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IMPACT OF STRUCTURED NUTRITION EDUCATION PROGRAMME ON DIABETES MELLITUS PATIENTS

Manjula R., Shanthamma, Shalini H and Hemalatha M.S.
Department of Food Science and Nutrition, Karnataka State Open University, Mysore
*Corresponding author: E-mail: drmshemap@gmail.com;

Abstract

Regularity in diabetes self-management practices among individuals with Type 2 Diabetes Mellitus (T2DM) is crucial for achieving effective glycemic control. Both knowledge and attitude have been shown to have linear relationships with diabetes self-management, positively influencing glycemic control. This study aimed to develop and examine a structural knowledge intervention that describes the interrelationship between diabetes knowledge, attitude, self-management practices, and glycemic control, as indicated by blood sugar levels. A cross-sectional study was conducted in Victoria Hospital, Bengaluru, Karnataka, India, including 150 participants with T2DM, selected through simple random sampling based on specific inclusion criteria. Results indicated that diabetes knowledge significantly predicted attitude, which in turn significantly predicted both diabetes self-management and blood sugar levels. The positive results were observed in anthropometric data with decrease in weight, dietary intervention in helped in decrease of intake of carbohydrates, protein and fat in contrast increased with Iron, Calcium and Vitamin C. Most importantly the knowledge score had increased after intervention which helped in controllong the biochemical markers. The study concludes that attitude and self-management practices have a direct impact on blood sugar levels in individuals with T2DM. Developing a self-management intervention model that integrates knowledge, positive attitude, and diabetes self-management practices could lead to improved and sustainable glycemic control in T2DM patients, particularly at the community level.

Keywords: Structured intervention, Knowledge score, Fasting blood sugar and Post prandial blood sugar

1. Introduction

Diabetes Mellitus Type II care is accomplished by patients outside of a healthcare setting in addition to medicine and nutritional food (Funnell & Anderson, 2003). Therefore, patient empowerment should be the main emphasis of initiatives meant to enhance diabetes care (Funnell & Anderson, 2004). The most important, yet complex and challenging task, is promoting and supporting adherence to a healthy diet (Forouhi et al, 2018). People with type 2 diabetes mellitus (T2DM) have a poor understanding of the role of nutrition in diabetes management (El-Khawaga & Abdel-Wahab, 2015). Since knowledge acquisition alone cannot lead to behavioral change, even those who understand it struggle to adapt their eating habits to new recommendations (Curfman, 2009). Accordingly the improvements in other facets of self-care, the involvement of people with T2DM in healthy eating is very low. Such a lack of awareness, and the resulting unhealthy eating behavior, leads to poor clinical prognosis and serious health implications.

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Patient-centered nutrition education is a viable strategy for bridging the gap between acquiring nutrition information and adjusting eating behaviors. (Aschner et al, 2014). The teaching is tailored to the recipients' needs, values, and preferences, as well as their food literacy and numeracy (Bowen et al, 2016). Consequently, it promotes knowledge, perception, and healthy eating behaviors. In fact, data shows that patient-centered education increases patients' satisfaction with their nutrition care and aids them in implementing changes in their eating habits (Evert et al, 2014. However, implementation is challenging, and there remains a significant gap between knowledge and practice.

Diabetes nutrition education services, especially patient-centered approaches, are scarce in India (Ranjani, 2014). According to the Indian Council of Medical Research, individuals with diabetes should receive nutritional counseling on healthy dietary patterns at diagnosis and as needed throughout their lives (Geldsetzer et al, 2018) . However, data from most diabetes clinics reveal that consultation periods are relatively short, providing little or no opportunity for patient education.

The collective and active involvement of healthcare professionals (HCPs) and stakeholders in diabetes care is essential for establishing a focused, multidisciplinary approach. Some government and private organizations have attempted to implement effective educational programs to increase awareness about proper diabetes management (Pradeepa et al, 2002). Despite these promising approaches, increased attention and effort are crucial for developing a healthcare system that provides quality diabetes care. Ensuring accessible, affordable, and high-quality care remains a major challenge. Therefore, healthcare delivery systems must identify more proactive methods to manage patients both in the community and in their homes (Anjana et al, 2015).

The aim of the present study therefore was to assess the Nutritional knowledge and eating habits, to impart Nutritional knowledge and healthy life style and to evaluate effect of nutrition education programme to manage diabetes mellitus

2. Methodology

2.1. Study setting and participants:

The study was conducted in Victoria Hospital, Bengaluru, Karnataka, India. Study participants were persons with Type 2 Diabetes mellitus covering around 150 subjects each 50 subjects for Neuropathy, Arthropathy and Foot Ulcer.

