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Determinants and Effects of Non Adherence to Drugs in Type 2 Diabetes Mellitus in a Teaching Hospital

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Materials and Methods : A cross sectional study was undertaken for a period of three months in outpatient department of Basaveshwara Medical College Hospital and Research Centre, Chitardurga. The patients were chosen randomly, and a predesigned and structured questionnaire was administered for the participants. The data thus obtained compiled and analysed using appropriate statistics.

Results : Most of the subjects were males, aged between 40 to 70 years, married, had diabetes since 6 years and belonged to lower socio – economic status. The non adherence rate was 15% in this study. The patients with non adherence had high blood sugar levels and HBA_{1c} levels. Changes in vision, abnormal lipid profiles, micralbuminuria and abnormal BUN/CR ratios were the common effects in the non adherence.

Conclusions : The adherence drug medication is influenced by demographic, psychological, social factors, health care provider, medical system, disease and treatment related factors.

I. INTRODUCTION

Healthcare mainly relies on prescription of medicines mainly to allay the disease and promotion of health. Millions of prescriptions are generated everyday by the medical professionals for treatment of various diseases.¹ In a chronic disease like diabetes mellitus needs constant attention to diet, exercise, glucose monitoring and medication to achieve good glycemic control and to prevent further

complications. But most of the patients with Diabetes do not adhere to their medications which can be frustrating for both health care workers and family members.^{2, 3} In general the non-adherence rates for most of the chronic diseases are approximately 50%.⁴ As per WHO the term adherence is defined as “the extent to which a person’s behavior – taking medication, following diet, and/or executing lifestyle changes – corresponds with agreed recommendations from a health care provider”.⁵ The available literature shows that, the adherence rates were 65% for the diet and 19% for the exercise.^{6,7} The electronic measurements of adherence to oral medications in two of the studies were 53 and 67%. In another study the adherence rates to sulfonylureas by pill count was 104% to one day regimen and 87% to twice and thrice a day regimens. On electronic monitoring the same rates were reduced to 94 and 57% respectively.⁸ Several factors influences the nonadherence in diabetes mellitus like demographic, psychological and social factors.² But the literature is scarce especially in country like India to show the exact role of these factors in nonadherence.

The literature available also shown that diabetes accelerates the natural course of atherosclerosis and many diseases like hypertension needs to be treated.⁹ In the era of increase in diabetes mellitus, especially in older patients and overweight with cardiovascular risks medication adherence plays a key role. The health care systems cannot provide support to each patient due to paucity of the resources. The problem with poor self management of diabetes despite improved technology is escalating the problem of diabetes related problems.¹⁰

Since there is paucity of literature regarding the nonadherence rates and factors which are influencing the nonadherence, this study was taken up in a resource scarce setting like Karnataka. This study was mainly taken up with the aim of studying the adherence rates and factors influencing the nonadherence.

II. MATERIALS AND METHODS

A cross sectional study was conducted in a tertiary care hospital in order to meet the objectives of the study. This study was conducted for a period of three months between January, 2013 and March 2013.

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About 400 patients visit the outpatient department of Basaveshwara Medical College Hospital and Research Centre, Chitradurga daily, of which 10% of the patients were suffering from type 2 diabetes mellitus. Most of the diabetes patients were visiting OPD for regular follow up. These patients were randomly chosen for the study. A total of 167 type 2 diabetic patients were chosen randomly as study sample. A pre designed and structured questionnaire was administered all the patients included in the study. The questionnaire

included demographic particulars, family history of diabetes mellitus and drug compliance among family members, recent fasting blood sugar and HbA_{1c} levels and reasons for non compliance. The data thus obtained was compiled and analysed using Statistical Package for Social Services (SPSS vs 18). Univariate ANOVA was used to study the influence of different factors of nonadherence and its effects in type 2 Diabetes Mellitus.

