

Junctures to the therapeutic goal of diabetes mellitus: Experience in a tertiary care hospital of Kolkata

S. K. Lahiri, D. Haldar, S. P. Chowdhury¹, G. N. Sarkar, S. Bhadury¹, U. K. Datta²

Department of Community Medicine, RG Kar Medical College, ¹Department of General Medicines, ²Calcutta Medical College and Hospital, Kolkata, India

ABSTRACT

Introduction: The World Health Organization has declared India as the “diabetic capital” of the world. In controlling of such chronic, mostly asymptomatic disease, patients’ role can’t be overemphasized.

Aims: To assess the level of compliance to anti-diabetic therapies and to ascertain the determinants of non-compliance, if any.

Materials and Methods: A cross-sectional observational study was conducted for 3 months in a diabetic clinic of R G Kar Medical College and Hospital, Kolkata. Data were collected by interviewing the patients, examining their prescriptions and laboratory reports and anthropometry after obtaining informed consent.

Results: Blood report at the point of data collection revealed controlled glucose homeostasis in 38.93% patients but evaluation of past 3 months report showed only 24.3% had control over hyperglycemia. Glycemic control was seen to be positively related to short duration of disease, compliance to therapies, and high knowledge about diabetes. Compliance to therapies found in 32.22% of study subjects was in turn associated with short duration of disease. House-wives showed poor compliance; insulin treatment with or without oral-anti-diabetic agent showed better compliance. Knowledge of diabetes was significantly high among higher educated; poor among women, house-wives, and rural people.

Conclusion: Patient-providers collaboration is to be developed through a patient-centered care model based on the mutual responsibility of both so that each patient is considered in the mesh of his/her other goals of life and helped to promote empowerment to take informed decision for behavioral change conducive to control the disease.

Key Words: Adherence, compliance, diabetic-knowledge, glycemic control

INTRODUCTION

Due to economic, demographic, and epidemiological transition, India is facing double burden of diseases, i.e. rapid emergence of the noncommunicable disease which is the second highest (44%) cause of death only next to the unfinished agenda of communicable diseases which still shares 47% mortality of the country.^[1] Our health system traditionally developed to tackle the communicable diseases and nutritional disorders is not yet reformed fully to handle the rapid march of the noncommunicable health problems. Moreover, the expensive and technology oriented curative care seriously depletes the scarce societal resources which are still very much needed to cope with the traditional communicable and nutritional disorders.^[2] Diabetes mellitus (DM) has grown very fast during the

past two decades.^[3] At present, India leads the global top ten countries in terms of highest number of people with diabetes with current figure of 40.9 million followed by China having 39.8 million.^[4] It is projected to increase to 69.9 million by 2025.^[3] Every fifth patient visiting a consulting physician is a diabetic and every seventh patient visiting a family physician is a diabetic.^[5] The World Health Organization (WHO) has declared India as the “diabetic capital” of the world.^[6] Studies have shown that increasing patient knowledge regarding disease and its complications has significant benefits with regard to patient compliance to treatment and to decreasing complications associated with the disease.^[7] Considering

Address for Correspondence: Dr. Dibakar Haldar, Anandapally, Duttapara, Sitko Road, Baruipur, Kolkata - 700 144, India.
E-mail: dibahaldar@gmail.com

Access this article online

Quick Response Code:



Website:
www.jmidlifehealth.org

DOI:
10.4103/0976-7800.83271

this, it was sought to quantify in a population of diabetics visiting the clinic, the level of knowledge about diabetes and compliance to its treatment.

Objective(s)

1. To describe the socio-demographic profile of patients attending the clinic,
2. To assess the level of compliance to anti-diabetic therapies,
3. To ascertain the causes of noncompliance, if any.

MATERIALS AND METHODS

Study type and design

An Institution based cross-sectional observational study was conducted from January to March 2010 among the diabetic patients attending diabetes clinic (held once a week) at R G Kar Medical College and Hospital (RGKMC and H), Kolkata, a tertiary care teaching hospital.

