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A Study on Factors Affecting the Adherence Among Diabetic Patients in the Rural Field Practice Area of a Medical College Andhra Pradesh

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ABSTRACT

The present study has been undertaken to find out the socio-demographic profile of type 2 diabetics, to measure the levels of adherence to medication, diet and exercise and to identify the factors affecting adherence. The present study was carried out in 10 Villages, in people with type 2 diabetes mellitus residing in the rural field practice area. Socio demographic profile, diabetic profile and Medication, diet and exercise adherence details were recorded. Majority cases were females (53.9%) compared to males (46.1%). About 35.6% belong to >60 years followed by 51-60 years (34.9%). Majority of the study population (61.1%) were found to be illiterate. 50% were unemployed and about 26.5% were into cultivation. Majority of the study population are belonging to upper class (48.5%), followed by upper-middle class (39.9%). Majority of the population (31.7%) were diagnosed between 51-60 years. 41.8% were known diabetics since 1-5 years. 58.5% of study population do not have any family history of diabetes mellitus. 39.5% of study population were Pre-obese. 80.4% were non-smokers and about 89.2% were non-alcoholic (89.2%). 83.4% of the people have been getting regular blood checkups (at least once in 3 months). 54.6% of the study population have episodes of hypo/hyperglycaemia. About 55.2% developed no complications due to diabetes. 92.8% were taking oral Hypoglycaemic drugs. Majority of the study population (74.8%) were non-vegetarians. 68.3% of the population get their heath check from Private Health Care Systems (which included private clinics, private medical colleges and corporate hospitals. About 10% from quacks (Rural medical practitioners, quacks and directly from medical shops. 26.1% of the people have been hospitalized because of Diabetes Mellitus. 93.1% were adhering to the medication advice given by the doctor. 78.5% have successfully restricted their diet to the doctor advice. 79.7% of the study population were having more servings of vegetables as per the doctor's advice. 87.9% of the study population were having consumption of Sweets according to doctor's advice, 11.2% are moderately adhering, and 0.9% are having poor control towards sweets. Only 63.7% of the study population are having controlled servings of high fat food items as per the doctor's advice. Only 9.8% of are doing exercise other than routine work as per the doctor's advice.

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Key Words

Diabetes mellitus, adherence, illiterate, socioeconomic status, hypoglycemia drugs

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INTRODUCTION

Non-communicable diseases (NCDs) represent a large and growing proportion of the global burden of disease, NCDs are largely preventable and many are driven by four big risk factors, physical inactivity, unhealthy diets, tobacco use and a harmful use of alcohol. Diabetes is one of the major health and development challenges of the 21st century. It is a chronic, incurable, costly and increasing but largely preventable non-communicable disease (NCD), which is responsible for millions of deaths annually, debilitating complications and incalculable human misery[1]. As per estimates of WHO, in 2014, 422 million adults had diabetes-a prevalence of 8.5% among the adult population. In 2012 there were 1.5 million deaths worldwide directly caused by diabetes. Higher-than-optimal blood glucose was responsible for an additional 2.2 million deaths as a result of increased risks of cardiovascular and other diseases, for a total of 3.7 million deaths related to blood glucose levels in 2012. Many of these deaths (43%) occur under the age of 70 years[2]. The prevalence of diabetes has been steadily increasing for the past 3 decades and is growing most rapidly in low-and middle-income countries. Associated risk factors such as being overweight or obese are increasing. Diabetes is an important cause of blindness, kidney failure, lower limb amputation and other long-term consequences that impact significantly on quality of life. WHO Adherence meeting in June 2001[3] concluded that defining adherence as "the extent to which the patient follows medical instructions". Effective treatment relationships are characterized by an atmosphere in which alternative therapeutic means are explored, the regimen is negotiated, adherence is discussed and follow-up is planned. The adherence project has adopted the following definition of adherence to long-term therapy, a merged version of the definitions of Haynes and Rand (10): the extent to which a person's behaviour-taking medication, following a diet and/or executing lifestyle changes, corresponds with agreed. Poor adherence to the treatment for diabetes results in avoidable suffering for the patients and excess costs to the health system[4]. The control of diabetes requires more than just taking medicine. Other aspects of self-management such as self-monitoring of blood glucose, dietary restrictions, regular foot care and ophthalmic examinations have all been shown to markedly reduce the incidence and progression of complications of diabetes. India has the unfortunate privilege of being the "Diabetes capital" of the world. More concerning is the fact that diabetes prevalence over the past 4 decades has increased fourfold. Diabetes is one of the leading causes of morbidity and mortality worldwide and a major problem in India. The present study has been undertaken in the rural field practice area of Dr PSIMS and RF, to find out the socio-demographic profile of type 2 diabetics, to measure the levels of adherence to medication, diet and exercise and to identify the factors affecting adherence.

