



DETERMINING THE INTERRELATIONSHIP OF DIABETIC AWARENESS TO GLYCAEMIC LEVELS AND TREATMENT ADHERENCE IN KNOWN DIABETICS: A CLINICAL STUDY

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ABSTRACT

Background: Better diabetes knowledge is associated with better glycaemic control and medication adherence. Good glycaemic control helps in decreasing diabetic complications secondary to medication adherence and self-management by diabetic patients. **Aim:** The present clinical study was conducted to assess the interrelationship of diabetic knowledge to glycaemic levels and treatment adherence in known diabetic patients. **Materials and Methods:** In 122 diabetic patients, detailed history was recorded. Concerning adherence to the medication, the subjects were divided into three categories based on Morisky Medication Adherence Scale scores as follows; less than 6: poor adherence, 6-8: Moderate adherence, and score of 8 as high adherence. The data was collected for results formulation. The collected data was subjected to statistical evaluation and results were formulated. **Results:** Dyslipidaemia and hypertension were common comorbidities seen. 72.13% (n = 88) subjects had a low adherence, 24.59% (n = 30) subjects had medium treatment adherence, and 4.09% (n = 5) study subjects had high adherence to the treatment. Main factors noticed for adherence lack were drug dependence fear, considering prescribed medicine ineffective, lack of hospital access, side effects, alternate therapy shifting, discontinuation on their own, missing doses often, unawareness towards effects of missed doses, time lack, and difficulty in following diet restrictions seen in 41.96% (n = 47), 23.21% (n = 26), 28.57% (n = 32), 45.53% (n = 51), 16.07% (n = 18), 18.75% (n = 21), 72.32% (n = 81), 66.96% (n = 75), 52.67% (n = 59), and 72.32% (n = 81) study subjects. **Conclusion:** Within its limitations, the present study concludes that awareness and knowledge concerning diabetes is a vital factor governing adherence to advised anti-diabetic therapy. Diabetic subjects and healthcare providers should be well-informed about the interrelationship of disease awareness and better compliance and adherence.

KEYWORDS: Adherence, Diabetes knowledge, Glycaemic levels, Medication adherence, OHA (Oral Hypoglycaemic Agents), Type 2 diabetes

INTRODUCTION

Diabetes mellitus is a disease with heterogeneous disorders having chronically elevated blood glucose levels caused by acquired/inherited insulin deficiency owing to decreased pancreatic production, or ineffective use, or both as advised by WHO. Insulin deficiency leads to chronically elevated blood glucose levels, which in turn,

affect body systems, progressing to diabetes-associated complications affecting nerves and vessels including diabetic neuropathy, nephropathy, and/or retinopathy. The prevalence of diabetes is very high globally, affecting approximately 400 million people.¹ With more than 70 million diabetes cases, India is becoming the diabetic capital of the World. Estimated increases in diabetics globally by

2045 is 150 million, with the major increase expected in India and developing nations owing to unhealthy diet, lifestyle, obesity, and population increase.²

One rare type of diabetes is MODY (maturity-onset diabetes mellitus) resulting from the genetically altered inherited β -cells dysfunction in islets of Langerhans of the pancreas resulting in non-insulin-dependent diabetes mellitus. In India, there is a significant increase in the diabetes prevalence in both rural and urban geographic areas, with approximately 1/4th diabetic population in urban areas, and more in South India than North India. Diabetes claims many lives annually in India.³ Medical condition in an individual is largely governed by two factors including the understanding of the disease and treatment compliance. Diabetes mellitus is treated by lifestyle modification added with pharmacotherapy, both of which are long-term management strategies. Failure to maintain long-term management results in diabetes-associated complications including diabetic neuropathy, nephropathy, and/or retinopathy. Previous literature data suggest approximately 50% of diabetics are non-compliant with management leading to complications and death.⁴

Lifestyle modification is an essential, however, a challenging measure to achieve in diabetics, and hence, need an alternative, and hence medicine plays an important role concerning this. Medication adherence is another factor determining the successful management of a chronic illness along with disease awareness. Diabetic awareness in India is poor where one study suggests approximately 50% population had diabetic awareness. Better diabetes knowledge is associated with better glycaemic control and medication adherence. Good glycaemic control help in decreasing diabetic complications secondary to medication adherence and self-management by diabetics. Discharge medicine and counseling can help in management adherence with adequate glycaemic control (90-110 mg/dl). Monitoring medication adherence can be direct (urine/blood analysis for assessing drug presence) or indirect (reports by practitioners, self, and other related persons).⁵

Diabetes management is demanding requiring equal try from healthcare providers and the subjects including periodic glucose monitoring and regular medication intake. Increasing awareness and knowledge among diabetics and the general population by healthcare providers is a vital tool to improve adherence and decreasing complications, which can be achieved by using posters, audio-visual aids, and patient counseling.⁶ The present clinical study was conducted to assess the interrelationship of diabetic knowledge to glycaemic levels and treatment adherence

in known diabetics. The study also assessed factors leading to medication adherence.

