline, but not in placebo group. The study concluded that suggest that cinnamon may have a moderate effect in improving glycemic status indicators in diabetes mellitus patients.

4. Methodology

4.1 Research Design

The research design chosen for the study is a quasi experimental pre test and post test control group design. The design can be represented as,

Group	Pretest	Intervention	Post Test
Experimental group	O_1	X	O_2
Control group	O_1	-	O_2

Keys:
X Administration of 3 gm of cinnamon powder twice daily for 30 days after food
O_1 Pre test assessment of blood glucose level with glucometer
O_2 Post test assessment of blood glucose level with glucometer.

4.2 Variables

Independent variable
In this study, Cinnamon was the independent variable.

Dependent variables
In this study, Blood glucose level was dependent variable.

Extraneous variables
Age, Occupation, Religion, family history of diabetes, smoking habit, Habit of alcoholism, Dietary Habit, and Practising Regular exercise.

Setting
The investigator has selected the drivers who are diagnosed as Type II Diabetes Mellitus at Dhanalakshmi Srinivasan Group of Institutions, Perambalur to conduct this study. It is located in the high ways of Perambalur to Thuraiyur main road with a distance of 2 km from perambalur town. The total drivers strength of the Institution is more than 300, in this study the investigator selected 20 drivers for experimental group and 20 drivers for control group.

Population
The population for this study is drivers with type II diabetes Mellitus at Dhanalakshmi Srinivasan Group of Institutions, Perambalur.

Sample
The sample for this study comprises of drivers who are diagnosed Type II diabetes Mellitus at Dhanalakshmi Srinivasan Group of Institution, Perambalur during the study period and those who meet the sampling criteria.

Sampling Technique
Non Probability Purposive Sampling Technique was used in this study.

Sample Size
The investigator has selected 40 drivers with Type II diabetes among them, 20 drivers with Type II diabetes Mellitus was assigned to experimental group and other 20 patients with Type II diabetes Mellitus was assigned to control group.

Development of the Tool
The tool for the data collection was conducted by doing extensive literature review. The primary and secondary sources of literature were reviewed to develop an appropriate tool. Content validity was obtained from experts in the field of general medicine and nursing. Their opinions and valuable suggestions was incorporated in the tool and it was finalized.

4.3 Description of the Tool

Section- A
A structured interview schedule was used to collect information regarding demographic data such as Age, occupation, Religion, family history of Diabetes, Smoking habit, Habit of alcoholism, Dietary Habit and Practising Regular exercise.

Section B

Scoring Key:
Blood glucose level was measured by bio physiological measures (glucometer)

4.4 Table showing the scoring key

Grade	Blood glucose Level
I	140-160
II	161-180
III	181-200
IV	>200

5. Results: Section A: Distribution of the Drivers with Type II Diabetes Mellitus with Their Selected Demographic Variables

Table 4.1: Frequency and percentage distribution of the demographic variables of the drivers with Type II Diabetes Mellitus

Sl.No	Demographic variable		Experimental group (N_1=20)		Control group (N_2=20)	
			Frequency N_1	Percentage %	Frequency N_2	Percentage %
1.	Age (years)	a) 35-45	1	5	7	35
		b) 46-55	9	45	7	35
		c) 56-65	8	40	5	25
		d) above 66 years	2	10	1	5
2.	Occupation	a)Sedentary worker	0	0	0	0

		b)Moderate worker	14	70	20	100
		c) Heavy worker	6	30	0	0
3.	Religion	a) Hindu	17	85	11	55
		b) Muslim	1	5	4	20
		c) Christian	2	10	5	25
4.	Family history of Type II diabetes Mellitus	a) Yes	7	35	6	30
		b) No	13	65	14	70
5.	Smoking Habit	a) Yes	9	45	11	55
		b) No	11	55	9	45
6.	Habit of Alcoholism	a) Yes	12	60	8	40
		b) No	8	40	12	60
7.	Dietary habits	a)Non vegetarian	19	95	16	80
		b) Vegetarian	1	5	4	20
6	Duration of illness	a)>1 year	5	25	5	25
		b)1-3 years	5	25	9	45
		c)3-6years	6	30	3	15
		d)<6 years	4	20	3	15
9.	Practicing regular exercise	a)Yes	8	40	2	10
		b)No	12	60	18	90
10.	Body mass index	a)18.5- 24.9 (Normal)	17	85	16	80
		b)25-29.9 (Over weight)	3	15	4	20
		c)30-34.9 (Obesity grade1)	0	0	0	0
		d)35-39.9 (Obesity grade 2)	0	0	0	0
		e)40 Above (Obesity grade 3)	0	0	0	0

