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Evaluation of Treatment Adherence and Uncontrolled Blood Sugar Prevalence in Type 2 Diabetes Mellitus Patients at a Tertiary Care Centre in Rajnandgaon, Chhattisgarh, India.

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ABSTRACT

Background

Diabetes mellitus is a growing global health challenge, with diabetic peripheral neuropathy (DPN) emerging as one of its serious complications. DPN contributes significantly to morbidity, including debilitating pain, foot ulcers, and increased risk of amputation, particularly among populations with limited healthcare resources.

Methods

A descriptive, cross-sectional study was conducted at the Government Medical College Hospital in Rajnandgaon, involving 203 patients aged 21 years and above with type 2 diabetes mellitus (T2DM) diagnosed for at least one year. The Michigan Neuropathy Screening Instrument (MNSI) was employed to assess DPN, and socio-demographic along with clinical data were systematically collected. Data analysis using SPSS revealed associations between DPN and various risk factors.

Results

The prevalence of DPN among the study cohort was substantial. Statistical evaluation indicated significant correlations between the presence of neuropathy and factors such as prolonged duration of diabetes, advanced age, and suboptimal glycemic control. These findings highlight the vulnerability of diabetic patients to nerve damage over time due to sustained metabolic imbalances.

Conclusions

The considerable prevalence of DPN underscores the critical need for routine screening and early intervention in diabetic care, particularly within resource-constrained settings. Implementing standardized diagnostic tools like the MNSI can facilitate timely detection and management, thereby reducing complications and improving quality of life. Tailored healthcare strategies focused on optimal glycemic control are essential to address the socio-economic and clinical challenges posed by DPN.

Keywords: Glycemic Control, Type 2 Diabetes, Prevalence, Rural Healthcare.

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Conflict of Interest—none | Funding—none

Ethical Issues: Before the commencement of the study, approval was obtained from the Institutional Ethical Committee (IEC) with approval number (No.10-2022/GMC RJN/I.E.C./2022:24/11/2022). A written informed consent was obtained from all respondents. In addition, respondents were informed that participation in the study was entirely voluntary and that they had the right to withdraw from the study and were assured that should they decide not to participate, it would not affect their future access to hospital services in any way.

INTRODUCTION

Diabetes is one of the largest global health emergencies of the 21st century. The effect of diabetes mellitus includes long-term damage, dysfunction and failure of various organs. Once regarded as a single entity, diabetes is now seen as a heterogeneous group of diseases resulting from a diversity of aetiologies, environmental and genetic, acting jointly (1). The incidence of diabetes mellitus has continued to increase globally with the resulting burden resting more heavily on tropical, developing countries(2). The majority of cases of diabetes mellitus are Type 2, and the greatest numbers of people with this disease are aged from 40 to 59 years. More than 80% of diabetes deaths occur in low- and middle-income countries. WHO projects that diabetes will be the seventh leading cause of death in 2030(3). According to the International Diabetes Federation estimates, around 425 million people had DM in 2017 and this number is expected to rise to 629 million by 2045(4). The global prevalence of diabetes in 2017 was 8.8% (uncertainty interval: 7.2–11.3%) in adults aged 20–79 years (5). Worldwide, there is a projected increase in the prevalence of diabetes mellitus to 592 million (10.1%) by 2035 [a]. India is known as the "Diabetes Capital of World", with approximately 50 million diabetic patients and about 3.4 million deaths occurring due to diabetes (6) . The number of diabetic patients is estimated to increase up to approximately 70 million by 2025. In India, this is more important as every fifth person is a diabetic. Treatment of diabetes mellitus includes medical management, lifestyle modification and surgery. The use of medication is thus vital in the management of diabetes mellitus (DM). However, the effectiveness of the treatment is largely dependent on the level of adherence and glycemic control towards prescribed medication. In India, limited studies have focused on diabetes care and provide an insight into the current profile of patients and their management. More than 50% of people with diabetes have poor glycemic control, uncontrolled hypertension and dyslipidemia, and a large percentage have diabetic vascular complications(7),(8).As a result of poor adherence, patients do not receive optimal benefit from their drug therapy and this reflects in the form of uncontrolled blood sugar among them. Suboptimal treatment and poor blood sugar control can lead to increased use of health care services (acute care and hospitalizations), reduction in patient's quality of life, and increased health care costs (drug costs and medical costs)(9),(10). Adherence to treatment is the key link between treatment outcomes in medical care.Therefore, this study was carried out to find the medication adherence and Prevalence of uncontrolled blood sugar among patients with type 2 diabetes in a Tertiary Health Care Centre Rajnandgaon, Chhattisgarh. Observations from the above study will help physicians to identify the hindering factors in adherence and addressing these factors may ensure better control of diabetes.

