

Medication adherence and associated factors among individuals with non-communicable diseases registered for care in primary health centers of Villupuram district, South India

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ABSTRACT

Introduction: Early detection and compliance to prescribed treatment is the cornerstone to avert life threatening complications among those with non-communicable diseases (NCD). Medication adherence is a critical determinant for ideal control status in Non-communicable diseases. Assessing adherence to medication and its correlates can help in devising effective strategies to improve medication adherence. **Objectives:** To assess adherence to prescribed medications and associated factors among diabetic and/or hypertensive patients registered in NCD clinic of selected PHCs of Tamil Nadu, South India. **Methodology:** A facility based cross-sectional analytical study was conducted in six conveniently selected PHCs of Villupuram district, Tamil Nadu. The individuals with hypertension and/or diabetes, registered and received NCD drugs for more than four weeks were included. All eligible individuals attending the clinic during study period were included. The medication adherence was assessed using MMAS-8 questionnaire. The data was entered in EpiData software V 3.1 and analyzed using Stata version 11.0. **Results:** Of the 1406 participants, the mean (SD) age was 56.3 (± 11.4) years; 831 (59.1%) were females. Only diabetes was found in 340 (24.2%), 806 (57.3%) had only hypertension and 260 (18.5%) had both diabetes and hypertension. Low adherence to medication was seen in 203 (14.3%, 95% CI (9.8%, 19.9%)) of the study participants. Having only hypertension (PR-1.5, 95% CI-1.1–2.1), consuming more than two class of drugs (Prevalence ratio PR-1.7, CI-1.1–2.4) and more than four (PR-2.8, CI-2.3-3.6) were independently associated with low adherence. **Conclusion:** Around one out of six individuals registered in NCD clinics of PHC had low adherence to prescribed medication. Those having higher number of concomitant drugs to consume were more likely to have low adherence.

Key Words: Diabetes, Hypertension, Adherence, Non adherence, Primary health care, medication.

INTRODUCTION

Non-Communicable Diseases contribute to 43% of overall disease burden in the world and are expected to be responsible for 60% of the disease burden and 73% of all deaths by 2020.¹ Hypertension and diabetes are the common chronic morbidities which can lead to life-threatening complications like cardiovascular diseases and stroke.² Globally about 392 million people live with diabetes and the number is expected to rise to 592 million by the year 2035.³ Of the total estimated, about four-fifths live in Low and Middle Income Countries (LMIC). International Diabetes Federation (IDF) estimates that diabetes accounts for 14.5% of all-cause mortality among people aged between 20 and 79 years.³ There is high healthcare spending to treat diabetes and prevent its complications; estimated to be 673 billion USD and projected to increase by 20% in 2040.⁴ World Health Organization (WHO) rates hypertension as one of the most common cause of premature deaths worldwide.⁵ Hypertension independently accounts for almost 57% and 24% of deaths due to stroke and cardiovascular diseases respectively.⁵ Global Burden of Diseases (GBD) rated hypertension as the second important cause of mortality

placed only next to under-five malnutrition in South Asia.⁶

Like any other developing country, India is facing the double burden of disease with high burden of communicable and non-communicable diseases.⁷ India is home for nearly 69.9 million people with diabetes mellitus, only next to China.³ The burden of diabetes has increased significantly over the last few decades. Similarly, there is high burden of hypertension in the country with estimated prevalence of 29.2% among adults.⁸ With increasing burden of the diseases and premature mortality associated with non-communicable disease like diabetes, National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was launched.⁹ The program advocates delivery of care to the patients with NCD at the Primary Health Centres (PHCs), with timely referral to secondary and tertiary hospitals. The patient registered in NCD clinics are clinically assessed once in a month and drugs are prescribed for duration of one month in PHCs. However, NPCDCS has not devised and implemented any standard operating procedures for assessing adherence to medication among NCD patients.