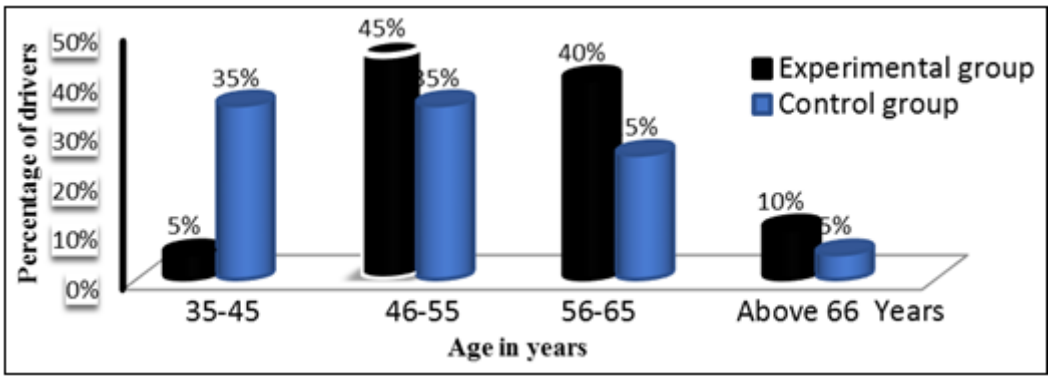

Figure 4.1: Cluster cylinder diagram showing percentage distribution of age of individuals with Type II Diabetes Mellitus

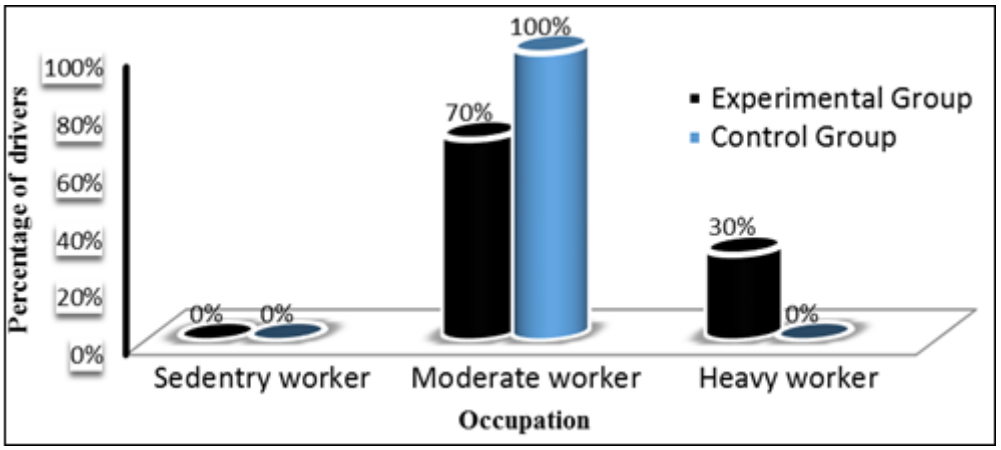

Figure 4.2: Cluster cylinder diagram showing Percentage distribution of occupation of individuals with Type II Diabetes Mellitus

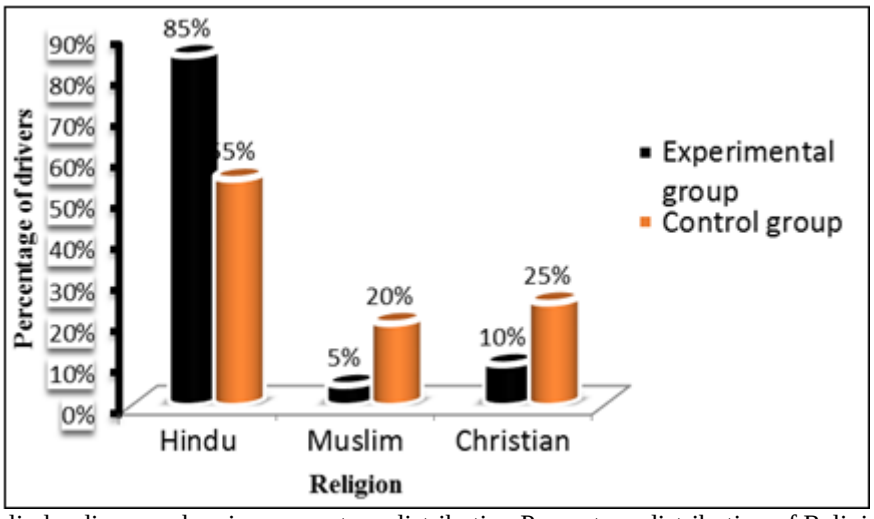

Figure 4.3: Cluster cylinder diagram showing percentage distribution Percentage distribution of Religion of individuals with Type II Diabetes Mellitus

