ORIGINAL ARTICLE

Assessment of Non-Compliance of Medicine and its Associated Factors among Type II Diabetes Mellitus in a Tertiary Hospital

Samuel Shahzad[1], Amjad Ali[2] and Sadaqat Ali Bajwa[1*]

[1]*Amazing Grace Institute of Nursing, P.E.C.H.S, Karachi, Pakistan*

[2]*Dow Institute of Nursing and Midwifery, Dow University of Health Sciences, Karachi, Pakistan*

Abstract

Background: Diabetes mellitus is a devastating disease worldwide, and its impact on human life is alarming. Medication non-compliance is a major cause leading to serious complications and a high burden on the entire healthcare system.

Objective: To assess the non-compliance of Medicine and its associated factors in type-II Diabetes mellitus.

Methodology: A cross-sectional study was conducted between February 2019 and August 2019 among patients with type 2 diabetes mellitus at the Endocrinology OPD of Dow Hospital Karachi. The Moriskey Medication Adherence Questionnaire-8 was used to assess non-compliance. A non-probability purposive technique was used for data collection, and all patients diagnosed with type II diabetes mellitus were included in this study.

Results: 196 participants took part in the study. Most of the participants were male (57.7%), married (85.2%), and over 50 years old (39.3%). The study found that 11.2% of participants had high compliance with medication, while 19.9% had medium adherence and 68.9% had low compliance. In univariate analysis, younger age, presence of comorbid, and prescription of tablets were associated with a lower risk of low/moderate non-compliance. On multivariable analysis, having comorbidity and advice of tablets were found to be associated with lower odds of low to moderate levels of non-adherence.

Conclusion: The findings of this study highlight the need to identify the value of measuring patient compliance to treatment plans related to diabetes for the maintenance and co-management of this disease.

Keywords: *Diabetes Mellitus type II, non-compliance, associated factors, adherence rate, self-management.*

INTRODUCTION

The incidence of type 2 diabetes mellitus has significantly risen in both developed and developing countries. However, the optimum approaches to diabetes management are not yet fully defined due to the complexity of management programs and lifestyle factors [1]. In the past few years, the number of diabetes patients has increased rapidly in low-middle-income countries like Bhutan, reporting an incidence of 75-82 persons per 10,000 people [2]. Type 2 DM is the most prevalent form of DM, accounting for approximately 90% of patients, while the remaining 10% have type 1 diabetes or gestational diabetes. The prevalence of diabetes is rapidly increasing globally, leading to a significant economic burden on patients and society [3]. Additionally, Type II Diabetes Mellitus is one of the leading causes of death worldwide. Non-compliance with medication is one of the primary factors that contribute to complications among patients. This study has identified factors that lead to non-compliance with medication among type II DM patients [4]. Research suggests that up to 50% of patients do not take their medications as prescribed, and those who struggle to adhere to their medication regimens often experience poor health outcomes and find it challenging to manvage their glucose levels [5].

Furthermore, a recent scoping review indicates that poor medication adherence in LMICs is influenced by a lack of knowledge, negative attitudes, and misconceptions, ultimately leading to a poor quality of life. Other recognized factors contributing to non-adherence include busy work schedules, inadequate health education from healthcare providers, social misconceptions, and casual behaviors [6]. Additionally, there are several initiatives in place to support medication adherence among patients by targeting four major influencing aspects: education, cognitive behavior, and a multi-approach [7]. Unsatisfactory control of blood glucose levels results in high morbidity and mortality rates, which are steadily increasing despite the availability of various options, including new pharmacological treatments [8]. A recent national study found that non-compliance with T2DM self-management is influenced by multiple factors and requires continuous support through structured diabetes education sessions. The study also demonstrated a direct relationship between the provision of diabetes education and self-management compliance levels [9]. According to the latest data provided by IDF, diabetes prevalence in Pakistan was 17.1% in 2019, which is 148% higher than previous repo rts [10]. Thus, the burden of type II diabetes is increasing day by day, and the people of Pakistan are not very conscious

**Corresponding author: Sadaqat Ali Bajwa, Amazing Grace Institute of Nursing, P.E.C.H.S, Karachi, Pakistan, Email: sadaqatali2bajwa@gmail.com*

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about their health. This study is of great significance in identifying the reasons leading to poor control of type II DM. The study aimed to assess non-compliance with medication and its associated factors in type II Diabetes Mellitus. The study identified factors contributing to non-compliance with medication among type II DM patients who are on hypoglycemic agents. The findings of this study provide baseline data regarding medication non-compliance, which can inform future policy-making by the health authorities of Pakistan.

