

# **Determinants of Non-Adherence to Diabetes Treatment and Health Care Seeking Behaviour Before and During COVID-19 in Tamil Nadu: Mixed Methods Study**

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## **Abstract:**

Non-adherence to medication is common among type 2 diabetes mellitus patients. Non-adherence leads to increased morbidity and mortality as well as increased rates of hospital admission. Hence, this study was carried out to determine the factors affecting the non-adherence to medication among patients attending Non-Communicable Disease (NCD) clinic at Rural Health Training Centre (RHTC) in South India and to explore the reasons and possible solutions for treatment non-adherence among diabetes patients and treatment seeking behaviour among patient during covid-19 pandemic. A mixed method study was employed with quantitative being a secondary data collection and qualitative as In-depth interview (IDI) technique. IEC clearance was obtained. The descriptive and analytical data were analyzed using SPSS (Version\_24.0) while Smith's salience index was calculated with Visual Anthropac (version\_1.0) software to determine the most salient items. Manual content analysis was done for IDI. The overall

prevalence of non-adherence to diabetes medication was seen in 438 patients (73.8%) out of 593 patients. Among the non-adherent patients, 277 (63.2%) patients were  $\geq 50$  years, 231 (52.7%) were females, 183 (41.7%) were illiterate, 213 (48.6%) were physical inactive, 372 (84.9%) were belongs to APL, 360 (82.1%) were having history of Diabetes mellitus, 93 (21.2%) were addicted to tobacco and alcohol usage and 270 (61.6%) were overweight and obese. Forgetfulness and fear of side effects were ranked first among the reasons of diabetes adherence to medication. Important barriers affecting quality of life of diabetes patient during COVID-19 lockdown were diet, exercise adherence and monitoring of blood glucose and blood pressure. Thus, this study has explored some barriers and solutions for medication adherence faced by the patients and their quality of life during COVID-19 pandemic.

**Keywords:** Treatment non-adherence; diabetes; barriers; solutions; COVID-19

**Introduction:** Diabetes which is a Non – Communicable Disease (NCD) is a chronic, progressive metabolic disorder characterized by an elevated level of blood glucose level (hyperglycemia), which leads to serious complications over time in multiple organs and yet has no curable treatment. Among the classification of diabetes, type 2 is the most common and complicated to treat if advanced. According to WHO (World Health Organization) 2016, the global prevalence of diabetes among adults is 10% by which it is considered as ‘The Seventh leading cause of death’.<sup>1</sup>

In India, the diabetic prevalence is about 7.8% in which 1 in 2 remain undiagnosed. Due to increasing rate of diabetes in India it is referred as ‘Diabetic Capital of the World’.<sup>2</sup> The prevalence is more in rural region (7.3%). The major causes are overweight (21.4%), physical inactivity (12.1%) and obesity (4.7%).<sup>3</sup>

People with chronic diabetes appear to be vulnerable to increased risk of developing higher HbA<sub>1C</sub> and treatment non-adherence under various circumstances. COVID-19 also risks worsening the diabetes outcomes due to disruption caused by pandemic at the healthcare level, even that includes stress and changes in their diabetes self-care management.<sup>4</sup> If the risk were understood, it is possible to mitigate them during and after the COVID-19 pandemic.

### **Objective:**

1. To determine the factors affecting the non-adherence to medication among patients attending NCD clinic at our RHTC Thiruvannainallur in South India.
2. To explore the reasons and possible solutions for treatment non-adherence among diabetes patients
3. To explore treatment seeking behavior among patient during covid-19 pandemic.

### **Material and methods:**

**Study area and setting:** The study was conducted by the Department of Community Medicine at our Rural Health Training Centre (RHTC), Thiruvannainallur. NCD clinic runs on every Thursday in RHTC, by a team of Assistant Professors, Postgraduates, Interns and Medical Social Workers. Regular programs consist of risk factor assessment, enrolment of new diabetic and hypertensive patients, follow up of old cases, treatment of old and new cases. Besides, it ensures a health education on diet management, foot care management, physical activity<sup>5</sup> and counselling for all patients. As for diabetes, Fasting and Postprandial blood sugars were collected once in every three months visit to the clinic. Support group was formed in the villages under our service area for regular meeting among diabetes patients. The monthly diabetes awareness program was organized in the villages targeting the diabetes support group patients as well as the high-risk category groups.