Sampling design and sample size

As on records, average attendance of diabetic clinic was 180 per day. Among them, approximately 70% were follow-up visits/patients and they were the study population for the present study. About 1500 follow-up patients would attend the clinic in three months duration. 10% of these patients were included into the study with the help of systematic random sampling method. Thus, 152 patients were selected for the study.

Data collection and analysis

After getting approval, data pertaining to socio-demographic variables, information of diabetic condition e.g. duration, treatment modalities with duration, complication, family history, compliance to treatment and height-weight etc. were collected by interviewing patients using a predesigned and pretested questionnaire; examining medical records and by anthropometry after obtaining informed consent. Socio-economic status (SES) was judged as per modified B.G. Prasad's scale.^[8] Patients were also asked some questions that tested their knowledge about causation of diabetes, desired blood sugar level, and how to be achieved, complication if untreated, ways of prevention of DM, and comprehensibility of physician's advices. The knowledge score was calculated by points given for correct answers.^[5] 20 was the maximum score. Score of 50% or less (≤ 10) and more than that were considered as poor/average and good. Plasma sugar approximate to recommended value, i.e. fasting < 110 , < 90 mg%, and post-prandial < 140 , < 120 mg% for normal individual and pregnant lady, respectively, was considered "controlled." Three response sheets were duplicated

and excluded. Thus, data collected from 149 diabetic subjects were analyzed using simple proportion, "t", " χ^2 " tests and odds ratio (OR) with 95% confidence interval (CI), SPSS 17, and Epi info 3.4.3 version.

RESULTS

The mean, median, and range of age of participants were 49.4 ± 12.9 , 49 and 5-76 years, respectively. Of the participants, 28.18%, 61.07% and 10.74 % belonged to the age groups of ≤ 44 , 45-65, and ≥ 66 years, respectively. Males were 33.6% and older than females (52.8 ± 13.6 yrs vs 47.7 ± 12.3 yrs with $t=2.21$ at $df=147$, $P \leq 0.05$). Majority (77.2%) were Hindu and urban residents (75.8%). About 45% were either illiterate or had schooling up to primary level; 41.61%, 13.42% had secondary, higher secondary (HS) and above level of education. Out of 149 cases, 4 were type-I diabetics, 2 were Gestational diabetics (GDM) and rest were type-II diabetics. On the whole, present plasma glucose level was within normal limit in 38.93% subjects and 50%, 100%, and 37.76% in type-I, GDM, and type-II DM subjects. Glycemic control was not found to be associated with age, sex, religion, residence, education, occupation, SES, family history of DM, regularity and type of anti-diabetic drug intake, presence of cardiovascular disease (CVD) or other non-communicable disease (NCD) co-morbidity (33.56% patients had hypertension, 7.38% were hypothyroid, 3.36% were suffering from CHD, 4.69% had dyslipidemia, 1.34% were patients of COPD and 2.68% were suffering from anxiety/insomnia/depression, etc.) for which they were being treated concurrently [Tables 1 and 2]. It was also found not to have association with DM-related complications [Table 2] (6.71% patients reported abscess/gangrene of foot/toe, 13.42% complained of low vision, 6.71% had early cataract, 1.34% had glaucoma, 4.03% were diagnosed to suffer from peripheral neuropathy and 0.67% had compromised renal functions). However, satisfactory plasma glucose was seen among those who were reportedly suffering from DM for last 2 years or less and the same was true for those who were being treated at diabetic clinic of RGKMC and H for last 2 years or less [Table 2]. More than two-third (67.78%) participants were non-compliant who mentioned the component(s) of advice (multiple responses) they couldn't comply and indicated as cause of poor glycemic control. Financial constraints was reported by 11.88%, 37.37% confessed their inability to carry out physical exercise as advised, majority (54.54%) were unable to maintain dietary restriction, 6.06% reported alteration of drug regimen by their own and another 13.13% participants stated anxiety as cause of elevated

Table 1: Present status of glucose homeostasis and socio-demographic profile (N= 149)