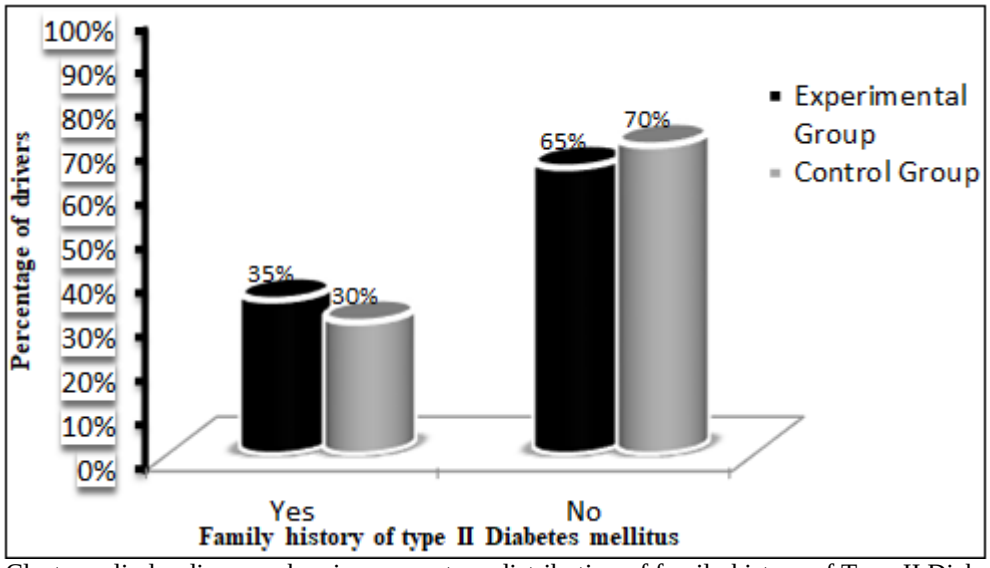

Figure 4.4: Cluster cylinder diagram showing percentage distribution of family history of Type II Diabetes Mellitus

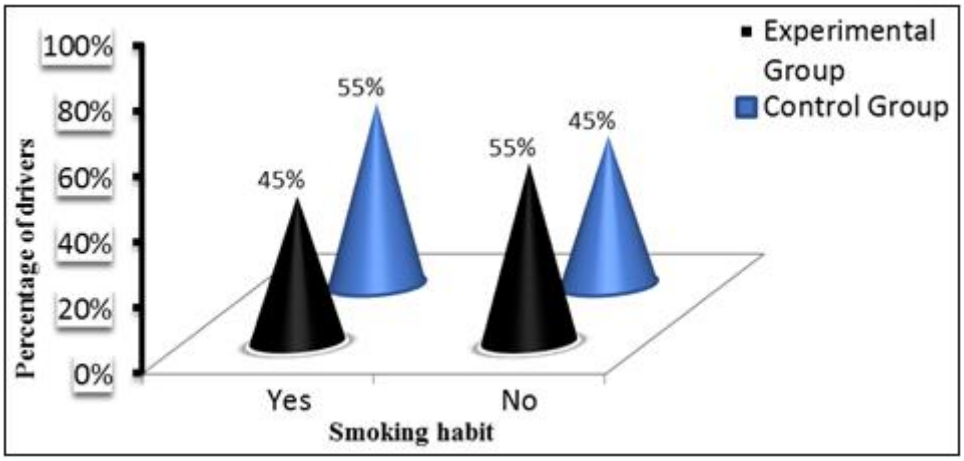

Figure 4.5: 3 D Cone diagram showing percentage distribution of smoking habit of individuals with Type II Diabetes Mellitus