Objectives

The principal objective of the research is to find out the medication adherence and Prevalence of uncontrolled blood sugar among patients with type 2 diabetes.

Material and Method

This was a cross-sectional facility based; prospective, observational study carried out in Tertiary Care Hospital in the district of Rajnandgaon, Chhattisgarh and was conducted for the ICMR Short Term Research Studentship (2018) program.

Study settings

Department of Community Medicine, Urban health training centre, rural health training centre and Department of general medicine Government Medical College Hospital, Rajnandgaon (C.G)

Study period

Study was undertaken from the month of February 2018 to May 2018 for a period of four months.

Study unit: The study was conducted on diabetic's patients attending Government Medical College and associated Hospitals in Rajnandgaon District of Chhattisgarh state.

Sample size

The sample size required to be representative of the study population was calculated using a sample size calculation formula (11). The sample size for this study was 109 patients (z score of 1.96,

95% confidence interval, ±10%) in accordance with World Health Organization (WHO) manual to assess drug use in individual facilities. (12). Adjusting for a non-response rate of 4 % gives the total sample size of 130.It was a pilot study in which 130 patients of diabetes of age ≥21 years and above receiving anti-diabetic therapy for more than 1 year were randomly selected for participation after fulfilling inclusion/exclusion criteria.

Inclusion Criteria

Adults of age ≥21 years with diabetes, and they had been on treatment for at least 1 year prior to the study , who were attending the Government Medical College and associated Hospitals in Rajnandgaon and consented to participate in the study were included.

Exclusion Criteria

Patients diagnosed with gestational diabetes, type 1 diabetes, recent diagnosis of diabetes (<1 year), acutely ill and debilitated patients and patients who will not give consent were excluded.

Study tool, Data collection and Procedure

The ethical approval from the ethical committee was taken prior to start with the study. A structured self-administrative questionnaire (Annexure 1) was developed with the aid of available evidence by the researchers for data collection to fully meet the demands of this research (13),(14). Pilot study was conducted among 10% of total respondents, before undertaking the major study to test the interview schedule and to assess any constraints that could arise and would need to be addressed during this study. The developed questionnaires are corrected, revised and validated by public health experts and clinicians. After that the developed questionnaire is revised by researchers and then has been translated into Hindi language. It was pretested before its use in this study. This tool containing the Questionnaire includes the following component- Age, gender and Anthropometric assessment. The treatment details had variables like type of morbidity and duration of treatment. The details of treatment received were extracted using patient case sheets. The adherence to medication was captured with the eight-item Morisky Medication Adherence Scale (MMAS-8) which has eight questions and was graded as low adherence, moderate adherence and good adherence. MMAS-8 is validated in India and other parts of world in different languages with reliability value (α) of 0.83 (15)

Statistical analysis:

The relevant data was collected, checked for completeness and correctness. Each completed questionnaire was coded on pre- arranged coding to minimize errors. Data were analysed using excel, windows 2007 and using a software (epi info 7)(16) . The Chi-square test was used, the significance of the results was computed at the level of $p<0.05$.

RESULTS

Table no.1 Socio-demographic details of the Diabetic Patients (N= 130)

Sl.No	Variables	Categorization	Frequency	Percentages %
1	Age (Years)	>60	10	7.60
		50 – 60	36	27.69
		40 – 50	44	33.84
		<40	40	30
2	Sex	Male	93	71.53
		Female	37	28.46
3	Family	Nuclear	48	36.92
		Joint	82	63.08
4	Marital Status	Married	108	83.04
		Unmarried	6	4.62