MATERIALS AND METHODS

Study Design: Cross sectional study.

Study Period: The present study was conducted from January 2017 to February 2018. Total period of 22 months.

Study Area: The present study was carried out in 10 Villages i.e. the catchment area of rural field practice area of Dr. PSIMS and RF which covers 10 villages with 35,339 Population (2011 census), which belongs to Bapulapadu Mandal, Krishna district, Andhra Pradesh.

Study Population: People with type 2 diabetes mellitus residing in the rural field practice area of Dr PSIMS and RF.

Inclusion Criteria:

- People diagnosed with type 2 diabetics mellitus ≥1 year(s).
- Above 18 years of age.
- People resident to the study area.
- Who were willing to give consent.

Exclusion Criteria:

- Type 1 diabetics.
- Women with gestational diabetes mellitus.
- People who were seriously ill.
- Not willing for giving consent.

Sample Size: Sample size was calculated by using the formula

$4PQ/L^2$

P (Prevalence)=45.5 %[5]

Q=100-P=54.5

L=Allowable error 13% of 45.5=5.915

With 13% allowable error the sample size=284.

Considering 10% non-response rate the sample to be collected is estimated to be 313. P=45.5%. (In a study done in Bengaluru prevalence of adherence to diet, regular blood sugar monitoring, medication and exercise were 82%, 73.26%, 58.4%, 45.5% respectively. But we have taken the prevalence of adherence to exercise because it is the least prevalence and would cover all the other sample size, which is the prevalence of adherence to exercise (45.5%)[5].

Sampling Technique: Proportionate Stratified Random Sampling.

Sampling Method: A community based cross sectional study was conducted in the study area. Proportionate

sampling method was used[6]. The proportionate stratified random sample will be obtained by using the formula. Stratified sample size was estimated from all the 10 villages and the following stratified sample size for each village was derived.

Materials: Data was collected using the study questionnaire which was adapted from the Summary of Diabetes Self-care Activities (SDSCA) Measure. Questionnaire was pilot tested in rural setting among DM patients for assessing its feasibility and reliability. Suitable modifications were done afterward. Opinion of experts on each questionnaire item was obtained, and all graded excellent in its construct and meaning. The questionnaire consisted of the following parts:

- Socio demographic profile.
- Diabetic profile.
- Medication, diet and exercise adherence details.

Data Collection Procedure: Study was started after obtaining ethical clearance certificate from Institutional Ethical Committee. Before collecting data from the villages information was given to the respective village authorities. Data was collected starting from the house which was nearest to the Panchayath office. In villages where there is no Panchayath office data collection was started from the house nearest to the Anganwadi centre. The diabetics in the villages were identified by house to house visit by random walk method with the help of the community health worker of RHTC and ASHAs of the respective areas. All the diabetics in the households were taken in the sample. Written informed consent was taken before the data collection from the individuals. An interview based method was adopted to collect data using a pilot tested questionnaire. The diabetics who were not willing to give written consent were not interviewed. Data collection in the respective villages was stopped once the desired sample size reached as per the stratified sampling method. From all the ten Villages data was collected from 313 diabetic patients. Among the 313 study subjects, 7 were non responsive to certain questions. They were excluded as an item non-response and final sample was confined to 306.

Data Analysis: Data was compiled and entered into Microsoft Excel sheet and analysed using Statistical Package for the Social Sciences Trial Version 23 (SPSS). Data was presented in frequencies and percentages. Factors affecting adherence and non adherence was analysed using inferential statistics such as Pearson Chi square test of significance, Fisher's exact test and p value of <0.05 was considered as statistically significant. Data was presented in the form of tables, figures and graphs wherever necessary.