**Study design:** Mixed method study design<sup>6</sup> include secondary data analysis (quantitative) followed by free-listing and in-depth interview (qualitative). (**Figure 1**)

**Study participants:** All diabetic treatment non adherent patients registered in our NCD clinic from 2016 to 2019 were included in the study after getting informed consent. Free listing was done among 30 patients who do not take medication as prescribed over the period of six months and also with the poor glycemic outcome, were purposively selected. Ten In-depth interview was conducted among 10 participants who were willing to give consent and were vocal.

### **Data extraction and collection method:**

**Quantitative data:** Data was extracted from the NCD clinic card in RHTC, Thiruvannainallur. Details of the variables such as NCD number, date of first screening, age at first screening, gender, education status, occupation, socioeconomic status, smoking and alcohol consumption, old/newly diagnosed diabetes, compliance to diabetic treatment, anthropometric measurement and blood sugar levels were extracted from the NCD clinic card by the investigators.

**Qualitative data:** The free listing exercise<sup>7</sup> was done to explore the reasons for diabetes treatment non-adherence and its possible solutions. About 30 patients who do not take medication as prescribed over the period of six months and with the poor glycemic outcome, were purposively selected for free listing exercise.<sup>8</sup> After obtaining consent, two primary stimulus questions based on the cognitive domain factors were asked to explore the reasons for treatment non-adherence and its possible solutions includes ‘*can you list our few reasons for treatment non-adherence?*’, ‘*can you please mention some probable solutions and suggestions to overcome the diabetes treatment non-adherence?*’ We achieved saturation at various levels of interview for the two questions. We also did follow up of our registered patients during COVID-19 lockdown through telephonic consultation. In-depth interview<sup>7</sup> were conducted among ten diabetes patients regarding their diabetes treatment and its adherence, physical activity, dietary habits and foot care during lockdown.

#### **Ethical issues:**

The present study was approved by Research committee and Institutional Ethics Committee (IEC approval number: 02/2019) of SMVMCH, Puducherry.

**Data entry and analysis:** Data was entered in the software Epi\_Info (version\_7.1.5.0) (Developed by Centre of Disease Control, Atlanta, USA and WHO) and was analyzed using Statistical Package for the Social Sciences (SPSS) Software (Version\_24.0). Description of categorical variables was made by using frequency and Chi-square test to test the level of significance. Multivariate Logistic regression analysis was done to identify the variables that best predicts the diabetes treatment non-adherence. These variables were loaded in the software using the ‘Enter’ method. The results were considered statistically significant when the p value was <0.05. Visual Anthropac (version\_1.0) software was used to calculate Smith’s salience Index to

obtain the most salient items. Manual content analysis<sup>7</sup> were done for IDI to obtain the items with highest item frequencies.

**Mechanism to be followed for anonymity:** Anonymity was maintained by ‘removing all identifiable information from all the interviewer transcripts or quotations used from it, so that no of individual participants can be identified from these documents’.<sup>7</sup> In this secondary data analysis, anonymity was maintained by removing name from the collected data and coding was done using NCD clinic number followed by decoding.

### **Results:**

**Table 1** shows that out of 593 patients 438 [73.8%; 95% CI: 70.2 – 77.2] were non-compliant to medication and remaining 155 [26.2%; 95% CI: 22.7 – 29.7] were compliant to medication. In bivariate analysis, patients aged  $\geq 50$  years had 1.61 times higher odds of developing noncompliance to diabetes mellitus treatment. The odds of developing noncompliance to treatment were 1.57 times high among physically inactive patients. In multivariate analysis, two variables such as age  $\geq 50$  years and those who were physically inactive emerged as significant predictors for developing noncompliance to medication.

Free listing was done to find the reasons and possible solutions of diabetes treatment non-adherence among type-II diabetes patients in our Rural Health Training Centre. The most salient reasons of diabetes treatment non-adherence were forgetfulness of taking medicines during working hours and perceived fear of side effects of diabetes medications (**Table 2**). The best proposed solution for diabetes treatment adherence were reduction of number of drugs or prescription of combination of drugs and administration of reminder methods (**Table 3**).

### **Follow up status and Quality of life of diabetes patient during COVID 19 lockdown:**

In-depth interviews were conducted among ten diabetes patients regarding their diabetes treatment during COVID-19 lockdown. The key results include majority of the patients had issues regarding medication adherence due to non-accessibility to medications and high cost of the drugs in the pay pharmacies which posed a negative impact on the treatment adherence. In addition, follow-up visits were reduced which further reduced the regular monitoring of blood glucose and blood pressure level. Though few received help from nearby NGOs and self-help

group members for procuring medication and travel to health care centres, since there is stoppage of transport facilities during lockdown. In addition, majority of the patients faced issue in adherence to healthy dietary habits and physical activity.