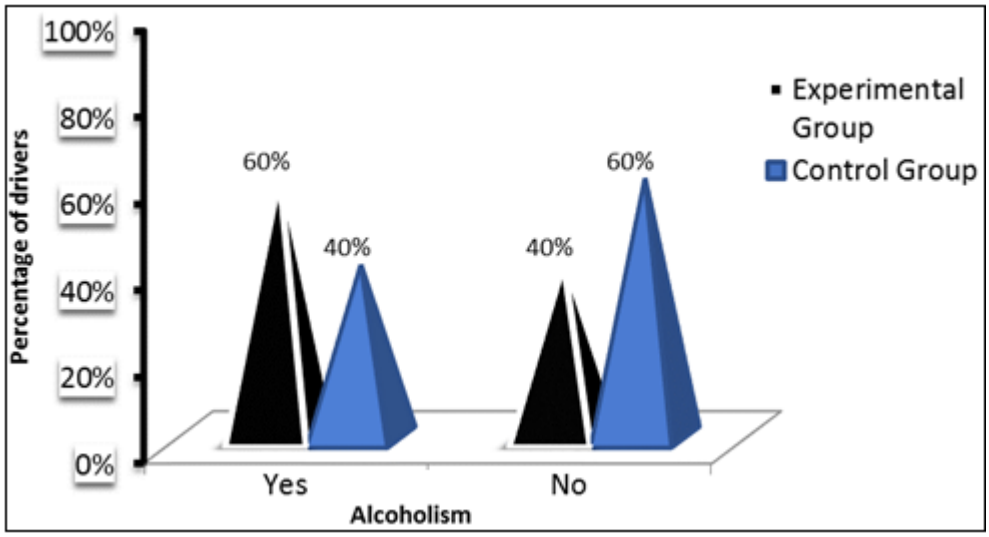

Figure 4.6: 3 D Pyramid diagram showing percentage distribution of alcoholism of individuals with Type II Diabetes Mellitus

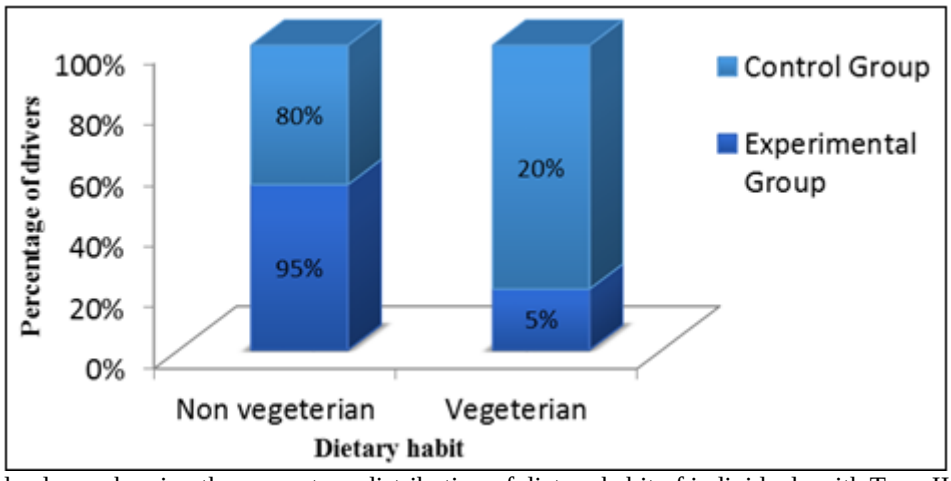

Figure 4.7: Staked column showing the percentage distribution of dietary habit of individuals with Type II Diabetes Mellitus

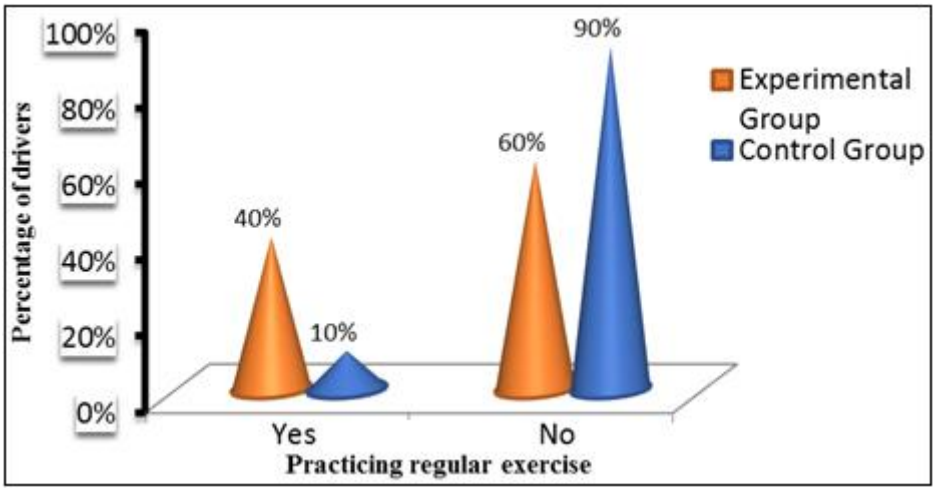

Figure 4.8: Cluster cone diagram showing percentage distribution of practicing regular exercise of individuals with Type II Diabetes Mellitus