III. RESULTS

Table 1 : Socio – demographic factors of the study sample

	Characteristics	Drug adherence		Total N (%)	Multivariate analysis	
		Yes N (%)	No N (%)		F value	p value, sig
Age	25 - 40 years	8 (5.6)	6 (24)	14 (8.4)	0.229	0.633, NS
	40 - 55 years	72 (50.7)	8 (32.0)	80 (47.9)		
	55 - 70 years	51 (35.9)	6 (24.0)	57 (34.1)		
	More than 70 years	11 (7.7)	5 (20)	16 (9.6)		
Sex	Male	79 (85.9)	13 (14.1)	92 (55.1)	0.032	0.857, NS
	Female	63 (84.0)	12 (16.0)	75 (44.9)		
Marital status	Married	118 (88.1)	16 (11.9)	134 (80.2)	5.653	0.019, Sig
	Single	16 (76.2)	5 (23.8)	21 (12.6)		
	Divorced	6 (75.0)	2 (25.0)	8 (4.8)		
	Widowed	2 (50.0)	2 (50.0)	4 (2.4)		
Family Income INR	10000 – 50000	23 (67.2)	11 (32.4)	34 (20.4)	7.180	0.008, Sig
	50000 – 100000	34 (91.9)	3 (8.1)	37 (22.2)		
	100000 – 200000	45 (90.0)	5 (10.0)	50 (29.9)		
	More than 200000	40 (87.0)	6 (13.0)	46 (27.5)		
Duration of diabetes	1 – 3 years	41 (89.1)	5 (10.9)	46 (27.5)	2.153	0.144, NS
	3 – 6 years	35 (87.5)	5 (12.5)	40 (24.0)		
	6 – 10 years	41 (80.4)	10 (19.6)	51 (30.5)		
	More than 10 years	25 (83.3)	5 (16.5)	30 (18.0)		
Family history	Yes	92 (82.9)	19 (17.1)	111 (66.5)	0.34	0.561, NS
	No	50 (89.3)	6 (10.7)	56 (33.5)		
Drug compliance in family members	Good	52 (83.9)	10 (16.1)	62 (37.1)	0.000	0.997, NS
	Poor	18 (66.7)	9 (33.3)	27 (16.2)		
	Unknown	22 (100)	0	22 (13.2)		
	No family history	50 (89.3)	6 (10.7)	56 (33.5)		
Type of anti- diabetics	Only on insulin	44 (81.5)	10 (18.5)	54 (32.3)	2.853	0.093, NS
	Only on Oral hypoglycemic	90 (85.7)	15 (14.3)	105 (62.9)		
	Both on insulin and OHGs	8 (100)	0	8 (4.8)		
Diet	High in carbohydrates and proteins	90 (63.4)	6 (24.0)	96 (57.5)		
	High in fats	38 (26.8)	14 (56.0)	52 (31.1)		
	Junk food	14 (9.9)	4 (16.0)	18 (10.8)		
	Controlled health diet	38 (26.8)	9 (36.0)	47 (28.1)		

Table 1 shows the demographic factors of the study sample. Most of the patients with type 2 diabetes mellitus were aged between 40 – 70 years and males were more than females. Almost 80.5% of them were married and had income of more than one lakh INR per year. More than half of the patients had diabetes within 6 years and had family history of type 2 diabetes mellitus. The drug compliance was good in 37.1% of the patients and poor in 16.2% with type 2 diabetes mellitus.

About 15% of the patients in this study had nonadherence to the diabetic drugs. Most of them were aged more than 40 years. Females were non adherent more than males. The participants who were married had lower rates of nonadherence compared to those who were single, divorced and widowed. The nonadherence rates were higher in economically weak patients and who had diabetes since 6 years or more and those with family history of diabetes. The family

member's adherence rates had shown that it was poor in 33% in the family members of the diabetic patients. The rate of nonadherence to insulin was more compared to those who were on oral hypoglycemic drugs. Only 28.1% of the patients were on controlled healthy diet in this study.

A multivariate analysis had shown that marital status and family income were significant risk factors for nonadherence to drugs in diabetes mellitus.