### **Discussion:**

Around three-fourth (73.8%) of the patients were non-compliant to diabetes medication. Patient aged  $\geq 50$  years and those who were physically inactive emerged as significant predictors for developing noncompliance to diabetes medication. The most salient reasons of diabetes treatment non-adherence were forgetfulness on taking medications during working hours and perceived fear of side effects to drugs. The best proposed solution for diabetes treatment adherence were reduction of number of drugs and administration of reminder methods. Another major issue affecting quality of life during COVID-19 lockdown were patient not able to attend regular follow-up visits to hospitals, monitoring of blood glucose and blood pressure were also not done at regular intervals and there was issue in adherence to healthy dietary habits and physical activity.

In the present study prevalence of diabetes treatment non-adherence was 73.8 percentage. however, our study prevalence for treatment non-adherence was higher when compared with the studies done in other districts in Tamil Nadu include Kanchipuram (64.2%), Chidambaram (60.2%), Villupuram (45.4%), Puducherry (32.7%), Chennai (29.7%). As these changes might be due to wide variations in the study region, and access to healthcare centre.<sup>9-13</sup> Comparing these results might be difficult as most of the authors used difference methods to assess the compliance level. In addition, studies done in neighbouring state within South India, includes Kerala (74%) found similar prevalence of diabetes treatment non-adherence, while Andhra Pradesh (9.7%) had lower prevalence of treatment non-adherence, probably due to self-reporting of treatment compliance.<sup>14-15</sup>

In the present study, age  $\geq 50$  years was one of the significant predictors for developing noncompliance to diabetes medication. A study by Sharma T et al, Pattnaik Set al, Muliylil DE et al also found that patient aged more than 60 years were more non complaint to diabetes treatment.<sup>15-17</sup>

We found that the most common reasons of diabetes treatment non-adherence were forgetfulness of taking medicines during working hours and perceived fear of side effects. Study done by Venkatesan M et al explored the factors include perceived lack of satisfaction with doctor-patient relationship, forgetfulness, myths about diabetes and poor knowledge about diabetes influence the non-adherence to treatment.<sup>11</sup> A study in Uttarkhand found that the most common reasons of diabetes treatment non-adherence were cost of the drug and too many drugs.<sup>16</sup> A study by Medi RK et al found that the main factors for non-adherence were lack of finance, forgetfulness and busy schedule during working hours.<sup>18</sup> Studies from outside India found reasons like usage of traditional treatment, lack of satisfaction in doctor-patient relationship and others were consistent with our study findings.<sup>19-21</sup> Thus, it implies a proper interventions which includes education and counselling regarding the importance of the medication adherence in diabetes to the patients visiting the hospital and during the mobile camps is necessary.

The solutions were the better doctor-nurse-patient relationship, reduction in pill burden, remainder methods and others. The solutions obtained in our study were similar to the study done in Zimbabwe, where the patients require support from the family, work, community. Requires better communication between doctors and patients and other items.<sup>19-21</sup> This can be improved by training the healthcare workers at the village level to counsel the family members regarding the moral support towards the diabetes patients.

The COVID-19 pandemic which had a negative impact on particularly patients with chronic illness, it doesn't spare the diabetes patients also. In addition, most of the healthcare system were disrupted all over the places.<sup>4</sup> In our study, we found that the patients had issues with regular follow-up with monitoring of blood sugar and blood pressure, availability of medication and its unaffordability due to cost. In addition, among the diabetes patients, elder population were affected most when compared to others. Study done in Ethiopia, also showed similar factors that were responsible for the treatment compliance during COVID-19 pandemic.<sup>22</sup> Likewise, dietary and physical management were lacked during COVID-19 lockdown, which was concordance with the study done by Mekonnen CK et al.<sup>23</sup> Thus, it is utmost important that people with diabetes should be recognized as a vulnerable group and at risk categories, for those strategies need to be planned to safeguard their health during the pandemic situations.

**Strength and limitation:**

This study will help to provide the comprehensive diabetic care to the patients attending RHTC which further enhance the development of the centre. Proactive outreach activity to the diabetic support group will help patients to improve their treatment adherence through community participation.