MATERIALS AND METHODS

The present prospective cross-sectional clinical study was conducted after obtaining clearance from the Ethical committee. The study population was recruited from the subjects visiting the Outpatient Department of Private Urban Clinic in Mumbai. The inclusion criteria for the study were subjects of age 35 years or more having type 2 diabetes mellitus for at least the past 1 year, subjects on either oral hypoglycaemics (OHA) or insulin for diabetes management and the subjects who agreed to give informed consent. Subjects with comorbidities were not excluded. The exclusion criteria for the study were subjects with gestational or type 1 diabetes mellitus, and subjects who did not agree to give consent for the study.

The study was conducted on a total of 122 diabetic patients including both males and females within the age group of 35 years to 80 years, and the mean age of 41.6 years. All the subjects were screened and assessed based on the study exclusion and inclusion criteria. After final inclusion, detailed history was recorded for each subject including demographics and disease-related history. The subjects who failed to give any asked information or informed consent or the subjects with no accompanying person were also excluded from the study.

Concerning adherence to the medication, Morisky Medication Adherence Scale⁷ was given to each subject. The scores for Morisky Medication Adherence Scale were given as 0 for the correct answer, whereas, the score of 1 was awarded to the incorrect responses. The scores were then added. The subjects were divided into three categories based on scores as follows; less than 6: poor adherence, 6-8: Moderate adherence, and score of 8 as high adherence. The data were collected for results formulation.

The collected data was subjected to the statistical evaluation using SPSS software version 21.0, 2012, Armonk, NY, ANOVA, and t-test. The results were formulated keeping the level of significance at $p < 0.05$.

RESULTS

The present study was conducted on 122 diabetic patients including both males (61.47%, $n = 75$) and females (36.88%, $n = 47$) within the age group of 35 years to 80 years, and the mean age of 41.6 years based on exclusion and inclusion criteria. The demographic characteristics of the study subjects are listed in Table 1. There were 9.83% ($n = 12$), 22.955 ($n = 28$), 31.14% ($n = 38$), 24.59% ($n = 30$), and

11.47% (n = 14) subjects respectively in the age group of 35-45, 46-55, 56-65, 66-75, and >75 years age group. 54.91% (n = 67) subjects had normal weight, whereas, 4.91% (n = 6) and 40.16% (n = 49) subjects had underweight and overweight respectively. Concerning lifestyle habits, 17.21% (n = 21) subjects were smokers, 22.13% (n = 27) were alcoholics, and 9.01% (n = 11) were both.

It was also seen that 4.91% (n = 6), 45.08% (n = 55), 31.96% (n = 39), 12.29% (n = 15), and 5.73% (n = 7) subjects had diabetes for 1-2, 2-5, 5-10, 11-15, and 16-20 years respectively. Associated comorbidities were present in 62.29% (n = 76) subjects. Among comorbidities, dyslipidaemia, hypertension, chronic kidney disease, pulmonary disease, CVDs were reported by 11.84% (n = 9), 30.26% (n = 23), 2.63% (n = 2), 1.31% (n = 1), and 9.21% (n = 7) study subjects. Dyslipidaemia and hypertension were common. Concerning treatment, 74.59% (n = 91) subjects were on Oral hypoglycaemics (OHA) and 25.40% (n = 31) subjects were on combined Oral hypoglycaemics (OHA) and insulin therapy (Table 1).

On assessing adherence towards the anti-diabetic therapy in the study, subjects were assessed using Morisky Medication Adherence Scale for treatment and medication adherence. It was seen that 72.13% (n = 88) subjects had low adherence, 24.59% (n = 30) subjects had medium treatment adherence, and 4.09% (n = 5) study subjects had high adherence to the treatment advised to them for diabetic control as shown in Table 2. In Morisky Medication Adherence Scale, most subjects with low adherence had a positive response to factors like forgetting medicine while traveling/moving out, having hassle sticking to the treatment plan, and/or forgetting to take medications.

