

# FACTORS AFFECTING MEDICATION ADHERENCE AMONGST DIABETIC PATIENTS IN INDIA: A CROSS-SECTIONAL STUDY

## Abstract

**Background:** Diabetes is a chronic condition that requires lifelong treatment with anti-diabetic medications to achieve optimum blood sugar level and to prevent complications associated with it but medication non-adherence becomes a major barrier in attaining good glycemic control.

**Aim:** The study was designed to determine the adherence rate to anti-diabetic medications and factors associated with medication non-adherence amongst diabetic patients in Punjab.

**Materials & Methods:** A cross-sectional study was carried out for 3 months on 138 diabetic patients who were using at least one hypoglycemic agent or were on insulin therapy. Hill-Bone Medication Adherence Scale (HB-MAS) - a 9 item questionnaire was used to measure adherence rate.

**Results:** Medication adherence in the study population was above average. 89(64.5%) had high adherence followed by 41(29.7%) having moderate and 8(5.8%) having low adherence. Factors associated with medication non-adherence were age group 18-30 years, male, unmarried and had a family monthly income < Rs 5000.

**Conclusion:** The factors which affect medication adherence needs to be evaluated at the constant interval for an individual patient. Patients must be educated about the disease and the benefits of adhering to their treatment regimen, which eventually improves the quality of life.

**Keywords:** Diabetes, medication non-adherence, anti-diabetic medication, Hill-Bone Medication Adherence Scale.

## Highlights

### What is already known about the topic?

- Punjab is among the top 10 highest diabetes states in India with a prevalence of 10%.
- In Punjab, the rate of medication adherence was low as per the literature available.

## **What does the paper add to existing knowledge?**

- This study is the first study conducted on factors affecting non-adherence in out-patient patients of district Moga, Punjab, India. So, it may provide help for further study on factors affecting non-adherence and patient's adherence rate.
- This study shows that age, gender, monthly income of the family, and marital status were significantly associated with adherence of the patient.
- The present study gives information to healthcare professionals or person in the related field regarding non-adherence and the factors related to non-adherence.

## **Introduction**

Diabetes is a group of chronic metabolic disorders that is growing rapidly in India [1]. The International Diabetes Federation (IDF) report of 2020 shows that 88 million people were suffering from diabetes mellitus in India with a prevalence of 8.9% [2]. A study reported that Kerala has the highest prevalence of diabetes in India (20%) followed by Punjab (10.0%) [3, 4]. Diabetes is a complex process that requires lifetime treatment with medications and lifestyle changes for management [5, 6]. Although appropriate treatment is given and various lifestyle modifications are done by healthcare providers to achieve optimum glucose level but often medication non-adherence remains a major barrier in achieving the full therapeutic outcome of the therapy with adherence rates ranging from 36% to 93% [7, 8].

Medication adherence is defined as “the extent to which the patients take their medications as prescribed by the doctor” [9]. Due to medication non-adherence, approximately 125,000 deaths are caused which results in increased annual healthcare cost by \$290 billion [10]. For acute conditions, adherence rates are much higher as compared to chronic conditions such as diabetes, hypertension because acute diseases are managed in a better way than chronic conditions [11]. The reason may be due to complicated treatment regimen and increased duration of treatment [12, 5]. This was justified by a study in which patients on the statin therapy were adherent to the medications in the first three months and the adherence levels reduced as the duration of treatment increased [13].

Medication non-adherence not only leads to medicine wastage, disease progression, poor quality of life, increased use of medical resources but also leads to health-related consequences such as treatment failure, re-hospitalizations, death and also increases the healthcare expenditure such as the cost of emergency medical interventions [14, 15]. Total healthcare cost gets doubled in the case of patients who are non-adherent as compared to the patients who are highly adherent to the therapy [13].

When there is treatment failure, rather than changing the prescription or increasing the dose of the drug or prescribing any new drug to achieve glycemic control, the physicians should focus on assessing the therapy [11]. Physicians should enquire about medication adherence at every clinical visit to prevent treatment failure [8]. A better understanding of the factors associated with

medication non-adherence will help in developing various strategies to improve medication adherence [16]. The study was performed to find the adherence rates to anti-diabetic medications in diabetic patients in Punjab and the factors which are associated with medication non-adherence using Hill-Bone Medication Adherence Scale (HB-MAS).

## **Objectives**

The present study was conducted to assess the socio-demographic profile of diabetic patients (type I and type II) as well as to assess the adherence rate to anti-diabetic medications. The study aim was to evaluate the factors associated with medication non-adherence among diabetic patients.