2.2. Sampling criteria

Inclusion criteria: We enrolled people with uncontrolled T2DM who were between the age group of 47-72 years including both male and female. The willingness of clients through letter and also who can read and write Kannada or English language

Exclusion criteria: Patients who have already developed complications of T2DM and who are not co-operative due to unspecified reasons

2.3. Data Collection and Measures

At baseline, patients filled out the questionnaire (demographic characteristics, personal information, complications of the disease), and data were recorded for biochemical indicators, including fasting blood glucose and post prandial blood glucose. Anthropometric data were also collected. Participants' weight was measured in light clothing and without shoes using a portable calibrated electronic weighing scale precision scale. Height was measured with portable

measuring inflexible bars (Seca model 220, Seca, Hamburg, Germany). Waist (at umbilicus) and hip (at widest point) circumferences (WC and HC) were measured according to standard conditions using a measuring tape, and waist/hip circumference ratio (WHR) was calculated. The follow-up was planned after 3 months and aimed to evaluate potential changes in the collected variables. Subjects recorded their physical activity using the International Physical Activity Questionnaire and a validated diet recall Food Frequency Intake form.

2.4. Lifestyle and Nutritional Intervention

The subjects were provided detailed structured nutritional intervention through charts, play cards and flash cards. The intervention included one face-to-face meeting about nutrition under the direction of a dietician and the patient. During this visit, the patients were informed about the purpose of the study, answered the 24 h diet recall questionnaire and were given an individualized nutritional plan (the energy requirements were calculated and personalized according to the preferences/needs of each patient) and detailed nutritional instructions, recommendations and advice, both for their diet and eating behavior. Patients were also educated regarding the choices of foods containing carbohydrates, with the aim of regulating sugar levels within normal limits as well as easily forming their daily diet. There were written specific nutritional recommendations: to have 5–6 meals per day, dividing the foods containing carbohydrates, to prefer foods rich in soluble fiber (legumes, fruits, vegetables, whole grains), to avoid the consumption of pure sugar and products containing it (sweets, cookies with sugar, cakes, jelly, ice creams with sugar, candies, sugared drinks, etc.), to reduce salt consumption and to avoid the consumption of saturated fat contained mainly in red meat, cold meats, egg yolks (up to 3 times/week) and butter. Emphasis was given to the consumption of vegetable fats, mainly olive oil, and to replace red meat with fish as much as possible. Some dietary recommendations were given by the dietician, such as reducing the intake of calories, total fat to <30% of daily energy intake and saturated fat (including trans fatty acids) to <10% of daily energy intake and increasing fiber intake (15g to 30g/day). The patients were given a form with the food categories mentioned above and an individualized nutritional plan (55% carbohydrate, 15% protein, and 30% fat) that they could follow for weight loss, as this was a key target of the intervention for those who were overweight or obese. They also received instructions for exercise.

2.5. Statistical Analyses

Statistical analysis was performed with the Statistical Package for the Social Sciences (SPSS 21). A frequency analysis was performed for each of the variables in the questionnaires. Data are presented as mean ± standard deviation (SD) or as median value (interquartile range). A paired t-test was used to compare parametric variables before and after three months of the nutrition education intervention.

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3. Results

3.1. Demographic Profile of the Subjects

The demographic data shows that 50% of the subjects were males and 50% subjects were females. The mean age of male subjects was 68 years and mean age of 60 years. Majority of them were literates having sedentary activity and were non-vegetarian in their food habits. About 34% of the subjects were vegetarians and 66% of subjects were non-vegetarian. About 40% were residing in urban area and rest were from rural area. Around 66% were literates. The activities of most of the subjects were sedentary making up to 80%.

3.2. Anthropometric Data of the Subjects

The ranges of height of the male subjects were 153-184 cms and female were 145-174 cms. The ranges of weight of the male subjects were 60-109 kg and female were 55- 84 kgs. The anthropometric data revealed that more than 78% of T2DM were obese. Male subjects have highest range of BMI compared to female subjects. Obesity is also known to be cause of insulin resistance. The Body mass indexes (BMI) of the male subjects were 22-32.5 kg/m^2 and female were 21-31 $kg/m^{2.}$ This implied that most of them fell to Obese grade I, only 10% were in obese grade II and 6% belonged to normal range. In the post test there was reduction in weight. The waist Hip ratio of these subjects ranged from 0.79 – 1.02 (male) and 0.7 - 0.97 (female). The majority of them were in abdominal obesity –I. 16% was in gluteal femoral obesity and 10% were in abdominal obesity-II.

3.3. Biochemical Reports of Subjects

Biochemical assessment was done based on fasting blood sugar level and post prandial sugar level during pre and post tests. The status of sugar level-FBS and PPBS were taken in three degree of control.

FBS: Good ≤ 110; Fair 110-130; Poor ≥ 130

PPBS: Good ≤ 130; Fair 130-150; Poor ≥ 150

In the pre-test 6% of subjects were in good control of sugar level and 94% were on poor control of sugar level in FBS. In PPBS 100% were in poor control of sugar level. In poor test, about 20% of subjects were in good condition, 40% were in fair condition and 40% were in poor condition. In pos-test about 20% of subjects were in good condition, 40% were in fair condition and 74% were in poor control. The structural knowledge impartment had brought down the sugar level. The ratio had improved in post-test compared to pre-test. Weight reduction after intervention has also contributed to their blood sugar levels.