High treatment adherence was seen in the age group of 66-75 years of age with 6.6% of study subjects, whereas medium adherence was seen in the 56-65 years age group with 26.31% subjects. Among 75 males, poor adherence to treatment was shown by 73.3% (n = 55) subjects, and among 47 females, 68.02% (n = 32) study subjects had poor adherence to treatment. For diabetes duration, low adherence, medium adherence, and high adherence was shown respectively in age groups of 1-5 (16.6, n = 1), 16-20 (28.57%), and 5-10 (69.23%) years duration. Concerning anti-diabetic therapy, low adherence was more in subjects taking Oral hypoglycaemics with Insulin with 74.19% (n = 23) subjects (Table 3).

On assessing the factors responsible for non-adherence to the advised treatment plans, the main factors noticed were drug dependence fear, considering prescribed medicine ineffective, lack of hospital access, side effects,

S. No.	Characteristics	Percentage (%)	Number (n)
1	Age (years)		
a)	35-45	9.83	12
b)	46-55	22.95	28
c)	56-65	31.14	38
d)	66-75	24.59	30
e)	>75	11.47	14
2	Gender		
a)	Females	38.52	47
b)	Males	61.48	75
3	BMI		
a)	Normal	54.91	67
b)	Underweight	4.91	6
c)	Overweight	40.16	49
4	Education Status		
a)	Primary	86.06	105
b)	Undergraduate or less	12.29	15
c)	Postgraduate or higher	1.63	2
5	Lifestyle		
a)	Smoking	17.21	21
b)	Alcohol	22.13	27
c)	None	51.63	63
d)	Both	9.01	11
6	Diabetes Duration (years)		
a)	2-Jan	4.91	6
b)	5-Feb	45.08	55
c)	10-May	31.96	39
d)	15-Nov	12.29	15
e)	16-20	5.73	7
7	Comorbidities Presence		
a)	Present	62.3	76
b)	Not present	37.7	46
8	Comorbidities (n=76)		
a)	Dyslipidaemia	11.84	9
b)	Hypertension	30.26	23
c)	Chronic Kidney disease	2.63	2
d)	Pulmonary disease	1.31	1
e)	Cardiovascular disease	9.21	7
f)	Others	44.73	34
9	Diabetes Treatment		
a)	Oral hypoglycaemics (OHA)	74.59	91
b)	Oral hypoglycaemics (OHA) with Insulin	25.4	31

Table 2: Medication and Treatment Adherence in the Study Subjects

S. No	Characteristics	Percentage (%)	Number (n)
1	Low	72.13	88
2	Medium	24.59	30
3	High	4.09	5

Table 3: Association of Demographics to the Treatment Adherence in the Study Subjects

S. No	Characteristics	Low Adherence % (n)	Medium Adherence % (n)	High Adherence % (n)
1.	Age (years)			
a)	35-45 (12)	75 (9)	25 (3)	0
b)	46-55 (28)	75 (21)	21.42 (6)	3.57 (1)
c)	56-65 (38)	68.42 (26)	26.31 (10)	2.63 (1)
d)	66-75 (30)	70 (21)	23.3 (7)	6.6 (2)
e)	>75 (14)	78.57 (11)	21.42 (3)	0
2.	Gender			
a)	Females (47)	68.08 (32)	29.78 (14)	2.12 (1)
b)	Males (75)	73.3 (55)	20 (15)	6.6 (5)
3	Education Status			
a)	Primary (105)	72.38 (76)	23.80 (25)	3.80 (4)
b)	Undergraduate or less (15)	73.33 (11)	20 (3)	6.66 (1)
c)	Postgraduate or higher (2)	100 (2)	0	0
4	Diabetes Duration (years)			
a)	1-2 (6)	66.6 (4)	16.6 (1)	16.6(1)
b)	2-5 (55)	76.36 (42)	21.81 (12)	1.8 (1)
c)	5-10 (39)	69.23 (27)	25.64 (10)	5.12 (2)
d)	11-15 (15)	66.6 (10)	26.6 (4)	6.6 (1)
e)	16-20 (7)	57.14 (4)	28.57 (2)	14.28 (1)
5	Comorbidities Presence			
a)	Present (76)	68.42 (52)	26.31 (20)	5.26 (4)
b)	Not present (46)	73.91 (34)	17.39 (8)	8.69 (4)
6	Diabetes Treatment			
a)	Oral hypoglycaemics (91)	70.32 (64)	26.37 (24)	3.29 (3)
b)	Oral hypoglycaemics with Insulin (31)	74.19 (23)	16.12 (5)	9.67 (3)