RESULTS AND DISCUSSIONS

In the present study majority (18%) of the diabetics belong to the village Veeravalli and least (3.6%) belong to village Singannagudem. Majority of the known Type 2 diabetics are females (53.9%) compared to males (46.1%). In the present study majority of the population 35.6% belong to >60 years followed by 51-60 years (34.9%). Majority of the study population (61.1%) are found to be illiterate, followed by 22.5% primary, 7.8% High School, 5.9% middle school, 1.3% graduated and 1.3% who can read only. Majority of the study population (50%) are classified as ''none'' in their occupation according to Modified Udai-Pareeks classification and of the remaining 26.5% belong to cultivation which form the second majority. Majority of the study population (64.7%) are of Hindu religion, followed by Christians (20.9%) and then Muslims (14.6%). Majority of the study population are belonging to OC (50%) category, followed by SC's (24.5%) and BC's (23.5%) almost the same and ST's are the least (1.6%). In the present study majority of the study population are live in Pukka house (67%) and the remaining in Katcha and Katcha-Pukka houses. Majority of the study population are belonging to a nuclear Family (70.3%), followed by three generation family (23.2%) and joint family (6.5%). In the present study majority of the study population are belonging to upper class (48.5%), followed by upper-middle class (39.9%). Majority of the population (31.7%) are diagnosed between 51-60 years, followed by (30.1%) between 41-50 years, very few (4.9%) are diagnosed early (21-30years). Majority of the population (41.8%) are known diabetics for period of 1-5 years.

Table 1: Distribution of the Study Participants Based on Occupation, Age, Duration of Diabetes, Family History and BMI

Distribution of the study participants	Frequency	Percentage (%)
Type of Occupation		
None	153	50.0
Labourer	33	10.8
Caste occupation	10	3.3
Business	19	6.2
Independent Profession	5	1.6
Cultivation	81	26.5
Service	5	1.6
Age (years)		
18- 30	15	4.9
31-40	43	14
41-50	92	30.1
51-60	97	31.7
>60	59	19.3
Duration of diabetes (years)		
1 year	37	12.1
1-5 years	128	41.8
6-10 years	89	29.1
>10 years	52	17.0
family history		
Parents	67	21.9
Siblings	26	8.5
Both	23	7.5
Others	11	3.6
None	179	58.5
BMI		
Underweight (<18.50)	8	2.6
Average (18.50-24.99)	83	27.1
Pre-obese (25.00-29.99)	121	39.5
Obese class-1 (30.00-34.99)	59	19.3
Obese class-2 (35.00-39.99)	27	8.8
Obese class-3 (>40.00)	8	2.7

In the present study majority (58.5%) of study population do not have any family history of diabetes mellitus and only 21.9% of the study population have their parents to be known diabetics. In the present study majority (39.5%) of study population are Pre-obese. In the present study majority (58.5%) of study population do not have any family history of diabetes mellitus and only 21.9% of the study population have their parents to be known diabetics. In the present study majority 80.4% are non Smokers, 12.4% are current smokers and 7.2% are past-smokers. In the present study majority of the population 83.4% of the people have been get Regular blood checkups in at least once in 3 months to weekly. In the present study 54.6% of the study populations have episodes of hypo/hyperglycaemia. In the present study majority of the study population majority about 55.2% seem developed no complications because of diabetes. Majority of the study population 93.1% are taking Oral Hypoglycaemic drugs as anti-diabetic treatment. Majority of the study population majority (74.8%) are Non- vegetarians. Majority 68.3% of the population get their heath check from Private Health Care Systems (which included private clinics, private medical colleges and corporate hospitals. About 10% from quacks (Rural medical practitioners, quacks and directly from medical shops. About 7% utilize multiple providers. Majority of the study population only 26.1% of the people have been hospitalized because of Diabetes Mellitus. In the Present Study majority (93.1 %) are adhering to the medication advice given by the doctor. In the present study 78.5% of the study population have successfully restricted their diet to the doctor advice. In the present study 79.7% of the study population are having more servings of vegetables as per the doctor's advice. In the present study only 66% of the study population are having controlled servings of fry items as per the doctor's advice.

Table 2: Distribution of the Study Participants Based on Associated Co-Morbidities, Complications, Medication Type, Diet Restriction and Exercise.