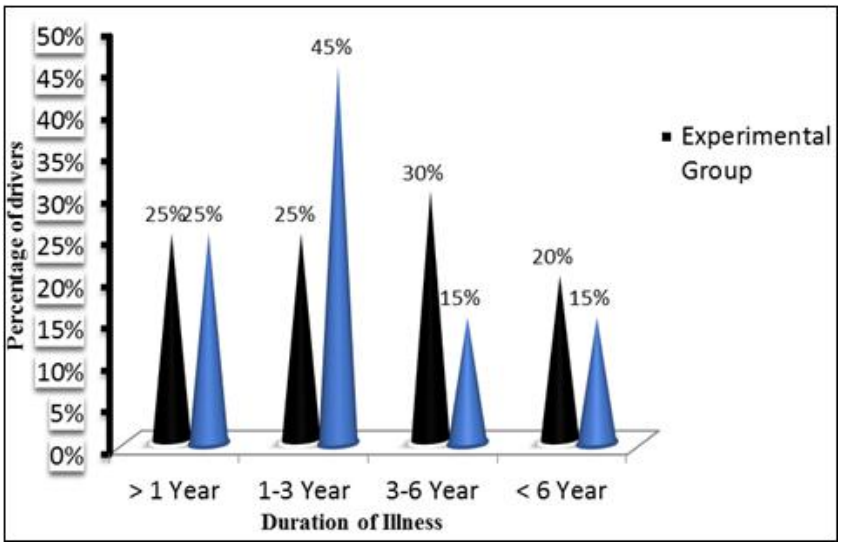

Figure 4.9: Cluster cone diagram showing percentage distribution of duration of illness of individuals with Type II Diabetes Mellitus

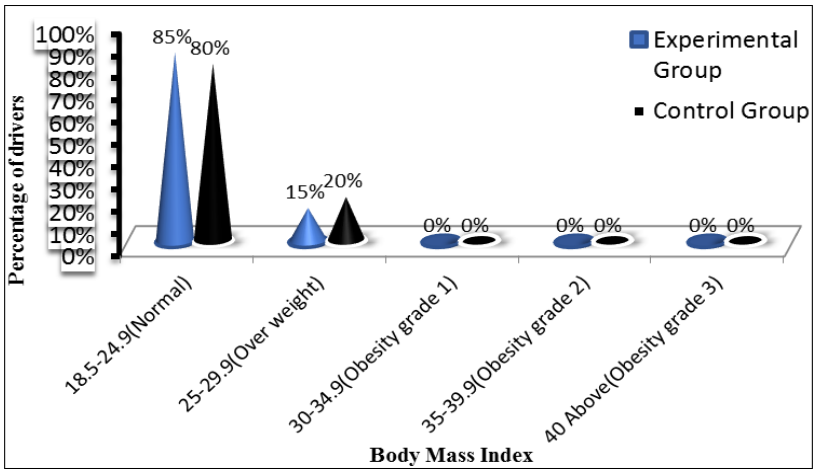

Figure 4.10: Cluster cone diagram showing percentage distribution of Body mass index of individuals with Type II Diabetes Mellitus

Section B: Assess and Compare the Pre and Post Level of Blood Glucose Among Drivers with Type II Diabetes Mellitus in Experimental and Control Group

Table 4.2: Frequency and percentage distribution of pretest and post test scores on the level of blood glucose among experimental group, **N_1=20**

Level Of Blood Glucose	Pretest		Post Test	
	Frequency (N_1)	Percentage %	Frequency (N_1)	Percentage %
Grade I (140-160mg/dl)	7	35%	13	65%
Grade II (161-180mg/dl)	2	10%	3	15%
Grade III (181-200mg/dl)	3	15%	2	10%
Grade IV (>200)	8	40%	2	10%

Table 4.2 shows frequency and percentage distribution of pre test and post test scores of experimental group depicts that, in the pretest majority 8(40%) of drivers were in the grade of IV level, 3(15%) were in grade III level, 2(10%) were in grade II and 7(35%) were in grade I level. Whereas in post test majority 13(65%) were in grade I, 3(15%) were in Grade II, were in Grade III, and 2(10%) were in Grade IV level.