Table 4: Factors Responsible for Non-adherence in the Study Subjects

S. No	Factors for Non-adherence	Percentage (%)	Number (n)
1	Drug dependence fear	41.96	47
2	Considering medicine ineffective	23.21	26
3	Lack of hospital access	28.57	32
4	Side effects	45.53	51
5	Alternate therapy shifting	16.07	18
6	Discontinuation on their own	18.75	21
7	Missing doses often	72.32	81
8	Unawareness towards effects of missed doses	66.96	75
9	Time lack	52.67	59
10	Difficulty in following diet restrictions	72.32	81

shifting to alternate therapy, discontinuation on their own, missing doses often, unawareness towards effects of missed doses, time lack, and difficulty in following diet restrictions seen in 41.96% (n = 47), 23.21% (n = 26), 28.57% (n = 32), 45.53% (n = 51), 16.07% (n = 18), 18.75% (n = 21), 72.32% (n = 81), 66.96% (n = 75), 52.67% (n = 59), and 72.32% (n = 81) study subjects as shown in (Table 4).

DISCUSSION

The present clinical study was conducted to assess the interrelationship between diabetic knowledge to glycaemic levels and treatment adherence in known diabetic patients. The study also assessed factors leading to medication adherence. The study included 122 diabetic patients including both males (61.47%, n = 75) and females (36.88%, n = 47) within the age group of 35 years to 80 years and the mean age of 41.6 years.

It was also seen that 4.91% (n = 6), 45.08% (n = 55), 31.96% (n = 39), 12.29% (n = 15), and 5.73% (n = 7) subjects had diabetes for 1-2, 2-5, 5-10, 11-15, and 16-20 years respectively. Associated comorbidities were present in 62.29% (n = 76) subjects. Among comorbidities, dyslipidaemia, hypertension, chronic kidney disease, pulmonary disease, CVDs were reported by 11.84% (n = 9), 30.26% (n = 23), 2.63% (n = 2), 1.31% (n = 1), and 9.21% (n = 7) study subjects. Dyslipidaemia and hypertension were common. Concerning treatment, 74.59% (n = 91) subjects were on Oral hypoglycaemics and 25.40% (n = 31) subjects were on combined Oral hypoglycaemics and

insulin therapy. These findings were similar to the ones reported by Druss B *et al.*⁸ in 2001 and Wolff J *et al.*⁹ in 2002 where authors suggest the occurrence of one or more comorbidities in diabetics, with hypertension and chronic kidney diseases being common ones.

On assessing adherence towards the anti-diabetic therapy in study, patients were assessed using Morisky Medication Adherence Scale for treatment and medication adherence. It was seen that 72.13% (n = 88) subjects had a low adherence, 24.59% (n = 30) subjects had medium treatment adherence, and 4.09% (n = 5) study subjects had high adherence to the treatment advised to them for diabetic control. In Morisky Medication Adherence Scale, most subjects with low adherence had a positive response to factors like forgetting medicine while traveling/moving out, having hassle sticking to the treatment plan, and/or forgetting to take medications. These findings were in agreement with the studies of Mathew E *et al.*¹⁰ in 2014 and Yusuff K *et al.*¹¹ in 2008 where authors reported comparable medium, low, and high adherence in diabetics.

On assessing the factors responsible for non-adherence to the advised treatment plans, the main factors noticed were drug dependence fear, considering prescribed medicine ineffective, lack of hospital access, side effects, alternate therapy shifting, discontinuation on their own, missing doses often, unawareness towards effects of missed doses, time lack, and difficulty in following diet restrictions seen in 41.96% (n = 47), 23.21% (n = 26), 28.57% (n = 32), 45.53% (n = 51), 16.07% (n = 18), 18.75% (n = 21), 72.32% (n = 81), 66.96% (n = 75), 52.67% (n = 59), and 72.32% (n = 81) study subjects. These findings were consistent with the results of Al-Qazaz H *et al.*¹² in 2011 and Padma K *et al.*¹³ in 2012 where factors similar to the present study were suggested by the authors concerning non-adherence to diabetes treatment.

CONCLUSION

Within its limitations, the present study concludes that awareness and knowledge concerning diabetes is a vital factor governing adherence to advised anti-diabetic therapy. Diabetic patients and healthcare providers should be well-informed about the interrelationship of disease awareness and better compliance and adherence. Hence, repeated reinforcement of knowledge to patients should be considered especially in rural areas with a lack of knowledge. However, the present study had few limitations including smaller sample size, shorter monitoring period, geographical area biases, and single OPD setup. Hence, further longitudinal studies with larger sample size and

longer monitoring period are required to reach a definitive conclusion.

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