The definition of the term “adherence” is “the extent to which a person’s behavior such as taking medication, following a diet and/or executing lifestyle changes corresponds with the agreed recommendations from a health care provider”.¹⁰ On the other hand, “Non-adherence” to treatment acts by increasing hospitalization, mortality and out of the pocket expenditure amongst patients with diabetes and/ or hypertension.¹¹ A study conducted at a tertiary care hospital in South India among diabetic in-patients showed that only 49.3% were adherent to prescribed medications.¹² A community based study among hypertensive patients in South India showed that 45.8% were having low adherence.¹³ Whereas studies conducted in single center among NCD patients showed 17.5% to have low adherence to medication.¹⁴

In India, studies assessing adherence to medication among patients with diabetes and hypertension are mostly limited to patients attending tertiary care facilities.¹¹⁻¹⁵ But, it is important to assess adherence to treatment and its correlates in those patients attending PHCs as most of them are yet to develop complications. Even though few studies have been conducted in PHCs, they are all limited to single PHCs¹⁶. Identifying the non-adherent patients and factors associated with non-adherence will help in guiding targeted interventions in future among these patients to improve adherence and avert complications that may arise due to non-adherence.

In this context, the present study was conducted among patients with diabetes and/or hypertension registered in NCD clinic at six Primary Health Center (PHC) of Villupuram HUD, Tamil Nadu, to assess a) the adherence to prescribed medications for diabetes and/or hypertension b) the socio-demographic and treatment characteristics associated with the low adherence

METHODOLOGY

Study Design and Setting

In 2017, during the months of June to August facility based cross-sectional analytical study was conducted in selected primary health centers of Villupuram district in the state Tamil Nadu, India. Tamilnadu is one of the well performing states in providing health care in southern part of India. Villupuram Health unit District (HUD) caters to the healthcare needs of 16,11,283 individuals. Villupuram HUD comprises of 11 Block Primary Health Centres (BPHCs), 43 Primary Health Centres (PHCs), 3 Urban Primary Health Centres (UPHCs) and 293 Sub Centres functioning under Directorate of Public Health (DPH) Tamilnadu Government.

Among those 43 PHCs, six PHCs were selected based on convenience of access of 60 kms from study headquarters (Tertiary care Hospital) as it is single investigator study. PHCs provide outpatient services from 8 am to 4.30 pm and emergency services in remaining hours. The NPCDCS was implemented in the Villupuram HUD during the year 2011..

Each PHC has a separate NCD wings manned by a NCD staff nurse supervised by the medical officer. Patients registered for care every month for follow up and for medications which are given for a month.- During the

visit the patients are reviewed and the updated in the comprehensive patient record by the attending medical doctor. The card has details of the patient like socio demographic details, screening results, life style modifications adopted, co morbidities, counselling provided, follow up details, date and result of lab investigations, details of drugs taken and referral details of the patient. The patients are advised regarding need for regular follow-up visits and lifestyle modifications to combat non communicable disease. The health care providers educate patients regarding dose and regimen of the prescribed medication to be followed during the course of next four weeks.

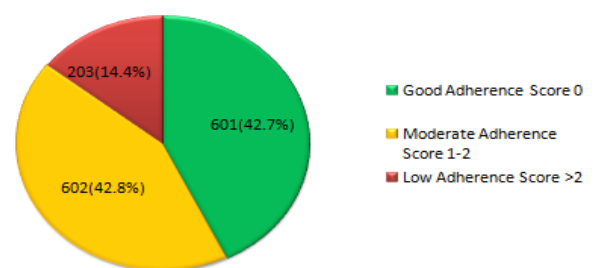
Study population:

We included all the patients with either diabetes and/or hypertension who are already registered and attending NCD clinic at the six PHCs who had at least four weeks of treatment prior to the date of interview. The minimum sample size was calculated to be 628, assuming 17% to have low adherence¹⁴, 3% absolute precision and 95% confidence limit. However, all the patients attending the clinic during month of June and August were included in the study.

Study tool and Study variables:

Pretested, semi-structured interview schedule was used to collect information. Pre testing was done in four patients who had both diabetic and hypertension, three patients who had diabetes alone & three with hypertension alone. No major changes needed. The interview schedule had 2 components socio-demographic details and adherence to medication. The component of socio-demographic details included age, gender, education, occupation, community, marital status and also lifestyle behaviours like alcohol use and tobacco use.