Table 4.3: Frequency and percentage distribution of pretest and post test scores on the level of blood glucose among control group, N_2 = 20

Level Of Blood Glucose	Pretest		Post Test	
	Frequency (N_2)	Percentage %	Frequency (N_2)	Percentage %
Grade I (140-160mg/dl)	5	25%	2	10%
Grade II (161-180mg/dl)	6	30%	9	45%
Grade III (181-200mg/dl)	4	20%	2	15%
Grade IV (>200)	5	25%	7	30%

Table 4.3 shows frequency and percentage distribution of pre test and post test scores of control group depicts that, in the pretest 5(25%) of drivers were the grade of I level, 6(30%) were in grade II level, 4(20%) were in grade III and 5(25%) were in grade IV level. Whereas in post test 2(10%) were in grade I, 9(45%) were in Grade II, 2(15%) were in Grade III, and 7(30%) were in Grade IV level.

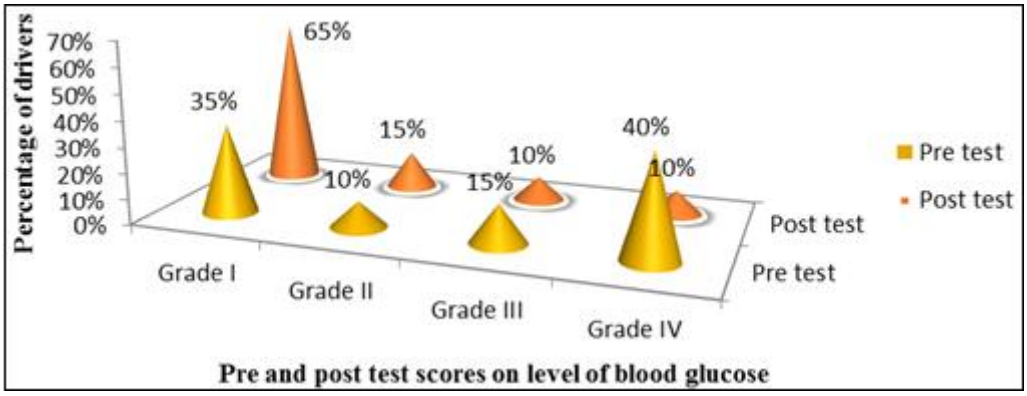

Figure 4.11: 3D cone diagram showing frequency and percentage distribution of pretest and post test scores on the level of blood glucose among experimental group

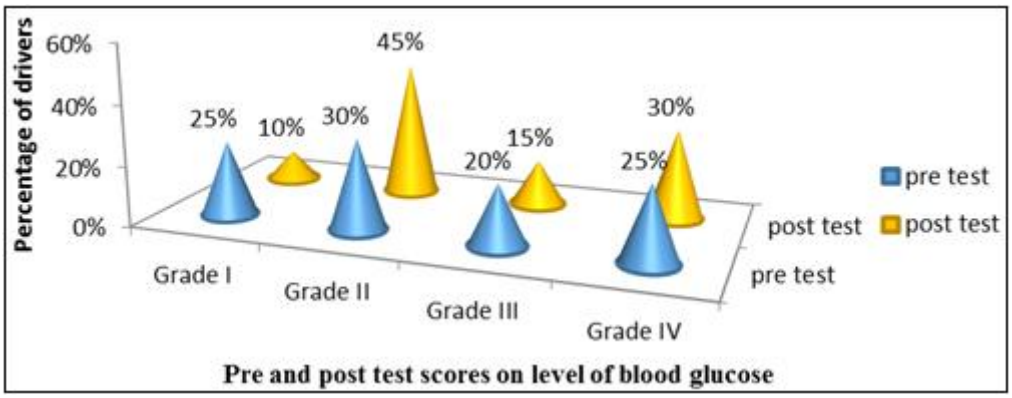

Figure 4.12: 3D Cone diagram showing frequency and percentage distribution of pretest and post test scores on the level of blood glucose among control group

6. Discussion

6.1 The first and second objective of the study was to assess and compare the pre and post test level of blood glucose among drivers with Type II Diabetes Mellitus in experimental group and control group.

Table 4.2 shows that in experimental group, in the pretest majority 7(35%) of the drivers were in grade I level, 2(10%) were in grade II, 3(15%) were in grade III level and 8(40%) of drivers were in grade IV level. Whereas in post test majority 13(65%) were in grade I, 3(15%) were in Grade II, were in Grade III, and 2(10%) were in Grade IV level.

Table 4.3 shows that in control group, in the pretest 5(25%) of drivers were in grade I level, 6(30%) were in grade II level, 4(20%) were in grade III and 5(25%) were in grade IV level. Whereas in post test 2(10%) were in grade I, 9(45%) were in Grade II, 2(15%) were in Grade III, and majority 7(30%) were in Grade IV level.