3.4. Food Frequency Pre-test and post test

The 24 hour recall and food frequency questionnaire showed high calorie distribution in pre-test, especially in macro nutrients such as carbohydrates, protein and fat which was exceeding Recommended Dietary Allowances (RDA) for Indians. The other nutrients such as Iron, Calcium, Zinc, Vitamin C were low with respect to the Recommended Dietary Allowances (RDA) for Indians. In the post test of frequency there was remarkable decrease in the calorie

intake due to decreased consumption of simple sugars and increase of fibre foods. This gave space for increase intake of micro-nutrients such as Iron, Calcium, Zinc, Vitamin C.

3.5. Knowledge of the subjects regarding the control of blood sugar levels

In the pre-test, about 26% were having the knowledge below 50% having the knowledge score of 1-60. 11% were having 61-70 knowledge score and only 8% were having knowledge score more than 70. In the post-test after intervention, more promising and positive results were deliberated. Around 65% had knowledge score of 61-70, followed by the rest.

4. Discussion

In this study, the nutritional and lifestyle recommendations given to diabetic patients appeared to cause significant changes in anthropometric characteristics and biochemical markers after intervention. Main role in achieving and maintaining an appropriate body weight, preventing complications of the disease and improving the overall clinical picture play also the appropriate dietary changes. Similar results were quoted by researchers, the findings were significant trend of a decrease in the recorded anthropometric characteristics and biochemical indices (Sharma & Prajapati, 2014; Ajala et al, 2019). In our study, body weight decreased from 81.8 to 77.8 kg after 3 months, and BMI also decreased from 28.8 to 27.1 kg/m2. There was also a significant reduction in the average fasting blood glucose from 110.7 to 99.5 mg/dL. A possible explanation is the multi-layered strategies such as a personalized diet plan, written instructions with healthy food choices and personal contact with the dietician (Sami et al, 2017). One more study indicated out of 100 patients with type 2 diabetes found no significant effects on BMI or daily intake of fruit and vegetables, but there were positive changes in fasting blood glucose and HbA1c as well as weekly consumption of fruit and vegetables (Duclos et al, 2013). Awareness about diabetes complications and consequent improvements in dietary knowledge, attitude and practices lead to better control of the disease (Pellegrini et al, 2012). Different medications may also have different effects (Hu et al, 2019) and it is important to provide appropriate motivation for physical activity (Guo, 2019). Our results agree with other studies that both dietary guidelines and nutritional interventions contribute to the reduction in anthropometric characteristics and biochemical indicators of people with type 2 diabetes. Following specific dietary interventions also gives better results for weight loss than are found in people who follow more general dietary recommendations (Norris et al, 2004).

Nutrition is unquestionably important in the progression of T2DM, but most people rely more heavily on medication to manage their disease. In our study, the majority of the patients managed their diabetes by taking medicinal tablets (26.4%) or by combining antidiabetic drugs with appropriate nutrition/diet (27.6%). One review of 22 studies of overweight adults with type 2 diabetes found that the most successful weight loss occurred with multicomponent interventions, including more intense physical activity and very low-calorie diets or low-calorie diets (Norris et al, 2004).

Programs delivered in primary care can produce meaningful weight loss. In our study, the average weight loss was 4 Kg. It is reported that a 5% to 10% weight loss is associated with

health benefits, including lower systolic blood pressure along with reduced triglyceride and glucose levels, which may impact cardiac health (Ryan & Yockey, 2017). In addition to weight control, the first goal is macronutrient and micronutrient intakes at the right amounts according to national dietary recommendations, i.e., a high-quality diet (Early & Stanley, 2013). The proper dietary plan could be helpful for patients to follow the advice, as many do not realize that following the proper dietary rules prevents the occurrence of complications of the disease and improves the overall clinical picture of the patient (Maheri et al, 2017). Although they know the importance of regulating blood glucose concentrations, they consider that reducing the calories they consume is enough to protect them from adverse situations. Observance of the frequency of meals by diabetic patients is of particular importance, but there were also a number of patients who skipped meals.

Therapeutic patient education for obesity or diabetes is a cost-effective intervention that improves patient outcomes (Norris et al, 2004). The first step is to learn about the patient's circumstances and perspective, the second step is to help the patient identify their goals, the third step is to help the patient develop a plan (especially a dietary plan and oral health routine), the fourth step is to help the patient implement their plan and the fifth step is to review progress and adjust to changing circumstances. The main objective is to give health professionals better access to effective nutrition education for all people by identifying risk factors such as obesity, malnutrition, excessive sugar intake, weight, age, smoking, alcohol consumption and physical inactivity. A fundamentally different approach is then needed, one that emphasizes disease prevention and health management through a multidisciplinary, integrated and patient-centered approach to overall health.