Distribution of the study participants	Frequency	Percentage (%)
Associated co-morbidities		
Coronary Artery Disease	14	4.6
Cerebro Vascular Attacks	5	1.6
Hypertension	131	42.8
Multiple co morbidities	34	11.1
None	122	39.9
Complications		
Coronary Arterial Diseases	25	8.2
Cerebro Vascular Attacks	7	2.3
Nephropathy, Neuropathy, Diabetic foot	17	5.5
Retinopathy	5	1.6
Nil	252	82.4
Medication type		
Oral Hypoglycaemic Drugs	285	93.1
Insulin	6	2.0
Both	15	4.9
Health Provider		
Government (SC/PHC/CHC/GGH)	44	14.3
Private (Pvt.clinics/Pvt.Medical colleges/ Corporate Hospitals)	209	68.3
Quack (RMP/Quacks/Medical Shops)	31	10.2
Multiple Providers	22	7.2
diet restriction (Days per week)		
Nil	6	2
1-3 days	60	19.5
4-7 days	240	78.5
Exercise (Days per week)		
Nil	203	66.3
1-3 days	35	11.4
4-7 days	38	12.5
7 days	30	9.8

In the present study 87.9% of the study population are having consumption of Sweets according to doctor's advice, 11.2% are moderately adhering and 0.9% are having poor control towards sweets. In the present study only 63.7% of the study population are having controlled servings of high fat food items as per the doctor's advice.In the present study only 9.8% of the study population are doing exercise other than routine work as per the doctor's advice. As depicted in the table, 29.4% (90) people were between the age group 18-50 years. Among them 90% (81) were adherent to medication. About 70.6% (216) belonged to age group >50 years and among them 94.4% (204) were non-adherent. Among people of those belonging to age groups 18-50 years about 61.1% (55) were adherent to dietary advice. In people with age >50 years about 66.2% (143) were found adherent. Among people of those belonging to age groups 18-50years only 12.2% were adherent to exercise. Among people of age >50 years 18.5% (40) were found adherent. The table shows that adherence was highest among those who were illiterate (96.3%). This finding was found to be statistically significant. Adherence to diet was observed to be more among the illiterates (74.8%) than the literates (45.8%). Adherence to exercise was more among the literates (80.9%) than those who were illiterates (15.2%). The above table elucidates that irrespective of the type of occupation the study population were found to be well adhered to medication. The adherence among unemployed was found to be 93.5% and in employed found to be 92.8%. The adherence to diet in unemployed was found to be 69.3% and in the study subjects who were employed it was 60.1%. In the study, as depicted in the table the adherence to exercise was more among the unemployed (84.3%) compared to employed (17.6%) Among people taking medications since 1-5years about 93.8% were found to be adherent. While among those taking from 6-10 years of age 94.3% were adherent. Among people taking medications since 1-5years about 64.2% were found to be adherent. While among those taking from 6-10 years of age 65.2% were adherent. Among people taking medications since 1-5years about 43.1% were found to be adherent. While among those taking from 6-10 years of age 20.6% were adherent. People who were non obese (94.8%) were found to be more adhered than those who were obese (89.4%). People who were non obese (70.3%) were found to be more adhered than those who were obese (52.1%). People who were non obese (81.1%) were found to be more adhered than those who were obese (11.8%). Irrespective of the family history the study participants were well adhered to medication. Among them those with known family history of diabetes were found to be more adherent (94.8%) than those with no family history of known diabetes (92.1%). People with known family history of diabetes (74.1%) were found to be more adhered than those with no family history of known diabetes (58.9%).Irrespective of the family history the study participants were poorly adhered to

Table 3. Association Between Adherence and Age Group

		Age group					
		18-50 years	**>50 year**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	81(90)	204 (94.4)	285	1.963	0.162	1
	Non Adherent (%)	9 (10)	12(5.6)	21			
	Total	90	216	306			
Diet Adherence	Adherent (%)	55(61.1)	143(66.2)	198	0.721	0.397	1
	Non Adherent (%)	35(38.9)	73(33.8)	108			
	Total	90	216	306			
Exercise Adherence	Adherent (%)	11(12.2)	40(18.5)	51	1.813	0.179	1
	Non Adherent(%)	79(87.8)	176(81.5)	255			
	Total	90	216	306			