Hypothesis$_1$: There is a significant difference in pre and post test level of blood glucose among drivers with Type II diabetes Mellitus in experimental and control group. So the Hypothesis H_1 is accepted.

6.2 The third objective of the study was to evaluate the effectiveness of cinnamon on reduction of blood glucose level among drivers with Type II Diabetes Mellitus.

Among both groups, the mean post test score on level of blood glucose level in the experimental group 150.4 (SD 30.28) was significantly lower than the mean post test score on level of blood glucose in control group 195.85 (SD 36.26). Unpaired t value 4.3232 (table value = 2.09) which is significant at P< 0.05 level. The finding revealed that there is a significant difference in the level of blood glucose between experimental group and control group which showed that cinnamon is effective among drivers with type II Diabetes mellitus.

It shows that there is a significant difference found in the post test scores on the level of blood glucose among experimental group drivers with type II Diabetes Mellitus and revealed that, cinnamon was effective on reduction of blood glucose level among drivers with type II Diabetes Mellitus.

Hypothesis$_2$: There is a significant effectiveness of cinnamon on blood glucose among drivers with Type II Diabetes Mellitus in experimental group. So the Hypothesis H_2 is accepted.

6.3 The fourth objective of the study was to find out association between the post test level of blood glucose among drivers with Type II Diabetes Mellitus with their selected demographic variables in experimental group and control group

Table 4.7 showed that, level of blood glucose has not been influenced by age, occupation, family history of type II Diabetes Mellitus, Smoking habit, habit of alcoholism, dietary habit, duration of illness, practicing regular exercise but has been influenced by religion and body mass index in

experimental group. Hence, the findings revealed that there was no significant association between drivers with type II Diabetes mellitus in experimental group with their demographic variables except the variables like religion and body mass index.

Table 4.8 infers that, level of blood glucose has not been influenced by age, occupation, religion, family history of type II Diabetes Mellitus, habit of alcoholism, dietary habit, and body mass index but has been influenced by smoking habit, duration of illness and practicing regular exercise in control group. Hence, the findings revealed that there was no significant association between drivers with type II Diabetes mellitus in control group with their demographic variables except the variables like smoking habit, duration of illness and practicing regular exercise.

Hypothesis$_3$: There is a significant association between the post test level of blood glucose among drivers with Type II Diabetes Mellitus with their selected demographic variables in experimental group and control group. So the Hypothesis H_3 is accepted.

Experimental group drivers

- Most of the drivers 45% were in the age group of 46-55 years
- Most of the drivers 70% are moderate workers.
- Majority 85% of them are Hindus.
- Most of the drivers 65% had the family history of Type II Diabetes Mellitus.
- Majority 55% does not have the habit of smoking.
- Majority 60% had the habit of alcoholism.
- Majority 95% of them are non vegetarians.
- Most of the drivers 30% had the illness from 3-6 years.
- Majority 60% does not have the habit of practicing regular exercise.
- Majority 85% had the body mass index 18.5-24.9(Normal)

Control group drivers

- Most of the drivers 35% were in the age group of 35-45 years
- Majority 100% are moderate workers.
- Majority 55% of them are Hindus.
- Most of the drivers 70% do not have the family history of Type II Diabetes Mellitus.
- Majority 55% had the habit of smoking.
- Majority 60% does not have the habit of alcoholism.
- Majority 80% of them are non vegetarians.
- Most of the drivers 45% had the illness from 1-3 years.
- Majority 90% does not have the habit of practicing regular exercise.
- Majority 80% had the body mass index 18.5-24.9(Normal)

2. Findings related to comparison of pre and post test score on the level of blood glucose among drivers with Type II Diabetes Mellitus in experimental and control groups.

- In experimental group, in post test majority 13(65%) were in grade I, 3(15%) were in Grade II, were in Grade III, and 2(10%) were in Grade IV level. The average pre test scores on the level of blood glucose of drivers with Type II Diabetes Mellitus is 195.15 (SD 62.72) and the post test mean score is 150.4 (SD 30.28). Thus the difference in the level of blood glucose was confirmed by the paired‘t’ value (9.61) which was found significant at the level of $P<0.05$
- In control group, in post test 2(10%) were in grade I, 9(45%) were in Grade II, 2(15%) were in Grade III, and 7(30%) were in Grade IV level. The average pre test scores on level of blood glucose in control group is 184.85 (SD 30.85) and the post test mean score is 195.85 (SD 36.26). Thus the difference in the level of blood glucose was confirmed by the paired ‘t’ value (2.656) which was found significant at the level of $P<0.05$

3. Findings related to the effectiveness of cinnamon on reduction of blood glucose level among drivers with Type II Diabetes mellitus in experimental group.