		Widow	16	12.31
5	Education	Illiterate	13	10
		Primary	18	13.85
		Middle	90	69.23
		Matriculate	5	3.85
		Graduate	4	3.08
6	Occupation	Unemployed	12	9.23
		Labourer	16	12.31
		Employee	25	19.23
		Retired	18	13.85
		Housewife	25	19.23
		Farmer	34	26.15
7	Socio-Economic Status	Upper class	12	9.23
		Upper Middle class	13	10
		Middle	19	14.62
		Lower middle	25	19.23
		Lower	61	46.92
8	Residence	Urban	36	27.69
		Rural	94	72.31
9	Co –Morbidities	Present	52	40
		Absent	78	60
10	BMI	Underweight	17	13.08
		Normal	70	53.85
		Overweight	36	27.69
		Obese	7	5.38
11	Adherence	Low	8	6.15
		Moderate	47	36.15
		High	75	57.69
12	Glycaemic Control	Good (HbA1c <7.0%)	50	38.46
		Uncontrolled (HbA1c-7.0-8.0%)	13	10
		Poor (HbA1c>8.0%)	67	51.54

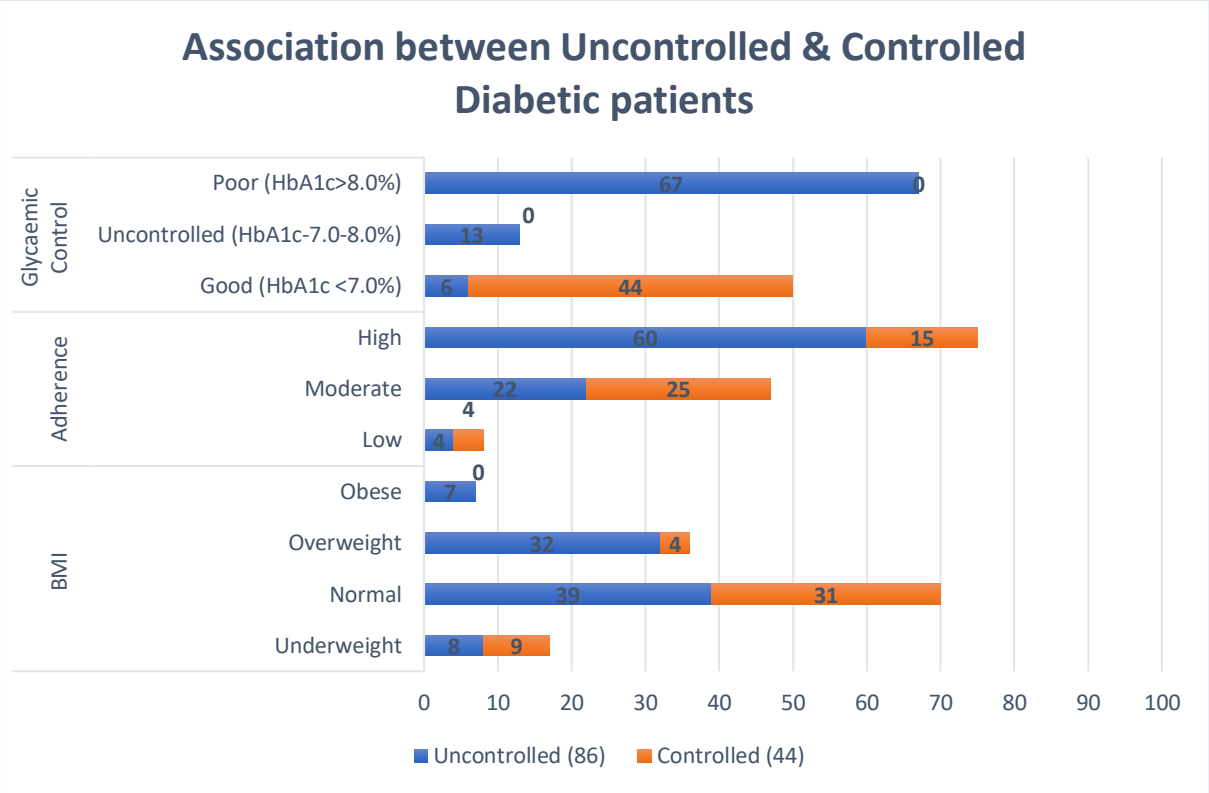
In Table 1 it is seen that the majority of respondents were 50 years old males living in joint families. Most of them were married residing in rural areas, belonging to lower middle class, farmers by profession and studied till middle school. The respondents had normal BMI with an absence of co morbidity. Majority of them showed high adherence to treatment and had poor glycemic control.