Parameters		High plasma glucose, No. (%)	Normal plasma glucose, No. (%)	χ^2 , df, P	OR (95% CI)
Age (yrs)	≤44	23 (54.76)	19 (45.24)	1.19,2, 0.55046568	NA
	45-65	57 (62.64)	34 (37.36)		
	≥66	11 (68.75)	5 (31.25)		
Sex	Male	30 (61.22)	19 (38.78)	0.00,1, 0.9789359	1.01 (0.47-2.16)
	Female	61 (61.0)	39 (39.0)		
Religion	Hindu	70 (60.87)	45 (39.13)	0.01,1, 0.9250730	0.96 (0.41-2.26)
	Muslim	21 (61.76)	13 (38.24)		
Residence	Urban	70 (61.95)	43 (38.05)	0.15,1, 0.6985752	1.16 (0.51-2.67)
	Rural	21 (58.33)	15 (41.67)		
Literacy	Illiterate/primary	37 (55.22)	30 (44.78)	1.94,1, 0.37836906	NA
	Secondary	40 (64.52)	22 (35.48)		
	≥ HS	14 (70.0)	6 (30.0)		
Occupation	House-wives	46 (69.7)	20 (30.3)	4.67,4, 0.32258469	NA
	Retired/at home	20 (55.56)	16 (44.44)		
	Laborer	6 (42.86)	8 (57.14)		
	Service	9 (56.25)	7 (43.75)		
	Small business	10 (58.82)	7 (41.18)		
PCMI (INR)*	<500	14 (70.0)	6 (30.0)	4.91, 3, 0.17814150	NA
	500-1499	45 (54.22)	38 (45.78)		
	1500-2999	15 (65.22)	8 (34.78)		
	3000 - ≥10000	17 (77.28)	5 (22.72)		

*Income of one subject could not be explored, NA= Not applicable, T/t = Treatment, HS= Higher secondary, PCMI= Per capita monthly income, OR= Odds ratio, INR = ₹ (Currency code of Indian rupee)

Table 2: Present status of glucose homeostasis and some correlates (N= 149)

Parameters		Abnormal plasma glucose, No. (%)	Normal plasma glucose, No. (%)	χ^2 , df, P	OR (95% CI)
Family history of DM	Present	45 (69.23)	20 (30.77)	3.23,1, 0.0724400	1.86 (0.89-3.89)
	Absent/DK	46 (54.76)	38 (45.24)		
Duration (yrs) of disease	≤ 2	25 (42.37)	34 (57.63)	14.37,1, 0.0001503	0.27 (0.13-0.57)
	>2	66 (73.33)	24 (26.67)		
T/t at RGKMC and H (yrs)	≤ 2	58 (55.24)	47 (44.76)	5.09,1, 0.0240157	0.41 (0.17-0.96)
	>2	33 (75.0)	11 (25.0)		
Treatment regimen	OADA	70 (62.5)	42 (37.5)	0.83,1, 0.3624217	1.42 (0.63-3.21)
	Insulin/+ OADA	20 (54.1)	17 (45.9)		
Life style modified	Diet control (DC)	12 (66.67)	6 (33.33)	0.27,1, 0.6037520	1.32 (0.42-4.23)
	DC + / exercise	79 (60.3)	52 (39.7)		
Drug intake	Regular	74 (58.27)	53 (41.73)	2.85,1, 0.0914356	0.41 (0.12-1.28)
	Irregular	17 (77.27)	5 (22.73)		
CVD/NCD co-morbidity	Present	47 (66.2)	24 (33.8)	1.50,1, 0.2210587	1.51 (0.74-3.11)
	Absent	44 (56.4)	34 (43.6)		
Complication	Present	31 (62.0)	19 (38.0)	0.03,1, 0.8691170	1.06 (0.50-2.26)
	Absent	60 (60.6)	39 (39.4)		
Reported compliance	Present	10 (20.83)	38 (79.17)	48.23,1, 0.0000000	15.39 (6.11-39.79)
	Absent	81 (80.2)	20 (19.8)		

DK= Don't know, T/t = Treatment, OADA= Oral anti-diabetic agent, CVD= Cardiovascular disease, NCD= Non-communicable disease, OR= Odds ratio

plasma glucose. Anti-diabetic drugs were boosted/ altered for 35.2% of participants with abnormal glucose homeostasis whereas 13.8% of patients of controlled hyperglycemia revealed reduction of drugs and or dose.