Table 2 : Fasting blood sugar and HbA_{1c} levels in the study group

	Characteristics	Drug adherence		Total
		Yes N (%)	No N (%)	N (%)
Fasting blood sugar	50 – 130 mg/dl	110 (99.1)	1 (0.9)	111 (66.5)
	130 – 200 mg/dl	32 (100)	0	32 (19.2)
	200 – 350 mg/dl	0	21 (100)	21 (12.6)
	More than 350 mg/dl	0	3 (100)	3 (1.8)
HbA _{1c}	4 – 7 %	124 (96.9)	4 (3.1)	128 (76.6)
	More than 7 %	18 (46.2)	21 (53.8)	39 (23.4)

The table 2 shows the fasting blood sugar and HbA_{1c} levels in the study group. Almost all the non adherent diabetic patients had fasting blood sugar

levels of more than 200 mg/dl and more than half of them had HbA_{1c} level of more than 7 %.

Table 3 : Effects of nonadherence to drugs of Diabetes Mellitus

	Characteristics	Drug adherence		Total	Multivariate analysis	
		Yes N (%)	No N (%)	No N (%)	F value	p value, sig
Weight changes	Increased	40 (28.2)	8 (32.0)	48 (28.7)	1.009	0.317, NS
	Decreased	23 (16.2)	5 (20.0)	28 (16.8)		
	No changes	79 (55.6)	12 (48.0)	91 (54.5)		
Changes in vision	Yes	18 (12.7)	6 (24.0)	24 (14.4)	0.067	0.796, NS
	No	124 (87.3)	19 (76.0)	143 (85.6)		
Lipid profile	Normal	43 (30.3)	5 (20.0)	48 (28.7)	0.123	0.726, NS
	Abnormal	99 (69.7)	20 (80.0)	119 (71.3)		
Microalbuminuria	Yes	56 (39.4)	20 (80.0)	76 (45.5)	13.577	0.000, Sig
	No	86 (60.6)	5 (20.0)	91 (54.5)		
BUN / CR	Normal	109 (76.8)	5 (20.0)	114 (68.3)	31.5	0.000, Sig
	Compatible with diabetic nephropathy	31 (21.8)	18 (72.0)	49 (29.3)		
	Failure because of other co morbid conditions	2 (1.4)	2 (8.0)	4 (2.4)		
Hypoglycemic episodes	Every day	0	4 (16.0)	4 (2.4)	11.20	0.001, Sig
	2 – 3 times a week	16 (11.3)	4 (16.0)	20 (12.0)		
	2 – 3 times a month	50 (35.2)	11 (44.0)	61 (36.5)		
	Very rarely	76 (53.5)	6 (24.0)	82 (49.1)		

Table no 3 displays the effect of nonadherence to diabetic drugs among the study group. About 56.0% of the non adherent subjects were consuming diet rich in fats and only 36.0% were consuming controlled healthy diet. About 32.0% of the non diabetic increased their weight and 20% decreased their weights. About 24% of the non adherent diabetics had changes of vision and 80% had abnormal lipid profiles. Eighty percent of the non adherent diabetics had microalbuminuria and 72% had BUN/ CR ratios compatible with the diabetic nephropathy. Among the non adherent diabetic subjects 44% had hypoglycemic episodes 2 – 3 times in a month.

The multivariate analysis had shown significant results for microalbuminuria, BUN & creatinine ratio and hypoglycemic episodes and nonadherence.

Table 4 : Reasons for nonadherence in the study group

Reason for not being compliant	Frequency	Percent
Poverty (can't afford medications)	5	20.0
Lack of awareness and negligence	4	16.0
Hates taking insulin injections	2	8.0
Depression and other mood disorders	5	20.0
Increased hypoglycemic episodes	2	8.0
Old or no caretakers	1	4.0
Worried about drug side effects	1	4.0
Does not like the side effects	2	8.0
Drug interaction	1	4.0
Hospitalized due to chronic disease	1	4.0
Other unknown	1	4.0

In this study the main reason for nonadherence was non affordability to purchase the drugs and psychiatric illness. This was followed by lack of awareness, hate towards insulin injection, increased hypoglycemic episodes and side effects of drugs were the other reasons for nonadherence in the study group.