Table no.2 Association between Uncontrolled & Controlled Diabetic patients

Sl No	Variables	Categorization	Uncontrolled (86)	Controlled (44)	Chi Square	P Value
1	Age (Years)	>60	7	3	2.68	0.44
		50 – 60	22	14		
		40 – 50	33	11		
		<40	24	16		
2	Sex	Male	61	32	0.038	0.84
		Female	25	12		
3	Family	Nuclear	30	18	0.2319	0.63
		Joint	56	26		
4	Marital Status	Married	77	31	7.84	0.0198
		Unmarried	3	3		
		Widow	6	10		
5	Education	Illiterate	8	5	7.72	0.10
		Primary	15	3		
		Middle	60	30		
		Matriculate	1	4		
		Graduate	2	2		
6	Occupation	Unemployed	8	4	2.83	0.82
		Labourer	10	6		
		Employee	14	11		
		Retired	11	7		
		Housewife	19	6		
		Farmer	24	10		
7	Socio-Economic Status	Upper class	5	7	4.80	0.30
		Upper Middle class	5	8		
		Middle	10	9		
		Lower middle	7	18		
		Lower	17	44		
8	Residence	Urban	19	17	3.19	0.07
		Rural	67	27		
9	Co –Morbidities	Present	31	21	1.203	0.27
		Absent	55	23		
10	BMI	Underweight	8	9	18.06	**0.0004**
		Normal	39	31		
		Overweight	32	4		
		Obese	7	0		
11	Adherence	Low	4	4	15.20	**0.0005**
		Moderate	22	25		
		High	60	15		
12	Glycaemic Control	Good (HbA1c <7.0%)	6	44	106.41	**0.00001**
		Uncontrolled (HbA1c-7.0-8.0%)	13	0		
		Poor (HbA1c>8.0%)	67	0		

(P valve less than .05 is significant)

Table 2 shows significant association between controlled and uncontrolled diabetics based on their marital status, BMI, adherence to treatment and glycemic control.



The table no 3 shows the average glycaemic control was high in uncontrolled diabetics and all respondents were taking treatment for more than three years.

Table no.3 Characteristics of patients with type 2 diabetes having controlled or uncontrolled glycaemia

Mean±SD	Controlled (HbA1c <7)	Uncontrolled (HbA1c ≥7)
Age		
46.34 ± 10.19	45.82 ± 10.58	46.60 ± 10.03
BMI		
22.9975 ± 4.08	21.08 ± 3.36	23.97 ± 4.10
HbA1C		
7.352 ± 1.863	6.16 ± 0.93	7.96 ± 1.92
Years on Medication		
3.60 ± 3.38	3.55 ± 3.36	3.63 ± 3.41

The table no 4 shows that BMI and adherence to treatment showed highly significant relations in comparison to other tested variables.

Table no.4 Binary Logistic regression

Variable	Odds Ratio	95%	C.I	Coefficient	S.E	Z-Statistics	P-value
Age > 50 (Yes/No)	0.91	0.35	2.35	-0.08	0.48	-0.17	0.86
Sex – Male (Yes/No)	0.79	0.30	2.11	-0.22	0.49	-0.45	0.65
Education – Graduate & Post Graduate (Yes/No)	1.59	0.10	24.46	0.46	1.39	0.33	0.73
Occupation - (Yes/No)	1.04	0.30	3.66	0.04	0.63	0.07	0.94
Family – Joint (Yes/No)	1.54	0.48	4.89	0.43	0.58	0.73	0.46
Married - (Yes/No)	0.45	0.11	1.79	-0.79	0.70	-1.13	0.25
Socio Economic Status – Lower Middle & Lower (Yes/No)	0.46	0.05	3.79	-0.76	1.06	-0.71	0.47
Resident – Rural (Yes/No)	6.11	0.70	53.32	1.81	1.10	1.63	0.10
BMI Category – Obese & Overweight (Yes/No)	12.20	3.33	44.65	2.50	0.66	3.78	0.0002
Co-Morbidities (Yes/No)	1.25	0.44	3.51	0.22	0.52	0.42	0.66
Adherence (Yes/No)	4.23	1.51	11.89	1.44	0.52	2.74	0.006
Years On Medication - > 10 Years (Yes/No)	0.52	0.12	2.31	-0.64	0.75	-0.84	0.39