Proportion of person with desirable plasma glucose

was significantly more among the compliant group [Table 2]. The compliance was not found to be related to age, sex, residence, religion, education, SES [Table 3], family background of diabetes, co-morbidity of CVD/ NCD, difference in advice for life style modification etc. [Table 4]. However, occupation, short duration of

Table 3: Compliance as per socio-demographic profile (N=149)

Parameters		Compliant, No. (%)	Non-compliant, No. (%)	χ^2 , df, P	OR (95% CI)
Age (years)	≤44	16 (38.09)	26 (61.91)	1.42,2,0.49092545	NA
	45-65	26 (28.57)	65 (7.43)		
	≥66	6 (37.5)	10 (62.5)		
Sex	Male	21 (42.86)	28 (57.14)	3.79,1,0.0516591	2.03 (0.93-4.42)
	Female	27 (27.0)	73 (73.0)		
Religion	Hindu	35 (30.43)	80 (69.57)	0.73,1,0.3924888	0.71 (0.30-1.69)
	Muslim	13 (38.24)	21 (61.76)		
Residence	Urban	37 (32.74)	76 (67.26)	0.06,1,0.8067422,	0.90 (0.37-2.18)
	Rural	11 (30.56)	25 (69.44)		
Literacy	Illiterate + primary	18 (26.87)	49 (73.13)	1.63,2,0.44360221	NA
	secondary	23 (37.1)	39 (62.9)		
	≥HS	7 (35.0)	13 (65.0)		
Occupation	Service	4 (25.0)	12 (75.0)	18.63,4,0.0009291	NA
	House-wives	13 (19.7)	53 (80.3)		
	Laborer	7 (50.0)	7 (50.0)		
	Retired + at home	12 (33.33)	24 (66.67)		
	Business	12 (70.59)	5 (29.41)		
PCMI (INR)*	<500	8 (40.0)	12 (60.0)	2.82,4,0.58866837	NA
	500-1499	24 (28.92)	59 (71.08)		
	1500-2999	8 (34.78)	15 (65.22)		
	3000-4999	4 (40.0)	6 (60.0)		
	5000- ≥10000	6 (50.0)	6 (50.0)		

PCMI= Per capita monthly income, OR= Odds ratio, HS= Higher secondary, NA= Not applicable, INR = ₹ (Currency code of Indian rupee)

Table 4: Compliance and some attributes of the disease (N=149)

Parameters		Compliant, No. (%)	Non-compliant, No. (%)	χ^2 , df, P	OR (95% CI)
Family history	Present	19 (29.23)	46 (79.77)	0.47,1,0.4929230	1.28 (0.60-2.73)
	Absent/DK	29 (34.52)	55 (65.48)		
Duration (years)	≤ 2	32 (54.24)	27 (45.76)	18.74,1,0.0000150	4.74(2.16-10.51)
	>2	16 (17.78)	74 (82.22)		
T/t at RGKMC and H (years)	≤ 2	42 (40.0)	63 (60.0)	9.87,1,0.0016808	4.22 (1.53-12.24)
	>2	6 (13.64)	38 (86.36)		
Treatment regimen	OADA	27 (24.11)	85 (75.89)	13.58,1,0.0002290	4.13 (1.77-9.74)
	Insulin / + OADA	21 (56.76)	16 (43.24)		
Life style modified	Diet control (DC)	2 (14.29)	12 (85.71)	2.27,1,0.1315094	0.32 (0.05-1.62)
	DC+/exercise	46 (34.1)	89 (65.9)		
Complication	Present	21 (42.0)	29 (58.0)	3.30,1,0.0692928	1.93(0.89-4.2)
	Absent	27 (27.27)	72 (72.73)		
CVD/NCD co-morbidity	Present	18 (26.1)	51 (73.9)	2.21,1,0.1371307	0.59 (0.27-1.26)
	Absent	30 (37.5)	50 (62.5)		

DK= Don't know, T/t = Treatment, OADA= Oral anti-diabetic agent, CVD= Cardiovascular disease, NCD= Non-communicable disease, OR= Odds ratio

disease and treatment at RGKMC and H, anti-diabetic drug regimen were shown to have significant effect on compliance [Tables 3 and 4]. All the reportedly irregular anti-diabetic drug users (14.77%) were found among the non-compliant group.