## **Materials & Methods**

**Study design & settings:** A cross-sectional study was carried out for a duration of three months (January 2021 to March 2021) in different tertiary care hospitals of district Moga. Patients attending the hospitals within this period were recruited in the study after following the inclusion and exclusion criteria. After taking the consent of the selected patients, they were interviewed by the trained nursing staff of the hospital regarding their socio-demographic details and adherence was calculated using HB-MAS.

**Study participants:** The patients were enrolled in the study as per the following inclusion criteria and exclusion criteria:

### **Inclusion criteria:**

- Type 1 and type 2 diabetic patients
- Patients above 18 years of age, and
- Patients using at least one oral hypoglycemic agent or insulin therapy.

### **Exclusion criteria:**

- Gestational diabetes and lactating women
- Pregnant women
- Patients who disagree to participate in the study

**Ethical Approval:** The study was commenced after seeking approval from the Institutional Ethics Committee (IEC) of ISF College of Pharmacy, Moga.

**Data Source:** Socio-demographic details were collected by using a self-administered questionnaire and the adherence rate was calculated using Hill-Bone Medication Adherence Scale (HB-MAS). Hill-Bone Medication Adherence Scale (HB-MAS) is a 9 item questionnaire that has been used to measure the adherence levels in patients [17]. The reliability of the HB-MAS scale was assessed using Cronbach's alpha value. The internal consistency of the scale was

found to be 0.9. A score of 1 was given to response “All of the time”, 2 for “Most of the time”, 3 for “Some of the time” and 4 for “None of the time”. A total score for each patient ranges from 9-36. The patient having a score of 28-36 was considered as highly adherent, a score of 19-27 was considered moderately adherent and patient having a score of 9-18 were low adherent.

**Study Size:** The sample size was calculated by software Epi Info, designed by the Centre for Disease Control and Prevention (CDC), Atlanta. The sample size was calculated by assuming a 95% confidence interval with a 5% level of significance. The sample size was found to be 138.

**Statistical analysis:** The data analysis was done using software using Statistical Package for Social Sciences (SPSS) version 25. Descriptive and analytical analysis was done to describe the results. All the categorical data was represented using frequencies and percentage and a chi-square test was performed to find out the highest proportion. The margin of error was set as  $P < 0.05$ .

## Results

Out of 138 patients, it was observed that the highest proportion of the patients, 61(44.2%) belongs to the age group of 45-59 years followed by 36(26.1%) belongs to age  $\geq 60$  years as shown in Table 1. The Chi-square test was performed between the age of the patients and adherence score, the results were found statistically significant  $\chi^2 (6, N=138) = 26.50, p = 0.001$ . Patients having age  $\geq 60$  years were highly adherent while patients from the age group 18-30 years had low adherence.

The present study reveals that 71(51.4%) of the patients were found male whereas 67(48.6%) were found female. A Chi-square test was performed between the gender of the patients and adherence score, the results were found statistically significant  $\chi^2 (2, N=138) = 7.91, p = 0.019$  as shown in Table 3. It was observed that females were more adherent as compared to male patients.

On the evaluation of BMI ( $\text{kg/m}^2$ ), most of the patients 52(37.7%) were found overweight having BMI between 25-29.9  $\text{kg/m}^2$  followed by 44 (31.9%) had normal BMI between 18.5-24.9  $\text{kg/m}^2$ . A chi-square test showed no significance between BMI of the patient and adherence score  $\chi^2 (6, N=138) = 9.89, p = 0.129$ . Patients having normal BMI had more adherence while underweight patients had low adherence.

The majority of the patients i.e. 114(82.6%) were married followed by 12 (8.7%) were unmarried. A Chi-square test was performed between the marital status of the patients and adherence score, the results were found statistically significant  $\chi^2 (4, N=138) = 13.69, p = 0.008$ . Higher adherence rates were found among married patients while unmarried patients had low adherence.

The proportion of patients who had family history was equal to the patients who did not have a family history. A chi-square test showed no significance between the family history of the patient and adherence score  $\chi^2 (2, N=138) = 4.55, p = 0.103$ . Patients who had a family history of diabetes had more adherence than those who didn't have a family history of diabetes.

The monthly income of the family in 62(44.9%) patients was 5000-20000 followed by 40 (29%) having monthly income of 21,000-50,000 Rs. A Chi-square test was performed between monthly income of the family and adherence score, the results were found statistically significant  $\chi^2 (6, N=138) = 13.34, p = 0.038$ . Patients having a monthly income of more than 50,000 Rs had a higher adherence level while patients having monthly income less than 5000 Rs had a low adherence level.