METHODOLOGY

This cross-sectional was conducted at Dow University Hospital. The duration of this study was from February 2019 to August 2019. All patients who came to endocrinology OPD and fulfilled inclusion criteria were considered participants of this study. The non-probability purposive technique was used for data collection and inclusion criteria we took all the patients diagnosed with type II diabetes Mellitus who were on hypoglycemic agents and were included in this study. Patients with type I DM and gestational DM were excluded from this study. Sample size calculation was performed *via* OpenEpi software. With the help of the percentage of medium adherence as 24.2 %, with a significant level of 6% and confidence interval of 95% the calculated sample size was 196. Written approval was taken from the Institutional Review Committee (DUHS/ION/MSN/2019/05/18/394) of Dow University of Health Sciences. Data were collected in the morning and afternoon shifts during consultant OPD timing. Informed consent was obtained from all participants. Data were collected from all type-II DM, who were on a hypoglycemic agent with the help of a demographic questionnaire and Moriskey Scale for non-adherence to medicine. Moriskey Scale is taken from open access (Moriskey DE-1986) and free for use so no need to take it permission to use. It is related to non-adherence to medicine, which consists of eight items. forget to take their medicine, sometimes miss taking their medicines, ever cut back or stopped taking medicine, During travel forget to bring along your medicine, you took medicines yesterday When you feel like your symptoms are under control, do you sometimes stop taking your medicine, Do you ever feel hassled about sticking to your treatment plan, do you have difficulty remembering to take all your medicine. Each question has the option “Yes” and “No” with scores of 1 and 0 respectively. The total scores “0” showed high adherence, “1 or 2” Medium adherence, and more than 2 scores exhibited low adherence to medicine [11].

Data were analyzed by SPSS V.21.0. Quantitative variables were shown by mean and standard deviations whereas for qualitative variables frequencies and percentages were mentioned. The chi-square test was used to compare study variables among different adherence groups. Adherence was categorized as high and low to moderate for applying binary logistic regression to assess the association of study variables with compliance status. Variables with p-value <0.25 in univariate analysis were put in a multivariable regression model. A P-value less than or equal to 0.05 was considered statistically significant in the final regression model.

RESULTS

Table **1** illustrates that the majority of the study participants 39.3% were in groups of more than 50 years of age and the majority of these participants were male (57.7%). This study highlighted that most of the study participants (55.6%) were uneducated or more than metric qualification and 85.2% of participants were married. Furthermore, 45.4% were unemployed, and the monthly income of most of the participants 45.4% was less than 10,000 Rs/month. The Mean and Standard deviation for Fasting Blood Sugar (FBS), Random Blood Sugar, and Hemoglobin A1C are 135.17±45.77, 222.24 ± 100.27, and 6.56±2.15 respectively.

The majority of the study participants 68.87% showed a low level of adherence level, followed by medium adherence 19.89%. Moreover, a high adherence level was found in only 11.22% of the study participants. The findings of this study are revealed in Table **2** which shows the association between sociodemographic associations with adherence level of the study participants. This study highlighted that age, level of education, marital status, and job status were significantly associated with adherence to medicine with P-values<0.001, 0.034, <0.001, and 0.010 respectively. Gender and monthly income level were not significantly associated with adherence to medicine.

Table **3** displays the univariate and multivariable association of study variables with compliance status. In univariate analysis, younger age, presence of comorbid, and prescription of tablets were associated with a lower risk of low/moderate non-compliance. On multivariable

Table 1: Demographic characteristics of the study participants.

Variables	Characteristics	Frequency	Percentage
Age	20-35 Years	52	26.5
	36-50 Years	67	34.2
	More than 50 Years	77	39.3
Gender	Male	113	57.7
	Female	83	42.3
Level of Education	Primary	26	13.3
	Matric	61	31.1
	Above matric	109	55.6
Marital Status	Single	29	14.8
	Married	167	85.2
Job Status	Permanent	26	13.3
	Contract	81	41.3
	Unemployed	89	45.4
Monthly Income	Less than PKR 10,000	89	45.4
	PKR 10,001-20,000	47	24.0
	More than PKR 20,000	60	30.6

Table 2: Association of level of adherence with demographic characteristics of study participants.