Only 26.85% of participants had good scoring (>50% marks) in knowledge about DM and showed proportionately more subjects with controlled plasma

glucose [Table 5]. Knowledge was found to have significant association with sex, residence, occupation [Table 5], and literacy [F (ANOVA) = 7.533 and P=0.001 among illiterate, primary, secondary, and higher secondary and above groups].

Almost 61% knew nothing about causation of DM, 38.5% didn't have any/correct idea about the desired plasma glucose level; 42.86%, 40.0%, 22.86%, and 20.0%

reportedly knew eye, kidney involvement, CVD risk, and other specific harmful effects of DM, respectively. 27.9% were unaware about major complications of uncontrolled hyperglycemia and 37.1% didn't know how DM can be prevented. Hopefully, 92.9% study subjects knew at least one measure to control hyperglycemia. With multiple responses, 77.14%, 80.0%, and 42.85% of patients mentioned physical exercise, dietary restriction, and anti-diabetic drugs, respectively, as measures to achieve blood glucose homeostasis. More than 98% participants reportedly comprehended all their physician's advices, 57.14% showed recommended BMI value (<25).

Retrospective tracking of 3 months laboratory results revealed that target blood sugar level was achieved and maintained on long-term basis only in 24.3% cases and was revealed to be influenced significantly by compliance ($\chi^2=12.19$ at $df=1$, $OR=7.68$ with 95% CI of 1.94 to 31.92) and short duration of the disease ($\chi^2=4.07$ at $df=1$, $P=0.0436933$, $OR=3.13$ with 95% CI of 0.88 to 11.33).

DISCUSSION

Lion's share of participants were women, middle aged (45-65 years), and senior citizen (≥ 66 years) suffering from type-II DM. The study revealed an unsatisfactory

level of present and past glycemic control which was found associated with poor compliance [Table 2]. Poor compliance was noted in 67.78% cases and was less than that (89.62%) observed by Bhattacharya *et al.*^[9] in their study. Compliance was very poor among house-wives and good in people engaged in small scale business. Bhattacharya *et al.*^[9] also found poor compliance among the house-wives. This might be partly due to significantly high illiteracy/low literacy among the house-wives (χ^2 test of goodness of fit between occupations = 25.35, $df=2$, $P<0.001$) who failed to produce better yield of knowledge as also observed by Bhattacharya *et al.*^[9] Poor compliance of the house-wives might be attributed partly to their higher economic dependence ($\chi^2=89.94$ at $df=1$, $P=0.00000001$; $OR=0.01$ with 95% CI= 0.00-0.04), 87% of whom were house-wives or at home elderly women dependent either on husband, son, daughter, or others. All 12 non-complaints due to financial constraints were women. Like Bhattacharya *et al.*^[9] the present study failed to elicit any difference in compliance among the patients with or without family history of diabetes but unlike her, significantly high compliance among those having better knowledge regarding DM [Table 5].

The present study showed 37.37% non-compliance to physical exercise as against 18.58% by Bhattacharya^[10] and 11.88% non-compliance due to financial constraints

Table 5: Knowledge (score) about diabetes (N=149)