Table 4: Association Between Adherence and Education

		EDUCATION					
		Illiterate	**Literate**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	184(96.3)	101(87.8)	285	8.131	0.004	1
	Non Adherent (%)	7(3.7)	14(12.2)	21			
	Total	191	115	306			
Diet Adherence	Adherent (%)	143(74.8)	55(45.8)	198	22.987	0.000	1
	Non Adherent (%)	48(25.2)	60(54.2)	108			
	Total	191	115	306			
Exercise Adherence	Adherent (%)	29(15.2)	22(80.9)	51	0.805	0.371	1
	Non Adherent(%)	162(84.8)	93(19.1)	255			
	Total	191	115	306			

Table 5: Association Between Adherence and Occupation

		Occupation					
		Unemployed	**Employed**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent(%)	143(93.5)	(92.8) 142	285	0.051	0.822	1
	Non Adherent(%)	10(6.5)	11(7.2)	21			
	Total	153	153	306			
Diet Adherence	Adherent(%)	106(69.3)	92(60.1)	198	2.805	0.095	1
	Non Adherent(%)	47(30.7)	61(39.9)	108			
	Total	153	153	306			
Exercise Adherence	Adherent (%)	24 (84.3)	27 (17.6)	51	0.212	0.647	1
	Non Adherent (%)	129 (15.7)	126(82.4)	255			
	Total	153	153	306			

Table 6: Association Between Adherence and Religion

		Religion						
		Hindu	**Muslim**	**Christian**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	188 (94.9)	40 (90.9)	57	285	3.022	0.083	2
	Non Adherent (%)	10(5.1)	4(9.1)	7(11)	21			
	Total	198	44	64	306			
Diet Adherence	Adherent (%)	119 (60.1)	33 (75)	46 (71.9)	198	5.32	0.031	2
	Non Adherent (%)	79(39.9)	11(25)	18(29.1)	108			
	Total	198	44	64	306			
Exercise Adherence	Adherent (%)	33 (16.7)	5 (88.6)	13 (79.7)	51	1.503	0.797	2
	Non Adherent (%)	165 (83.3)	39 (11.4)	51 (20.3)	255			
	Total	198	44	64	306			

Table 7: Association Between Adherence and Medication

		Medication					
		1-5years	**6-10years**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	152(93.8)	133(94.3)	285	2.629	0.449	1
	Non Adherent (%)	13(6.2)	8(5.7)	21			
	Total	162	141	306			
Diet Adherence	Adherent (%)	106(64.2)	92(65.2)	198	0.034	0.885	1
	Non Adherent (%)	59(35.8)	49(34.8)	108			
	Total	165	141	306			
Exercise Adherence	Adherent (%)	22(43.1)	29(20.6)	51	2.865	0.091	1
	Non Adherent (%)	143(56.9)	112(79.4)	255			
	Total	165	141	306			

Table 8: Association Between Adherence and Occupation

		BMI					
		Non obese	**Obese**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	201(94.8)	84(89.4)	285	3.026	0.082	1
	Non Adherent (%)	11(5.2)	10(10.6)	21			
	Total	212	94	306			
Diet Adherence	Adherent (%)	149(70.3)	49(52.1)	198	9.4	0.002	1
	Non Adherent (%)	63(29.7)	45(47.9)	108			
	Total	212	94	306			
Exercise Adherence	Adherent (%)	40(81.1)	11(11.8)	51	2.8408	0.122	1
	Non Adherent(%)	172(18.9)	83(88.2)	255			
	Total	212	94	306			

Table 9: Association Between Adherence and Family History of Diabetes

		family History					
		Present	**Absent**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	110(94.8)	175(92.1)	285	0.835	0.362	1
	Non Adherent (%)	6(5.2)	15(7.9)	21			
	Total	116	190	306			
Diet Adherence	Adherent (%)	86(74.1)	112(58.9)	198	7.278	0.007	1
	Non Adherent (%)	30 (25.8_)	78(41.1)	108			
	Total	116	190	306			
Exercise Adherence	Adherent (%)	24(20.7)	27(14.2)	51	2.177	0.141	1
	Non Adherent (%)	92(79.3)	163(85.8)	255			
	Total	116	190	306			