The limitations of this study include the small sample size. The primary care physician was recommended and notified. Future research needs to be conducted using personalized healthcare with lower costs. The biomarkers used were limited and wee scope to use more, this could be the next step for the researchers to study Type II diabetes mellitus subjects in different communities.

5. Conclusions

Knowledge, attitude and practices in the management of diabetes mellitus showed a significant increase from 40% pre-test to 71% post-test. The fasting blood sugar and post prandial blood sugar had significantly decreased in comparison with the pre-test from 130 and 150mg/dl to 120 and 140mg/dl respectively. The structured nutritional education programme was effective in improving the nutritional knowledge with respect to diabetes mellitus and its management.

References

Ajala, O.; English, P.; Pinkney, J. Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. Am. J. Clin. Nutr. 2013, 97, 505–516.

Anjana R.M., et al. Diabetes Care; 2015. Incidence of Diabetes and Prediabetes and Predictors of Progression Among Asian Indians: 10-Year Follow-Up of the Chennai Urban Rural Epidemiology Study (CURES) p. dc142814.

Aschner P, Beck Nielsen H, Bennet P, Boulton A, Colagiuri R, Colagiuri S, et al. Global guideline for type 2 diabetes. Diabetes Res Clin Pract. (2014) 104:1–52.

Bowen M, Cavanaugh K, Wolff K, Davis D, Gregory R, Shintani A, et al. The diabetes nutrition education study randomized controlled trial: A comparative effectiveness study of approaches to nutrition in diabetes self-management education. Patient Educ Couns. (2016) 99:1368–76. doi: 10.1016/j.pec.2016.03.017

Curfman G. Why it's hard to change unhealthy behavior–and why you should keep trying. Healthbeat Harv Health Publ. (2009) 14:4–5.

Duclos, M.; Oppert, J.-M.; Verges, B.; Coliche, V.; Gautier, J.-F.; Guezennec, Y.; Reach, G.; Strauch, G. Physical activity and type 2 diabetes. Recommandations of the SFD (Francophone Diabetes Society) diabetes and physical activity working group. Diabetes Metab. 2013, 39, 205–216.

Early, K.B.; Stanley, K. Position of the Academy of Nutrition and Dietetics: The Role of Medical Nutrition Therapy and Registered Dietitian Nutritionists in the Prevention and Treatment of Prediabetes and Type 2 Diabetes. J. Acad. Nutr. Diet. 2018, 118, 343–353.

El-Khawaga G, Abdel-Wahab F. Knowledge, attitudes, practice and compliance of diabetic patients in Dakahlia, Egypt. Eur J Res Med Sci. (2015) 3:40–53.

Evert A, Boucher J, Cypress M, Dunbar S, Franz M, Mayer-Davis E, et al. Nutrition therapy recommendations for the management of adults with diabetes. Diabetes Care. (2014) 37(Suppl. 1):S120–43. doi: 10.2337/dc14-S120

Forouhi N, Misra A, Mohan V, Taylor R, Yancy W. Dietary and nutritional approaches for prevention and management of type 2 diabetes. BMJ. (2018) 361:k2234. doi: 10.1136/bmj.k2234

Funnell M, Anderson R. Empowerment and self-management of diabetes. Clin Diabetes. (2004) 22:123–8. doi: 10.2337/diaclin.22.3.123

Funnell M, Anderson R. Patient empowerment: A look back, a look ahead. Diabetes Educ. (2003) 29:454–64. doi: 10.1177/014572170302900310

Geldsetzer P., et al. Diabetes and hypertension in India: a nationally representative study of 1.3 million adults. JAMA Intern. Med. 2018;178(3):363–372.

Guo, S.H.-M. Assessing quality of glycemic control: Hypo- and hyperglycemia, and glycemic variability using mobile self-monitoring of blood glucose system. Health Inform. J. 2019, 26, 287–297.

Hu, Y.; Wen, X.; Wang, F.; Yang, D.; Liu, S.; Li, P.; Xu, J. Effect of telemedicine intervention on hypoglycaemia in diabetes patients: A systematic review and meta-analysis of randomised controlled trials. J. Telemed. Telecare 2019, 25, 402–413.

Maheri, A.; Asnaashari, M.; Joveini, H.; Tol, A.; Firouzian, A.A.; Rohban, A. The impact of educational intervention on physical activity, nutrition and laboratory parameters in type II diabetic patients. Electron. Physician 2017, 9, 4207.

Marathe, P.H.; Gao, H.X.; Close, K.L. American Diabetes Association Standards of Medical Care in Diabetes 2017. J. Diabetes 2017, 9, 320–324.

Norris, S.L.; Zhang, X.; Avenell, A.; Gregg, E.; Bowman, B.; Serdula, M.; Brown, T.J.; Schmid, C.H.; Lau, J. Long-term effectiveness of lifestyle and behavioral weight loss interventions in adults with type 2 diabetes: A meta-analysis. Am. J. Med. 2004, 117, 762–774.