Variables	Groups	High Adherence Count (%)	Medium Adherence Count (%)	Low Adherence Count (%)	p-value
Age	20-35 Years	14(26.9)	16(30.8)	22(42.3)	<0.001*
	36-50 Years	5(7.5)	16(23.9)	46(68.7)	
	More than 50 Years	3(3.9)	7(9.1)	67(87)	
Gender	Male	11(9.7)	20(17.7)	82(72.6)	0.427
	Female	11(13.3)	19(22.9)	53(63.9)	
Level of Education	Primary	2(7.7)	7(26.9)	17(65.4)	0.034*
	Metric	7(11.5)	19(31.1)	35(57.4)	
	Others	13(11.9)	13(11.9)	83(76.1)	
Marital Status	Single	9(31)	12(41.4)	8(27.6)	<0.001*
	Married	13(7.8)	27(16.2)	127(76)	
Job Status	Permanent	5(19.2)	10(38.5)	11(42.3)	0.010*
	Contract	11(13.6)	16(19.8)	54(66.7)	
	Unemployed	6(6.7)	13(14.6)	70(78.7)	
Monthly Income	Less than 10000	7(7.9)	12(13.5)	70(78.7)	0.103
	10001-20000	7(14.9)	13(27.7)	27(57.4)	
	More than 20000	8(13.3)	14(23.3)	38(63.3)	

*Significant at p<0.05.

Table 3: Univariate and multivariable association of study variables with compliance status

Variables	Groups	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age	20-35 Years	0.11 (0.0-0.41)	**0.001	0.77 (0.14-4.16)	0.762
	36-50 Years	0.50 (0.12-2.18)	0.359	1.64 (0.30-9.18)	0.569
	More than 50 Years	Reference category		Reference category	
Gender	Male	1.42 (0.58-3.44)	0.442	-	-
	Female	Reference category		-	-
Level of Education	Primary	1.60 (0.34-7.64)	0.556	-	-
	Matric	1 (0.39-2.59)	1.000	-	-
	Above matric	Reference category		-	-
Marital Status	Single	0.31 (0.08-1.25)	0.099	0.66 (0.12-3.50)	0.622
	Married	Reference category		Reference category	
Job Status	Employed	0.41 (0.15-1.10)	0.077	1.49 (0.44-5.08)	0.524
	Unemployed	Reference category		Reference category	
Monthly Income	Less than 10000	1.80 (0.62-5.27)	0.282	-	-
	10001-20000	0.88 (0.29-2.62)	0.818	-	-
	More than 20000	Reference category		-	-
Comorbidity	Yes	0.06 (0.013-0.26)	**<0.001	0.07 (0.01-0.42)	**0.004
	No	Reference category		Reference category	
Type of medicine	Tablets	0.06 (0.01-0.48)	**0.008	0.06 (0.01-0.549)	*0.012
	Insulin	Reference category		Reference category	

CI: Confidence interval, OR: Odds ratio, aOR: Adjusted odds ratio, *Significant at p<0.05, **Significant at p<0.01

analysis, having comorbidity and advice of tablets were found to be associated with lower odds of low to moderate levels of non-adherence.

DISCUSSION

The study revealed that only 11.2% of participants demonstrated high adherence to medication, a significant difference from a previous nationally conducted study which reported a high adherence rate of 68.9% [12]. Another study reported a high adherence rate of merely 3% [13], while a recent study indicated a high adherence rate of 54% [14]. Additionally, a recent systematic review published in 2023 encompassing 30 studies found that 80% of them had a high adherence rate [15]. Comparing these findings with other regions of the world is worrisome. Factors such as economic burden and knowledge levels about medications could contribute to this discrepancy. Furthermore, this study identified that 68.9% of participants exhibited a low level of adherence, notably contrasting with an alternate study that estimated a low adherence rate of only 14.3% [16]. Conversely, a study published in a neighboring country yielded opposing results, reporting a low adherence rate of 28.5% [17]. This current study disclosed a medium adherence rate of 19.9%, akin to a finding of 26.2% reported in a study conducted in Kenya [18]. However, a study contradicts our results by noting a medium adherence rate of 31.8% [19].