Table 10. Association Between Adherence and Complications

		Complications					
		Present	**Absent**	**Total**	**Chi- square**	**p-value**	**d.f.**
Medication Adherence	Adherent (%)	51(94.4)	234(92.9)	285	0.175	0.677	1
	Non Adherent (%)	3(5.6)	18(7.1)	21			
	Total	54	252	306			
Diet Adherence	Adherent (%)	34(62.9)	164(65)	198	0.087	0.769	1
	Non Adherent (%)	20(37.1)	88(35)	108			
	Total	54	252	306			
Exercise Adherence	Adherent (%)	12(22.2)	39(15.5)	51	1.457	0.229	1
	Non Adherent(%)	42(77.8)	213(84.5)	255			
	Total	54	252	306			

exercise. People with known family history of diabetes (20.7%) were found to be more adhered than those with no family history of known diabetes (14.2%). Irrespective of the smoking status, study participants were found to be well adhered to medication. Non smokers (93.3%) were slightly more adhered than known smokers (92.1%). Nonsmokers (65.7%) were less adhered than known smokers (57.9%). Irrespective of the smoking status, study participants were found to be poorly adhered to medication. Nonsmokers (14.6%) were less adhered than known smokers (31.6%). People who were non alcoholics or stopped their habit of consuming alcohol were more adherent (94%) than alcoholics (80%). People who were non alcoholics or stopped their habit of consuming alcohol were more adherent (66%) than alcoholics (45%). Adherence was found to be more among non alcoholics (82.9%) compared to those who were known alcoholics (10%). People having their health care needs met through the public sector were more adherent (97.7%) than those from the private (92.4%). People having their health care needs met through the public sector were more adherent (77.2%) than those from the private (62.6%). People having their health care needs met through the public sector were less adherent (11.4%) than those from the private (17.6%). People with complications due to diabetes were more adherent (94.4%) than those without any complications (92.9%).People with complications due to diabetes were less adherent (62.9%) than those without any complications (65%).People with complications due to diabetes were more adherent (22.2%) than those without any complications (15.5%).

There is a need to investigate knowledge, attitude and behaviour among diabetic patients to aid in future development of national health programmes and techniques for effective health education. In the present study majority of the diabetic patients 70.5% (216) belonged to ≥51 years of age. Minimum age is 30 years and maximum age is 85 years, mean age of the diabetics is 57.99 and standard deviation ±11.171. As per the study done by Shreshta *et al.* (2013) in Katmandu about 71.5% people were aged ≥51 years with mean of 58.1 years and standard deviation of ±11.6[7]. In the present study majority of the diabetic population i.e. >half were females (53.9%) which were found similar to the studies done by Shuvankar Mukherjee *et al.* (2013) in Kolkata which also showed majority (52.9%) to be females[8]. In the present study majority (64.7%) of the diabetic patients were Hindus, followed by Christians (20.9%) and Muslims (14.6%). This was contrary to the study done by Upendra Bhojani *et al* (2013) in Kadugondanahalli slum in Karnataka which showed majority (68.7%) of the population belonging to Muslims followed by Hindus (21%) and then Christians (10.3%)[9]. In the present study majority of the diabetic patients (62.4%) were illiterates. About 36.2% studied upto high school and only 1.2% did graduation. But as per the study done by Swapna S Kadam *et al* (2014) in Chitradurga majority of the diabetic patients (47%) studied upto high school, 24% studied secondary education, 16% were illiterates and 13% were graduates and above[10].

In the current study the majority of the population belonged to Upper class (48.5%) followed by Upper-Middle class (39.9%), 5.6% were belonging to Middle class, 5.2% to Lower-Middle class and only 1% to Lower class. In the present study the majority (50%) of the diabetics were unemployed which included those who were into no occupation, retired men and

house wives and about 26.5% who were doing cultivation (agricultural farmers). About 10.8% were daily labourers, 5.3% business, 3.3% took over their caste occupations (like pottery, barbers etc.). As per the study done by Taruna Sharma *et al* (2014) in Uttarakand, majority (46.7%) of the study participants were working in government services including professionals. 25.8% were doing business, 11.7% were retired men, 10% house wives and 5.8% manual workers[11]. In the present study majority of the type 2 diabetics (31.7%) were diagnosed between age 51-60 years, followed by (30.1%) between age 41-50 years, a very few (4.9%) diabetics were diagnosed between age group 21- 30years. As per the study done by Meghna Borah *et al.* (2017) in Assam, the age of onset of diabetes in 78% of patients was between 40 and 59 years[12].