Pellegrini, C.A.; Verba, S.D.; Otto, A.D.; Helsel, D.L.; Davis, K.K.; Jakicic, J.M. The Comparison of a Technology-Based System and an In-Person Behavioral Weight Loss Intervention. Obesity 2012, 20, 356–363.

Pradeepa R.G., Deepa R., Mohan V. Epidemiology of diabetes in India - current perspective and future projections. J. Indian Med. Assoc. 2002;100:144–148.

Ranjani H., et al. 2014. Real Life Diabetes Prevention Initiatives in India; pp. 281–315.

Ryan, D.H.; Yockey, S.R. Weight Loss and Improvement in Comorbidity: Differences at 5%, 10%, 15%, and Over. Curr. Obes. Rep. 2017, 6, 187–194.

Sami, W.; Ansari, T.; Butt, N.S.; Hamid, M.R.A. Effect of diet on type 2 diabetes mellitus: A review. Int. J. Health Sci. (Qassim) 2017, 11, 65–71.

Sharma, R.; Prajapati, P. Diet and lifestyle guidelines for diabetes: Evidence based ayurvedic perspective. Rom. J. Diabetes Nutr. Metab. Dis. 2014, 21, 335–346.

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Table 1: Demographic Profile of the Subjects (%)

Parameters (%)	Diabetic Arthropathy	Diabetic Neuropathy	Diabetic Foot Ulcer	Average
Male	50	50	50	50
Female	50	50	50	50
Duration of diabetes 11-15 years	22	25	28	25
Duration of diabetes 16-20 years	36	34	8	26
Duration of diabetes Above 20 years	10	12	Nil	7
BMI between 18.5-22.9	20	22	Nil	14
BMI between 23.0-24.9	22	25	68	38
BMI above 25	58	53	32	47
Subjects who smoke	22	18	8	16
Subjects who use tobacco	20	13	8	14
Subjects who smoke and use tobacco	12	7	18	12
Subjects who do not smoke nor use tobacco	64	62	66	64

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Table 2: Biochemical Reports of Subjects

Parameters	**Diabetic Arthropathy**	**Diabetic Neuropathy**	**Diabetic Foot Ulcer**	**Average**
Pre-test				
Fasting Blood Sugar				
< 110	8	6	6	6
110-130	12	12	Nil	8
> 130	80	82	94	85
Post-test				
Fasting Blood Sugar				
< 110	16	18	20	18
110-130	41	38	40	39
> 130	43	44	40	42
Pre-test				
Post-Prandial Blood Sugar				
< 110	Nil	Nil	Nil	Nil
110-130	Nil	Nil	Nil	Nil
> 130	100	100	100	100
Post-test				
Post-Prandial Blood Sugar				
< 110	9	11	10	10
110-130	18	19	16	18
> 130	73	70	74	72

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Table 3: Food Frequency Pre-test and post test

Food Group	Never		Twice a week		Thrice a week		Alternate Days		Daily	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Cereals	19	5	8	16	10	23	25	24	38	32
Pulses	7	2	14	10	17	23	37	33	25	32
Vegetables	6	Nil	17	10	14	24	35	28	28	38
Leafy Vegetables	48	13	12	15	13	25	15	18	12	29
Roots & Tubers	42	22	15	17	14	23	17	24	12	14
Milk Products	24	18	12	16	15	21	17	18	32	27
Fats & oils	5	5	14	27	13	22	21	25	47	21
Fruits	2	2	13	22	23	24	24	27	38	25
Sugars	4	23	12	18	12	12	12	13	60	34

BLE 5: MEAN SCORES OF 24 HOUR NUTRIENT INTAKE BASED ON PAL

SEDENTARY PAL								
NUTRIENTS		**RDA**	**Diabetic Neuropathy**		**Diabetic Nephropathy**		**Diabetic Ulcer**	
	MALE	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**
ENERGY(Kcal)	**2320**	**1900**	1994 ± 646	1878 ± 534	1973 ± 741	1885 ± 841	1978 ± 966	1903 ± 877
PROTEINS(g)	**60**	**55**	55.6 ± 31.3	49.6 ± 21.5	56.2 ± 28.3	48.2 ± 36.5	55.3 ± 30.9	50.2 ± 33.6
FAT(g)	**25**	**20**	23.5 ± 22.2	18.4 ± 21.9	22.4 ± 25.7	19.4 ± 20.7	22.4 ± 27.5	18.3 ± 23.3