- Unpaired‘t’test was calculated to analyze the effectiveness between experimental and control group post test scores on the level of blood glucose among both the groups. The t’value is 4.3232 when compared to the table value (2.09) it is high. It shows that there is a significant difference found in the post test scores on the level of blood glucose among experimental group drivers and revealed that, cinnamon consumption was effective on reduction of blood glucose level in experimental group.

4. Findings related to the association of the post test scores on the level of blood glucose among drivers with Type II Diabetes Mellitus in experimental and control group with their selected demographic variables.

- In experimental group, the analysis infers that level of blood glucose has not been influenced by age, occupation, family history of type II Diabetes Mellitus, Smoking habit, habit of alcoholism, dietary habit, duration of illness, practicing regular exercise but has been influenced by religion and body mass index. Hence, the findings revealed that there was no significant association between drivers with type II Diabetes mellitus in experimental group with their demographic variables except the variables like religion and body mass index.
- In control group, the analysis infers that level of blood glucose has not been influenced by age, occupation, religion, family history of type II Diabetes Mellitus, habit of alcoholism, dietary habit, and body mass index but has been influenced by smoking habit, duration of illness and practicing regular exercise. Hence, the findings revealed that there was no significant association between drivers with type II Diabetes mellitus in control group with their demographic variables except the variables like smoking habit, duration of illness and practicing regular exercise.

7. Conclusion

From the findings of the study it can be concluded that,

- Most of the drivers in experimental group were in the age group of 46-55 years, are moderate workers, are hindus, does not have family history of type II Diabetes Mellitus, does not have smoking habit, had habit of alcoholism, are non vegetarians, had illness from 3-6 years, does not have habit of practicing regular exercise and normal body mass index.
- Most of the drivers in control group were in the age group of 46-55 years, are moderate workers, are hindus, does not have family history of type II Diabetes Mellitus, had

smoking habit, does not have the habit of alcoholism, are non vegetarians, had illness from 1-3 years, does not have habit of practicing regular exercise and normal body mass index.
- The cinnamon consumption was effective on the level of blood glucose among drivers in experimental group.
- There was significant association between the post test scores of level of blood glucose among drivers with their selected demographic variables in both groups.

8. Implications

The findings of the present study supports that, cinnamon is very safe, cost effective and almost is not harmful to health. It is provided to be effective in non pharmacological management to reduce the blood glucose level. The findings of the study have several implications in the following fields.

Implications for Nursing Practice
- The findings of the study enlighten the fact that cinnamon therapy can be used to maintain the blood glucose of the clients with type II Diabetes Mellitus.
- The study findings help the nursing personnel include cinnamon as a nursing intervention in the management of type II Diabetes Mellitus clients.
- The nurse should contribute to the evidence based practice through the experience gained from the applications of cinnamon powder while caring clients with type II Diabetes Mellitus.

Implications for Nursing Education
- The effectiveness of cinnamon in reducing blood glucose is to be published in the nursing journals to make awareness among the nursing professionals.
- This study results can be used as an example by the nurse educator in the classroom, when giving instructions regarding the care of clients with type II Diabetes Mellitus.
- Nursing students can educate the diabetic clients to use cinnamon daily in their diet to maintain blood glucose level.
- Nursing students can enhance their knowledge by giving education in the community settings.

Implications for Nursing Administration
- Nurse administrator can create awareness among nurses and enlighten their knowledge about the importance of cinnamon on type II Diabetes Mellitus.
- Nurse administrator can instruct the staff nurses to encourage their diabetic clients to use cinnamon.

Implications for Nursing Research
- Nurse researcher has to conduct the research by comparing the cinnamon with other complementary therapies.
- Nurse researcher has to conduct the study regarding the effectiveness of cinnamon in type I Diabetes Mellitus.
- Nurse researcher can do this study as a comparative study of both in type I and type II diabetic clients.
- Nurse researcher can do this study with large population to generalize the finding.
- Nurse researcher can do this study by comparing cinnamon with various home remedies.

9. Recommendations

a) The study can be conducted by using large population to generalize the findings.
b) A longitudinal study can be conducted to assess the effectiveness of cinnamon in maintaining blood glucose level.
c) This study can be done in multiple settings.
d) The effectiveness of cinnamon can be tested among clients with Diabetes Mellitus who are on insulin administration.
e) A follow up study can be done to find out whether the clients are practicing cinnamon intake regularly.

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