Duration of Diabetes: In the present study majority of the population (53.9%) are known diabetics since 1-5 years. Study done by Shuvankar Mukherjee et al (2013) in Kolkota, showed that the majority (53.8%) were known diabetics since >5 years[13]. In the present study majority (58.5%) of study population do not have any family history of diabetes mellitus and only 21.9% of the study population have a family history of diabetes mellitus. The current study has shown majority (39.5%) of study population as pre-obese, about 27.1% were belonging to average weight, 19.3% were obese class-1, about 8.8% were obese class-2 and 2.6% were belonging to underweight and obese class-3. In the present study m of type 2 diabetics 80.4% are Never Smokers, 12.4% are current smokers and 7.2% are ex-smokers. In the present study majority of the population 83.4% of the people have been getting their regular blood checkups at least once in 3 months. Sontakke *et al.* (2015) reported in their study done in Nagpur, only 46% patient's actually monitored blood glucose regularly[14]. In the present study, it was also observed that a significant proportion of the study subjects had associated co-morbidities such as hypertension (42.8%), coronary artery disease (4.6%), cerebro vascular attacks (1.6%) and about 11.1% were having multiple co morbidities. In the present study majority of the study population majority (55.2%) developed no complications due to diabetes. As per the study done by Nafisa C Vaz (2011) in Goa, among the diabetics, the prevalence of complications due to diabetes were observed to be CHD, peripheral vascular disease, CVA, retinopathy, cataract and neuropathy were 32.3%, 11.5%, 6.9%, 15.4%, 20% and 60% respectively[15]. The various complications were found to be significantly associated with DM. In the present study majority of the study population 92.8% were on oral hypoglycaemic drugs. This finding is similar to the study done by Manobharathi M *et al*. (2017) in which the majority (81.5%) were taking OHA[16]. In the present study majority of the study population (26.1%) of the type 2 diabetics have been hospitalized at least once because of Diabetes Mellitus. As per the study done by J.M. Khalid *et al.* (2013) in England, UK, 59.4% of patients had at least one hospitalisation (65.0% in the prevalent cohort., 45.8% in the incident cohort)[17].

Adherence Levels:

Medication Adherence: In the Present Study majority (93.1%) are adhering to the medication advice given by the doctor. As per the study done by ArulMoz Hi S. *et al.* (2014) in Puducherry, only 49.3% (95% CI: 41% to 57%) of the subjects had high medication adherence, 24.7% patients were showing moderate adherence and 26% low adherence[18].

Diet Adherence (Restricted Diet): In the present study 78.5% of the study population have successfully restricted their diet to the doctor advice. As per the study done by ArulMozHi S. *et al* (2014) in Puducherry, around 67.3% subjects reported of consuming diabetic diet for at least 4 days/week[18].

Exercise Adherence: In the present study only 9.8% of the study population are doing exercise other than routine work as per the doctor's advice. ArulMozHi S. *et al* (2014) in Puducherry reported only 22.7% of the diabetics did physical exercise for at least 30 minutes for at least 4 days in a week.

Factors Effecting Adherence:

Age: In the current study 29.4% (90) people were between the age group 18-50 years. Among them 90% (81) were adherent to medication. Remaining 70.6% (216) belonged to age group >50 years and among them 94.4% (204) were non-adherent. The above findings were not statistically significant with age (p=0.162). In the study done by Shuvankar *et al* (2013) both the univariate and the binary logistic regression analyses in the study showed that the compliance to the drug therapy had decreased significantly with an increase in age and that it was lowest (48.3%) in the age group of 60 years and above. In the current study among the type 2 diabetics, people belonging to age groups 18-50years about 61.1% were adherent to dietary advice. About 66.2% belonging to age >50 years were found adherent. The findings were statistically non significant (p=0.397).

Education: In the current study it shows that adherence to medication was highest among those who were illiterate (96.3%). This finding was found to be statistically significant (p=0.004). In the study done

by Shuvankar *et al* (2013) the compliance rate was significantly lower among those who were illiterate. In a study done by Shaimol T *et al* (2014) in Kerala by comparing educational status and medication adherence, patients with below matriculation level of education showed low adherence compared to undergraduate and graduate population[19]. In the current study adherence to diet was observed to be more among the illiterates (74.8%) than the literates (45.8%). This was found to be statistically significant (p=0.000). In the current study adherence to exercise was more among the literates (80.9%) than those who were illiterates (15.2%). The findings were statistically non-significant (p=0.805).