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CALCIUM(mg)	**600**	**600**	488.8 ± 393.3	407.8 ± 403.3	466.8 ± 491.1	454.7 ± 491.1	428.8 ± 480.2	496.7 ± 491.1
IRON (mg)	**17**	**21**	15.4±6.5	16.0±6.5	16.8±8.1	16.7±7.8	14.5±6.8	16.4±7.1
ZINC (mg)	**12**	10	11.2± 5.9	9.3± 7.4	10.7± 7.9	8.7± 8.6	11.1± 5. 5	9.5± 8.9
VITAMIN C (mg)		**40 mg**	36.3±22.6	33.3±26.5	34.8±27.2	35.8±25.8	31.6±27. 5	30.8±28.6
SEDENTARY PAL								
	2730	**2230**	2608 ± 772	1996 ± 788	2507 ± 843	1979± 864	2497 ± 721	1990 ± 701
PROTEINS	**60**	**55**	54.6 ± 43.1	48.6 ± 31.4	57.2 ± 38.5	50.2 ± 30.5	52.3 ± 40.7	51.2 ± 46.6
FAT	**30**	**25**	28.3 ± 28.2	23.8 ± 27.9	29.9 ± 24.8	22.4 ± 21.7	28.4 ± 26.3	23.6 ± 29.9
CALCIUM	**600**	**600**	478.7 ± 494.8	366.2 ± 453.2	486.8 ± 461.1	490.7 ± 467.9	489.8 ± 466.2	492.7 ± 466.5
IRON	**17**	**21**	16.1±2.5	18.2±7.3	16.8±8.5	19.8±8.8	14.9±4.8	19.9±8.8
ZINC	**12**	**10**	11.7± 1.9	9.6± 2.6	10.2± 5.5	9.1± 4.6	10.8± 5. 8	9.8± 4.9
VITAMIN C (mg)		**40 mg**	35.8±28.7	32.7±27.2	33.8±25.8	34.8±27.3	32.5±25. 9	30.5±26.3

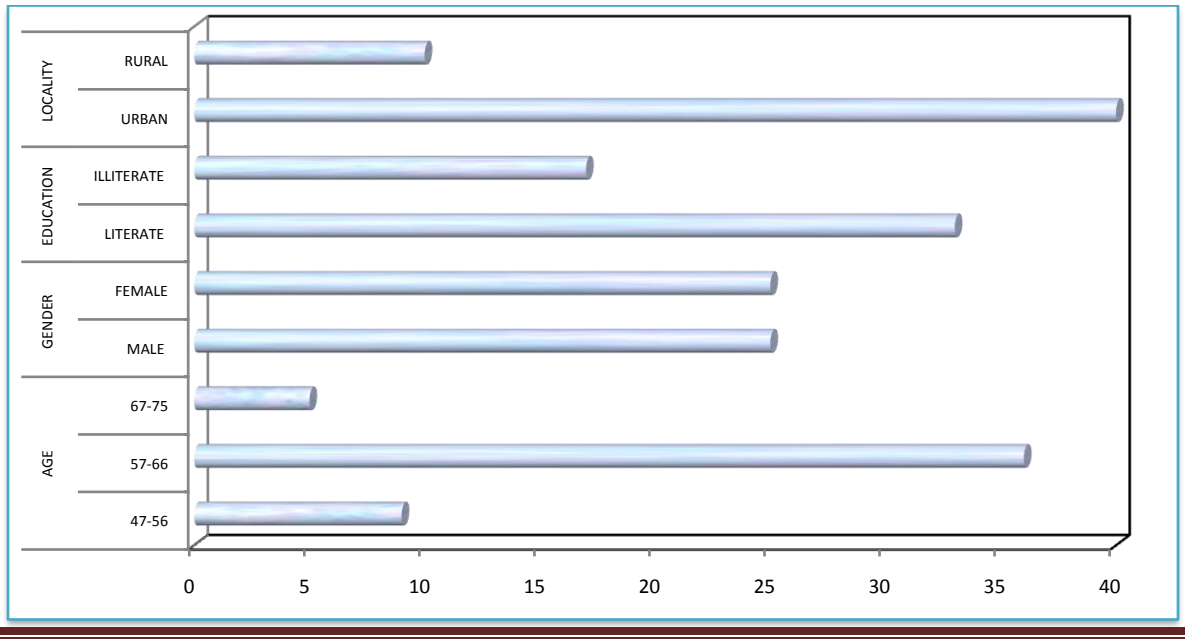

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Figure 1: Subjective Characteristics