Out of 138 patients, 58(42%) forgot to take their diabetes medicine none of the time, 64(46.4%) forgot to get their prescription filled some of the time, 6(4.3%) missed their diabetes pills all of the time when they were sick and 24(17.4%) missed taking the diabetes pills due to carelessness most of the time. A detailed representation of responses is given in Table 4.

Among the patients, 89(64.5%) had high adherence followed by 41(29.7%) having moderate and 8(5.8%) having low adherence. Low adherence was found to be higher in the age group 18-30 years, male gender, unmarried and who had a family monthly income less than Rs 5000 as shown in Table 2.

## Discussion

In this cross-sectional study, few patients had low adherence to their diabetic medication. Patients who were low adherent to their diabetic medications were 18-30 years of age, male, unmarried and have Rs <5000 monthly income of the family. Moreover, the reported prevalence of low adherence is very less in this study as compared to another study done in Kerala, India in 2015 by Sankar *et al* which reported low adherence in patients to be 74% [6]. The prevalence of low adherence in Kerala is much higher than in Punjab and this might be due to the higher literacy rate of Kerala compared to Punjab. So, a higher literacy rate is linked with more reporting of health issues.

More than half of the patients had high adherence to their diabetic medication. Patients who had high adherence to their diabetes medication were  $\geq 60$  years of age, female, married and have Rs >50000 monthly income of the family. However, the rate of high adherence in this study is higher than 35.7% reported in another study in Saudi Arabia in 2019 by Alqarni *et al* [19]. This difference in adherence rate could be due to the difference in lifestyle, healthcare services, socio-economic status or different method used to assess adherence across the study settings.

In this study, 61 (44.2%) of the diabetic patients belong to the age group of 45-59 years. Another study performed in Karnataka by Srividya & Balaje in 2019 [5] observed similar findings wherein 70 (46.7%) patients belong to the age group i.e. 45-59 years. Also in terms of gender,

similar findings were observed in the same study wherein 82 (54.7%) were male and 68 (45.3%) were female.

In the present study, the number of married patients was higher than the study conducted by Alqarni *et al.* in 2019 [19] wherein 261 (69.6%) were married. Non-adherence was observed more in males as compared to females. Our result was similar to the study performed by Kim *et al* in 2016 [16] which shows that male patients had poor adherence to diabetes medication as compared to male patients but these results are not similar to the study performed by Sankar *et al* in 2015 [6].

We observed a significant association between marital status and non-adherence to diabetic medications. The prevalence of low adherence was higher in unmarried patients as compared to married patients because married patients received support from their partner which is essential at some point in increasing the adherence rate of the patient, so married patients were more adherent than unmarried patients. These results were different from the other studies conducted in Karnataka [5], Korea [16] and Saudi Arabia [18].

A study conducted in Cameroon by Aminde *et al* in 2019 showed that patients with an age group >60 years were more adherent to the therapy as compared to patients who were <60 years. These results were similar to the present study in which old age patients were more adherent to the therapy due to more awareness towards their therapy [7].

Monthly income had a greater influence on medication adherence. Low adherence was associated with lower monthly income which is similar to the results in various other studies conducted in Uttarakhand [11], Eastern Nigeria [8] and Kerala [6] wherein patients faced difficulty paying for their medicines. The high cost of medications was the reason due to which the patient opted not to take the medicines. The physician should prescribe effective and budget-friendly medicines to the patient.

There were few limitations of the study: Firstly, the self-reported measure was used for data collection which may lead to biasness and may overestimate the adherence rates of patients. Secondly, the patients attending the tertiary care hospitals were recruited in the study which recalls selection biasness that patients attending the hospital are more concerned for their health. Third, the sample size of the study was small. So the data cannot be generalized to the entire population.

## **Conclusion**

Medication adherence in study participants was above average, still, participants were having moderate to low adherence. The factors which affect medication non-adherence need to be evaluated at constant intervals by physicians or any other healthcare worker such as nurses and pharmacist so that appropriate measures can be taken to improve adherence by ruling out the barriers that affect medication adherence. Education must be provided to the patients about their

disease and the benefits of adhering to their treatment regimen. Identification of individual factors that contribute to medication non-adherence and then working to reduce them can ensure a better quality of life.

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**Conflict of Interest Statement:** All the authors have declared that no competing interests exist.

**Statement of Ethics:** The research topic was granted ethical approval from the Institutional Ethics Committee (IEC) of ISF College of Pharmacy, Moga, Punjab. Informed consent was obtained from the patients. All procedures performed in studies involving human participants followed the institutional and national research committee's ethical standards and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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