DISCUSSION

The findings of the study seen in Table 1 suggest that even though medication adherence was high, the majority of respondents still had poor glycemic control. This suggests that other factors may be responsible for good glycemic control. In our study most of the respondents were between the age group of 40 to 50 years. While in a study by Tsehay et al (17) most respondents were between 50 to 60 years. Men were majority of respondents in our study, while Awodele et al (18) had more female respondents in their study. Joint families were more common among the respondents. Majority of respondents were married, as similarly seen in a study by Tiv et al.(19). Highest education of middle school was seen in most respondents while S. Padmanabha et al found most respondents to have studied till high school. Farming was the most common occupation of the respondents.

Lower socioeconomic status was most common among the respondents, similar to a study by Muliyil et al (20). Most respondents were from rural areas. No co morbidities were seen in most respondents, while in a study by Mishra et al(21), most respondents had co morbidities in their study . Majority of the respondents had normal BMI, and this was found to be statistically significant, similar to a study by Medi et. al(22). High adherence was noticed in most respondents, while Mishra et al (21) had more non adherent respondents. Good adherence was also noticed in a study by Olickal et al(23), and this was found to be statistically significant. Poor glycemic control was seen in most respondents and this was found to be statistically significant, while in a study by Prathyusha Rani T et a(24)l, uncontrolled glycemic control was commonly seen.

The mean age of respondents seen in Table 3 for uncontrolled diabetes mellitus was about 46 years. The average BMI of the respondents was normal. The mean HbA1C of uncontrolled diabetes mellitus was around 8 years. The mean year of medication of respondents was 4 years.Binary logistic regression seen in Table 4 of the various variables of our study showed that the variables of BMI and adherence were found to be statistically significant. While in a study by Prathyusha et al(24) BMI was found to be statistically significant in adherent respondents. In a study by Olickal et al(23) medication adherence was also found to be statistically significant.

CONCLUSION

Our study concluded that medication adherence is a critical determinant in the management of chronic non-communicable diseases such as diabetes mellitus. Ensuring that patients follow their prescribed treatment regimens not only improves glycemic control but also significantly reduces the risk of long-term complications such

as nephropathy, retinopathy, and cardiovascular disease. Therefore, structured and ongoing health promotion activities—including patient education, counseling, and regular follow-up—are essential components of diabetes care. These interventions should be tailored to individual patient needs and integrated into routine clinical practice to enhance understanding and motivation. Body Mass Index (BMI) was also found to be a significant factor influencing glycemic control. Overweight and obese patients often struggle with insulin resistance, which worsens diabetes outcomes. As such, lifestyle modifications aimed at gradual and sustainable weight reduction should be strongly advocated. Physicians and diabetes educators must promote evidence-based strategies such as regular physical activity (minimum 150 minutes/week of moderate-intensity exercise), individualized dietary planning (e.g., low glycemic index foods, controlled carbohydrate intake), and behavioral interventions for long-term success. Furthermore, achieving and maintaining good glycemic control—as indicated by the HbA1c test—was identified as a powerful motivator for continued medication adherence. This highlights the importance of continuous monitoring and feedback in diabetes self-management. Patients who see tangible results are more likely to stay committed to their treatment plans. From a preventive standpoint, early screening and risk assessment for pre-diabetes and metabolic syndrome can play a pivotal role in curbing disease progression. Community-based screening programs, supported by mobile health technologies and telemedicine, have shown promise in identifying high-risk individuals and initiating early interventions. Recent advances in diabetes management have further empowered both patients and healthcare providers. The use of continuous glucose monitoring (CGM) systems and flash glucose monitors offers real-time insights into blood sugar trends, allowing for timely interventions. Newer classes of ant diabetic medications such as SGLT2 inhibitors and GLP-1 receptor agonists not only provide effective glycemic control but also offer added benefits like weight loss and cardiovascular protection. Digital health tools, mobile apps for medication reminders, and AI-driven personalized care models are also revolutionizing the way diabetes is monitored and managed.In conclusion, a holistic approach to diabetes management that combines pharmacological treatment with lifestyle modification, patient empowerment, and modern technological tools is essential for improving outcomes. Health professionals must adopt a multidisciplinary strategy to address both the medical and psychosocial aspects of diabetes care.

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