The limitation of the present study includes self-reporting of treatment adherence. Recall bias could occur due to self-reported information. We had represented all independent variables as categorical variable and their interrelationship might influence the results of the multivariate analysis. The findings of the study were confined to smaller geographical area, could not address the generalizability.

### **Conclusion:**

The study has found the determinants of non-adherence to diabetes medication and also explored some reasons and possible solutions for medication adherence. Urgent interventions are required to tackle this problem in combined efforts to stem this looming diabetes epidemic by achieving better health, better quality care, and lower cost. Quality of life of diabetes patient regarding medication adherence, accessibility of drugs was affected during COVID 19 lockdown.

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**Conflict of interest:** Nil

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**Table 1: Bivariate and Multivariate analysis for diabetes treatment adherence (N = 438)**

Variables	Non-compliance N (%)	Unadjusted odds OR (95%CI)	p value	Adjusted odds OR (95%CI)	p value
<b>Age groups (years)</b>					
< 49	161 (79.7)	1	<b>0.021</b>	1.552 (1.018-2.365)	<b>0.041*</b>
≥ 50	277 (70.8)	1.61 (1.076-2.426)		1	
<b>Gender</b>					
Male	207 (75.3)	1.146 (0.793-1.657)	0.467	0.924 (0.552-1.544)	0.762
Female	231 (72.6)	1		1	
<b>Education</b>					
Illiterate	183 (70.9)	1	0.154	1	0.450
Literate	255 (76.1)	1.306 (0.904-1.887)		1.171 (0.778-1.762)	
<b>Physical activity</b>					
Inactive	213 (69.6)	1.577 (1.087-2.289)	<b>0.016</b>	1	<b>0.033*</b>
Active	224 (78.3)	1		1.637 (1.042-2.573)	
<b>Socioeconomic status</b>					
APL	372 (73.5)	1.132 (0.667-1.922)	0.646	0.981 (0.563-1.709)	0.946
BPL	66 (75.9)	1		1	
<b>Diabetes duration</b>					
Old patient	360 (74.2)	1.108 (0.694-1.767)	0.668	1.241 (0.765-2.012)	0.382
Newly diagnosed	78 (72.2)	1		1	
<b>Addiction (Tobacco and alcohol)</b>					
Yes	93 (74.4)	1.036 (0.660-1.627)	0.877	0.843 (0.482-1.474)	0.550
No	345 (73.7)	1		1	
<b>Nutritional status</b>					
Overweight or obese	270 (73.6)	1.041 (0.713-1.519)	0.836	1.056 (0.714-1.563)	0.784
Normal	168 (74.3)	1		1	

**p-value <0.05 is significant**

**Table 2: Reasons for diabetes treatment non-adherence among type-II diabetes patients in Rural Health Training Centre (RHTC) (N = 30)**

<b>Item</b>	<b>Frequency (%)</b>	<b>Average Rank</b>	<b>Salience</b>
Burden of taking medicine during work hours	80.0	2.25	0.567
Forgetfulness	70.0	1.00	0.700
Perceived fear on side effects of the medicine	40.0	2.25	0.265
Lack of satisfaction with doctor-patient relationship	40.0	3.25	0.153
Out of pocket expenditure	40.0	3.25	0.162
Multiple insulin dose is painful	30.0	3.25	0.160
Native treatment works better	30.0	2.00	0.222
No use in taking any medication	20.0	4.00	0.065
Burden for old people to get the medicine	20.0	3.00	0.067

**Table 3: Solutions for diabetes treatment non-adherence among type-II diabetes patients in Rural Health Training Centre (RHTC) (N = 30)**

<b>Item</b>	<b>Frequency (%)</b>	<b>Average Rank</b>	<b>Salience</b>
Good Doctor-Nurse-patient communication	63.3	2	0.463
Reduction of pill burden	60	2.5	0.34
Reminder methods to comply with medication	43.3	2.15	0.297
Reduction of cost of drug	40	2.25	0.26
Health education about the importance of medication for diabetes	33.3	2.2	0.23
Support from family members and workplace	33.3	2.2	0.229
Reduction of out-of-pocket expenditure including logistics	20	2.5	0.118
Regular monitoring and motivation through village groups (support group, self-help group and others)	13.3	2.5	0.09
Support from health care professionals at village level	10	2.67	0.057
Side effects from diabetes medication can be reduced	6.7	3.5	0.033

**Figure 1:** Consort diagram of the study participants in treatment non-adherence