Among the majority of study participants who were male, a high adherence rate of 13.25% was observed among

female participants. Conversely, a low adherence rate of 72.5% was observed among male participants, consistent with a nationally published study that documented higher adherence rates of 46% among females compared to 43.15% among males [20]. However, another study stated that males had a high adherence rate of 41% [21]. The study also identified associations between age, education level, marital status, job status, and medication adherence. Specifically, high adherence rates of 31.03% were observed among single participants. However, these findings are not supported by a study that reported high adherence rates of 84.5% among married participants compared to only 15.5% among single participants exhibiting low adherence [22]. Furthermore, another study contradicts our findings, revealing nearly equivalent adherence rates between married participants (65.4%) and single participants (55.6%) [23]. Regarding income, high adherence rates of 14.89% were found among participants earning between 10000-20000 PKR per month, while low adherence rates of 78.65% were observed among unemployed participants. However, these findings differ from a study conducted in the region, indicating that participants earning more than 1200 monthly per capita income had higher compliance rates of 61.2%, in contrast to those earning less than 1200 monthly per capita income with compliance rates of 38.2% [24]. According to a systemic review and meta-analysis published in 2023, employed individuals earning money have a 15% higher likelihood of exhibiting non-adherence or low adherence rates [25].

In this study, high adherence rates of 26.92% were observed among participants aged 20-35 years, associating younger age with a lower risk of low/moderate non-compliance. However, this finding contradicts a study that concluded older age (50-59 years old) was associated with a low risk of non-compliance [26]. Conversely, low adherence rates of 87.01% were found among participants aged over 50. These findings significantly differ from a study conducted nationally in a different city in Pakistan, which found that participants aged between 51-75 years had higher compliance rates of 78% compared to those aged between 25-51 years with rates of 74.4% [27]. Another study's findings also oppose ours, indicating individuals over the age of 50 had a high adherence rate of 59.8% [28]. Educational level was significantly associated with medication adherence, with rates of 7.69% among participants with primary education, 17.07% among those with matriculation education, and 11.92% among those with education above matriculation. However, these findings do not align with a study that found adherence rates of 49.03% among participants with high school education, 42.08% with college education, and 47.61% with post-graduate education [29]. Another study reported that individuals with higher education exhibited a more adherent score of 70% compared to those with primary or secondary education levels [30]. Participants with comorbidities were associated with lower odds of low to moderate levels of non-adherence, consistent with the findings of another study [31]. Accordingly, this study determined that glycemic control for participants was less than 7%. These findings contrast with a study where 64.9% of participants had poor glucose control [32]. Another study's conclusion contradicts this, stating that participant glycemic control was 78.2%, substantially differing from our results [33]. In terms of medication type, tablets were associated with low to moderate levels of non-adherence, similarly noted in a study published last year [34].

LIMITATION OF THE STUDY

The study has several limitations. Firstly, it was conducted in a single hospital in Karachi. Which may restrict the generalizability of the findings to a broader population, moreover, the study utilized a relatively small sample size, potentially limiting the representation of the large population. Additionally, the cross-sectional study design employed in this research poses inherent limitations in establishing causal relationships and capturing temporal change over time.

CONCLUSION

The findings of this study concluded that the majority of the study participants showed low levels of medication adherence. Furthermore, age, level of education, marital status, and job status were significantly associated with adherence.

RECOMMENDATION

Based on the findings of this study, the principal investigator suggested the reinforcement of educational sessions for people with type 2 diabetes to increase their knowledge and compliance level to self-care as the Majority of the study participants were non-compliant with medicine. In addition, to strengthen the healthcare system in Pakistan and improve patients' knowledge *via* teaching sessions, innovative strategies should be incorporated that aim to improve patients' compliance with their treatment are essential to taking into concern the important factors and also promote diabetic educators in the healthcare center of Pakistan and further studies are needed to provide a more clearer picture in Pakistan.

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Committee of the Dow Institute of Nursing and Midwifery, DUHS (REF Letter No. DUHS/ION/MSN/2019/05/18/394), Karachi. All procedures performed in studies involving human participants were by the ethical standards of the institutional and/or national research committee and with the Helsinki Declaration.

CONSENT FOR PUBLICATION

Written informed consent was obtained from the participants in both Urdu and English, based on their preference and convenience.

AVAILABILITY OF DATA

The authors consistently verify that the data supporting the results of this study are accessible within the article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

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AUTHORS' CONTRIBUTION

All the authors contributed equally to the publication of this article.

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