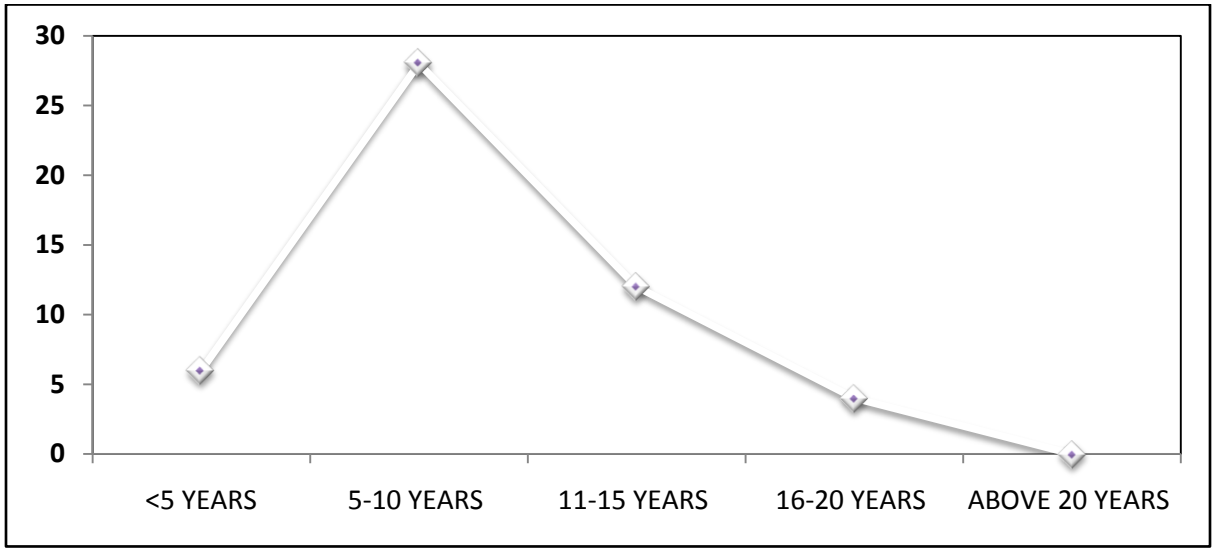

Figure 2: Onset of Diabetes Prevalence

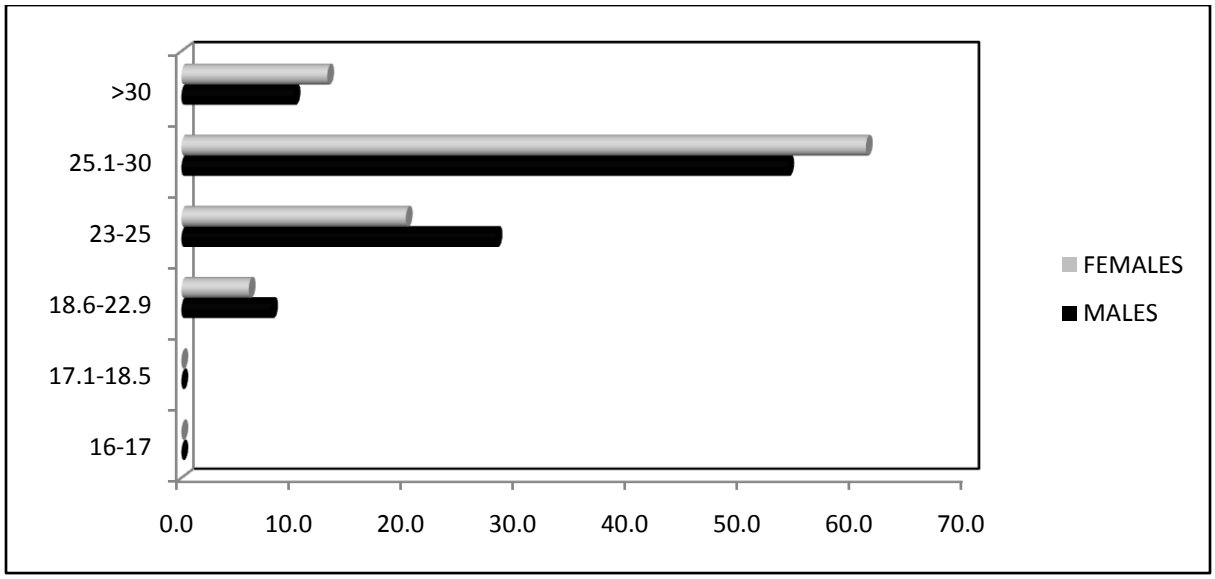

Figure 3: Body Mass Status

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