Occupation: In the current study proportion of adherence to medication was higher in people without unemployed (93.5%) than those who were employed (92.8%). This was found to have no statistical significance. The adherence to diet was more among people who were unemployed (69.3%) compared to the people with who were employed (60.1%). The findings were statistically non-significant (p=0.095).

Period of Medication: Considering adherence to medication prescribed by the doctor in the current study among people taking medications since 1-5years about 93.8% were found to be adherent. While among those taking from 6-10 years of age 94.3% were adherent. The findings were statistically not significant (p=0.449).

Considering Adherence to Diet: In the current study among people taking medications since 1-5years about 64.2% were found to be adherent. While among those taking from 6-10 years of age 65.2% were adherent. The above findings were statistically not significant (p=0.885). The statistical comparison between the group with <10 years DM duration and >10 years DM yielded better practices among participants with >10 years of DM in having a diet plan, consumption of high fat diet (less if DM duration ≥10 years, P=0.04), there was no statistically significant difference between the two groups with regards to consumption of fruits/vegetables in their diet and consumption of fried foods (71).

Obese: In the current study people who were non obese (94.8%) were found to be more adhered to medication than those who were obese (89.4%). The findings were statistically not significant (p=0.082).In the study people who were non obese (70.3%) were found to be more adhered to diet than those who were obese (52.1%). The findings were statistically significant (p=0.002). In the study people who were non obese (81.1%) were found to be more adhered to exercise than those who were obese (11.8%). The findings were statistically not significant (p=0.122).

Family History: In the current study people with known family history of diabetes were found to be more adherent (94.8%) to medication than those with no family history of known diabetes (92.1%). The findings were statistically not significant (p=0.362). In the current study people with known family history of diabetes (20.7%) were found to be more adhered to exercise than those with no family history of known diabetes (14.2%). The findings were statistically not significant (p=0.141).

Smoking History: In the current study people who were known smokers (92.1%) were less adherent to medication than those with no smoking or stopped smoking (93.3%). The findings were statistically not significant (p=0.789). The study showed that people who were known smokers were less adherent (57.9%) to diet than those with no smoking or stopped smoking (65.7%). The findings were statistically not significant (p=0.349). In the current study people who were known smokers were more adherent (31.6%) compared to people who were not smokers or stopped smoking (14.6%). The findings were statistically significant (p=0.008).

Health Care Provider: In the current study type 2 diabetics receiving their health care needs through the public sector were more adherent to medication (97.7%) than the diabetics receiving from the private sector (92.4%). People receiving their health care needs through the public sector were more adherent to diet (77.2%) than the diabetics receiving from the private sector (62.6%, p=0.06). The findings were statistically significant. In the study type 2 diabetics receiving their health care needs through the public sector were less adherent to exercise (11.4%) than the diabetics receiving from the private sector (17.6%). p=0.309.

Complications: In the current study, people with and without complications were comparatively better adherent to medication. In comparison among the diabetics with and without complications, the people with complication due to diabetes were more adherent (94.4%) to medication than those without any complications (92.9%). In the current study, people with and without complications were comparatively better adherent to diet. In comparison among them, people having complications due to diabetes were less adherent (62.9%) than those without any complications (65%). In the current study, people with

and without complications were comparatively less adherent to exercise. In comparison among them, people having complications due to diabetes were more adherent (22.2%) than those without any complications (15.5%). The findings were not significant (p=0.229).

CONCLUSION

Majority developed no complications due to diabetes. Health Care Systems (which included private clinics, private medical colleges and corporate hospitals) were used by >half of the diabetics. Only a quarter diabetics have been hospitalized because of Diabetes Mellitus as the underlying cause. Most of the study participants were adhering to the medication advice given by the doctor. Majority have successfully restricted their diet according to the doctor advice. Less number of study participants were either moderately or poor adherent to the control in consumption of sweets. Most of the diabetics were poorly adherent to exercise (at least 20-30 min walking daily), majority of them giving the reason as no time available or self-satisfied with the work they are engaged into. Only 1/10th are doing exercise other than routine work as per the doctor's advice.

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