IV. DISCUSSION

Adherence is a key issue especially in a chronic illness like diabetes mellitus. The nonadherence results elevation of the blood sugar levels and subsequent micro and macro vascular complications.^{2, 3} This cross sectional study was undertaken with the aim studying the prevalence, risk factors, effects and reasons for nonadherence in diabetic patients.

The prevalence of nonadherence to diabetic drugs was 15% in this study. The nonadherence rate was more for patients who were on insulin than oral hypoglycemics. In a study by Mason¹¹ et al, the adherence to oral medication was 53% and Paes¹² et al had shown 67% of the adherence to oral hypoglycemics. However this study had shown higher adherence compared other studies in the past. The literature also shows that the adherence rates decreases with increase in complexity of the diabetic drug regimen.²

The literature had documented that a number of factors related the diabetes regimen adherence problems including demographic, psychological, social factors health care provider, medical system, disease and treatment related factors.^{2, 13} In this study, marital status and family income were the significant risk factors for nonadherence. However other studies had shown age, sex, ethnicity, income, education and co morbidity with physical or psychiatric illness were considered as the predictors of non adherence.^{3, 14} The marital status influences the adherence that the spouses usually help in consumption of diabetic drugs. Since diabetes is a chronic disease requiring lifelong medication usually affects the people belonging to lower socioeconomic status. Similar findings were also noticed by Glasgow et al.¹⁵

The fasting blood sugar was raised above 200 mg/dl and HbA_{1c} levels were raised above 7 mg/dl in patients who were non adherent to diabetic drugs. The diabetes patients can regulate the blood sugar levels by drugs, diet and physical exercise. However if there disturbance in any of these control factors the sugar levels shoots up. This finding was also supported by similar studies.^{16, 17}

Self reported increase in weight, changes in vision, microalbuminuria, abnormal BUN & Creatinine ratio were the common abnormal lipid profiles and increased hypoglycemic episodes were the effects noticed more frequently in nonadherent groups than adherent group. The multivariate analysis also had shown the significant results for microalbuminuria, BUN & creatinine ratio and hypoglycemic episodes. While ENTRED study had noticed increased odds ratio for dyslipidemia presence of micro vascular complications in non adherence group compared adherence group.¹⁷

In another study by Ho et al, the non adherent patients were younger and had low comorbidities compared to their counterparts. The non adherent group noticed increased glycosylated hemoglobin, and increased low density lipoproteins. The study had also shown that the medication adherence also had increased risk for all causes of hospitalization and all cause mortality.¹⁸

In this study the main reason for nonadherence was financial constraints to purchase the drugs and psychiatric illness. Similar findings were also reported by Pascal et al in a study in Nigeria.¹⁶ In a study in Saudi Arabia, male sex, level of education, urban population, irregularity in follow up, non adherence to insulin were found to as risk factors for non compliance for diabetes mellitus.¹⁹

The non adherence to drug regimens of diabetes mellitus is serious health care concern in successful health care delivery. The non adherence results in improper control of glycemic levels and subsequent complications. The adherence to drug regimens is the responsibility of the patients. The health care worker including doctors can facilitate in adherence but cannot substitute the non modifiable risk factors.

Health education is the main tool in dealing with the non adherence rates.

The adherence to diabetic drugs is the key issue in delivery of effective health care. The adherence can be influenced by several factors. The adherence drug medication is influenced by demographic, psychological, social factors, health care provider, medical system, disease and treatment related factors. Some of these factors are modifiable and some are non modifiable. It is a combined effort from the patient, the treating physician and policy makers to reduce the non adherence and promote the health. The awareness programs of primary health care workers and patients are of utmost important to maintain the glycemic level and prevention of complications.

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