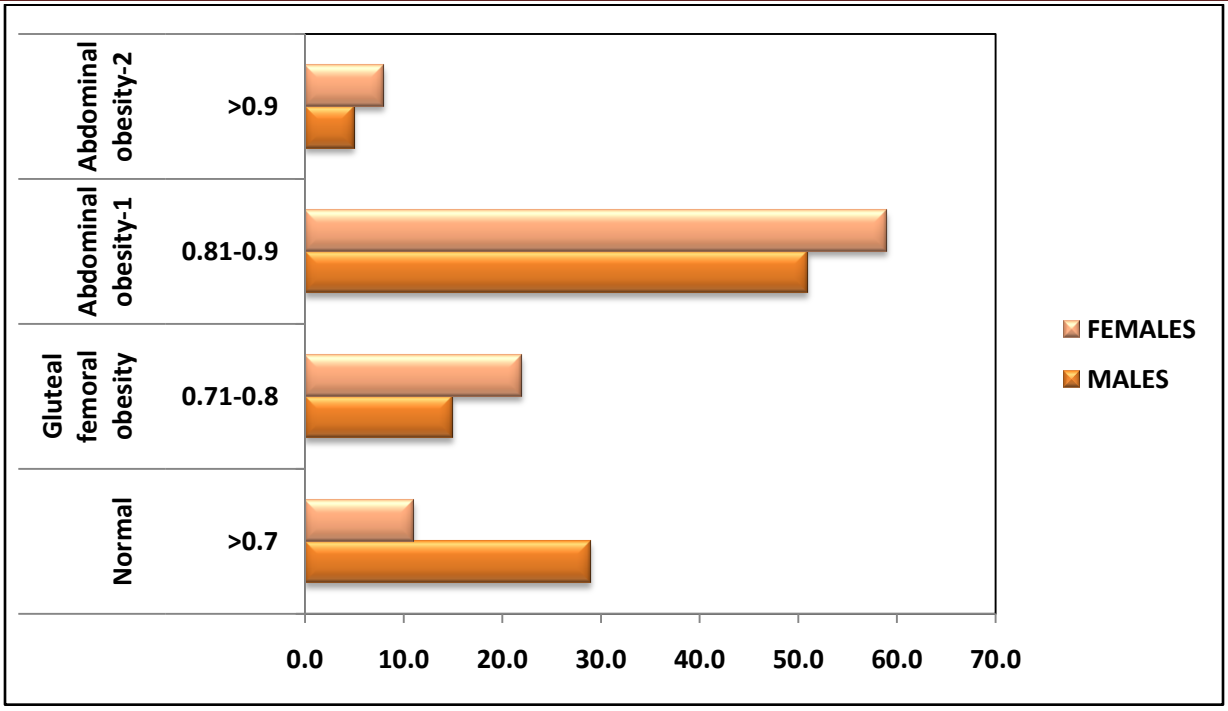

Figure 4: Waist and Hip Ratio Status

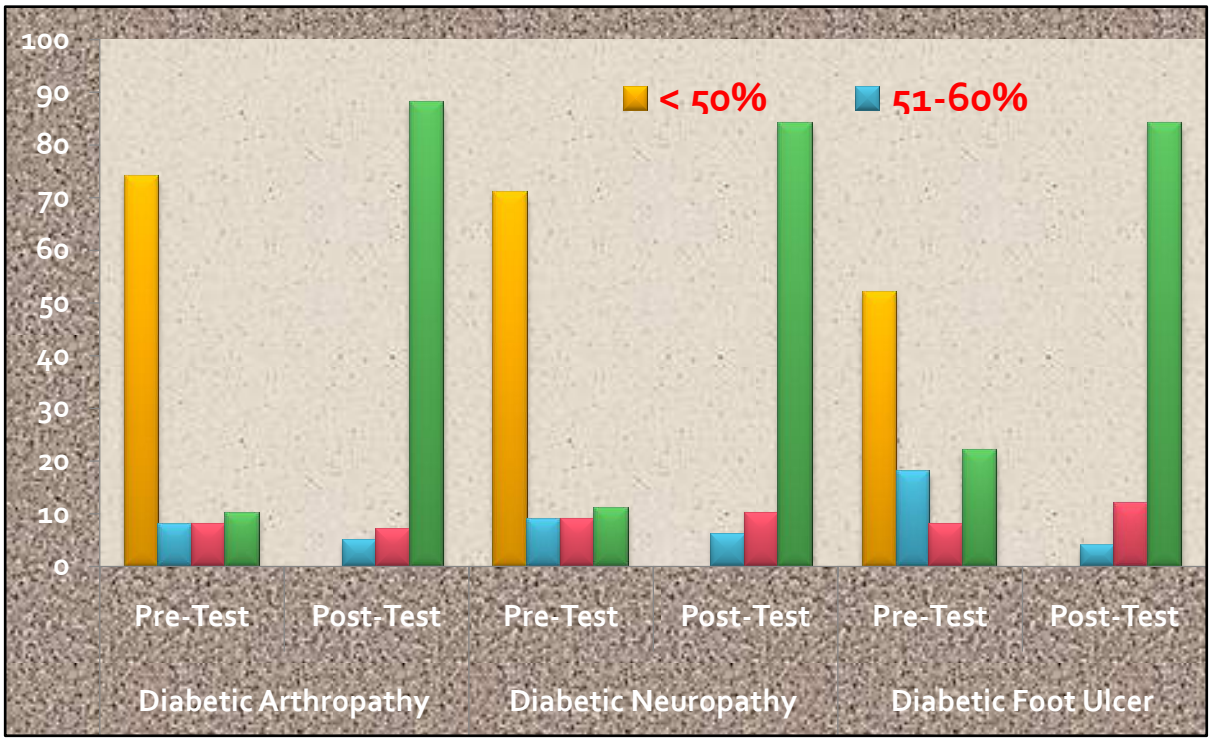

Figure 1: Knowledge score regarding different complications before and after intervention