Parameter	Knowledge score		χ^2 , df, P	OR (95% CI)	
	Poor + average (≤ 10)	Good (> 10)			
Mean age (years)	48.46 \pm 11.34	52.48 \pm 12.7	1.68,138,>0.05	NA	
Sex	Male	28 (54.90)	13.15,1,0.0002869	3.91 (1.72-9.00)	
	Female	81 (82.65)			17 (17.35)
Residence	Urban	74 (68.52)	4.30,1,0.0382231	2.68 (0.96-7.86)	
	Rural	35 (85.37)			6 (14.63)
Occupation	House-wife	55 (90.0)	27.85,4,0.00001337	NA	
	At home/ retired	23 (73.33)			8 (26.67)
	Service	5 (29.41)			12 (70.59)
	Small business	15 (71.43)			6 (28.57)
	Labourer	11 (55.56)			8 (44.44)
Duration (yrs)	≤ 2	50 (73.53)	0.01,1,0.9245901	1.04 (0.47-2.29)	
	> 2	59 (72.84)			22 (27.16)
Family history	Present	41 (67.21)	1.86,1,0.1730393	0.60 (0.27-1.33)	
	Absent	68 (77.27)			20 (22.73)
Compliance	Present	82 (75.93)	1.54,1,0.2153353	0.61 (0.26-1.44)	
	Absent	27 (65.85)			14 (34.15)
Plasma sugar	Controlled	38 (59.38)	10.85,1,0.0009898	3.47 (1.52-7.89)	
	Uncontrolled	71 (83.53)			14 (16.47)
BMI	< 25	63 (75.00)	0.33,1,0.5633201	0.81 (0.37-1.78)	
	≥ 25	46 (70.77)			19 (29.23)

BMI= Body mass index, OR= Odds ratio, NA= Not applicable

as against 16.98% revealed by Bhattacharya *et al.*^[9] Studies showed that compliance to chronic disease, particularly in asymptomatic conditions like diabetes, hypertension, etc. was found to be unsatisfactory^[11,12] due to the traditional physician-directed/compliance-oriented approach where patients are considered as passive receivers of the medical expertise ignoring his/her other goals of life and is judged and blamed for inability or unwillingness to achieve medical goal.^[13,14] It brings dissatisfaction/frustrations among the patients which begets non-compliance and ends in frustration among the physicians.^[13] These patients need to be empowered to take informed decision how to achieve control over the disease on daily basis in the context of other goals of their life.^[13] However, poor knowledge scores by 73.15% of participants were not very evident for empowering them as also showed by Gulabani *et al.*^[5] in their study at diabetic clinic of Christian Medical College, Ludhiana. The knowledge about DM showed no relationship with duration of disease. This might be the by-product of the poor patient care model^[13,14] and huge patients' load in the clinic leads to a poor patients-physicians interaction.^[15] Similarly, Gulabani^[5] and Viswanathan *et al.*,^[16] found that significantly poor knowledge among women might be due to low literacy among them (58% vs. 18.4%, $\chi^2 = 20.87$, at $df = 1$, $P = 0.0000049$, $OR = 6.14$ with 95% $CI = 2.52-15.30$). The same observation was true for the rural people ($\chi^2 = 4.19$, $df = 1$, $P = 0.0406713$; $OR = 0.44$ with 95% $CI = 0.19-1.04$) who in addition might not receive information about DM through other channels of communication. 91% patients were told for physical exercise, 77.14% knew its role, still 37.37% missed it and 57.14% achieved recommended BMI. 80.0% subjects mentioned dietary restriction to combat hyperglycemia but 54.54% failed to implement. Moreover, the knowledgeable group failed to show a significant difference in practice, e.g. recommended BMI, compliance to therapies. So a gap between knowledge and practice was conspicuous and might be due to the lack of inner force for a positive behavioral change.

CONCLUSION

To achieve the complex target of diabetes control which needs persistent motivation on the part of the patients is a critical issue. Chronic disease care is fundamentally different and requires a different vision and redefinition of the patient-physician relationship. Because diabetes is mostly a self-managed disease, patients are more than passive recipients of medical expertise and sound patient-physician collaboration is to be developed for controlling DM on the basis of trust and understanding

of every client's other facets of life. The patients are to be empowered to take informed decision for sustained change in life styles and behavior using this patient-centered and adherence-oriented approach. The roles and responsibility need to be redefined to match the reality of diabetic care and patient and physicians must create relationships that promote collaboration and partnership.

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How to cite this article: Lahiri SK, Halder D, Chowdhury SP, Sarkar GN, Bhadury S, Datta UK. Junctures to the therapeutic goal of diabetes mellitus: Experience in a tertiary care hospital of Kolkata. *J Mid-life Health* 2011;2:31-6.

Source of Support: Nil, **Conflict of Interest:** None declared.