Figure-1: Adherence to medication among NCD patients in the selected PHC's of Villupuram , N=1406



Low adherence to medication- 203 (14.4%, 95% CI- 9.8%-19.9%)

The treatment details had variables like type of morbidity (disease type), duration of treatment, number of drugs received. The details of treatment received were extracted using NPCDCS patient follow-up card. 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. MMAS scores can range from 0 to 8, with low adherence defined as MMAS scores less than 6; moderate adherence as scores of 6 to less than

Table-1: Socio-demographic characteristics & Morbidity Profile of NCD patients in the selected PHC's of Villupuram, March-2017 to August-2017, N=1406			
Socio-demographic Characteristics & Morbidity Profile		Frequency (n)	Percentage (%)
Age(years)	30-44	261	18.6
	45-59	682	48.5
	≥60	463	32.9
Gender	Male	575	40.9
	Female	831	59.1
Education	Illiterate	734	52.2
	1-5 th STD	212	15.1
	6-8 th STD	150	10.7
	9-10 th STD	130	9.3
	Intermediate and above	49	3.5
	Not Recorded	131	9.3
Occupation	Farmer and Farm workers	488	34.7
	Employed	89	6.3
	House wife	459	32.7
	Unemployed	115	8.2
	Others	255	18.1
Caste	Forward Caste	39	2.8
	Backward Caste	482	34.3
	Most Backward Caste	449	31.9
	Scheduled Caste	216	15.4
	Not Recorded	220	15.7
Alcohol use	Yes	64	4.6
	No	1096	77.9
	Not Recorded	246	17.5
Tobacco use	Yes	169	12.0
	No	1237	88.0
Disease type	Hypertension only	340	24.2
	Diabetes only	806	57.3
	Both	260	18.5
Disease duration (years)	<1	209	14.9
	1-3	466	33.1
	3-5	536	38.1
	>5	195	13.9
Regimen	Once daily	759	54.0
	Twice daily	581	41.3
	Thrice daily	66	4.7
Number of medication	One to two	565	40.2
	Three to Four	721	51.3
	More than Five	120	16.7

Table-2: Socio-demographic and Morbidity characteristics associated with low adherence among NCD patients in selected PHC's of Vilupuram HUD, N=1406				
Characteristics	Frequency	Low Adherence n(%)	Unadjusted PR (95%CI)	Adjusted PR (95% CI)
Age (in years)				
30-44	261	30(11.5)	1.0	
5-59	682	107(15.7)	1.4 (0.9-2.0)	1.2 (0.9-1.7)
≥60	463	66(14.3)	1.2 (0.8-1.9)	1.1 (0.8-1.6)
Gender				
Male	575	74 (12.9)	1.0	
Female	831	129 (15.5)	1.2 (0.9-1.6)	1.0 (0.5-2.1)
Education				
Illiterate	734	111(15.5)	1.5 (0.9 – 2.5)	1.5 (0.9- 2.5)
1-5 th STD	212	32 (15.1)	1.5 (0.8-2.7)	1.6 (1.1-2.5) †
6-8 th STD	150	15 (10.0)	1.0	
9-10 th STD	130	16 (12.3)	1.2 (0.6-2.4)	1.4 (0.9-2.1)
Intermediate and above	49	7 (14.3)	1.4 0.6 – 3.3)	1.6 (1.1- 2.3) †
Not Recorded	131	22 (16.8)	1.7 0.9-3.1)	1.9 (1.1-3.0) †
Occupation				

Farmer and Farm workers	488	69 (14.1)	1.5 (0.8 – 2.7)	1.6 (0.7-3.7)
Employed	89	13 (14.6)	1.5 (0.7-3.2)	1.7 (0.7-4.0)
House wife	459	81 (17.7)	1.8 (1.1 – 3.3)	1.7 (0.7-4.7)
Unemployed	115	11 (9.6)	1.0	
Others	255	29 (11.4)	1.2 (0.6 – 2.3)	1.3 (0.5- 3.5)
Caste				
Forward Caste	39	3 (7.7)	1.0	
Backward Caste	482	47(9.8)	1.3 (0.4-3.9)	1.4 (0.2-8.1)
Most Backward Caste	449	99 (22.1)	2.9 (1.0-8.6)	2.8 (0.4-19.1)
Scheduled Caste	216	31 (14.4)	1.9 (0.6-5.8)	1.9 (0.3-12.0)
Not Recorded	220	23 (10.5)	1.4 (0.4-4.3)	1.4 (0.3-7.6)
Alcohol Use				
Yes	64	5 (7.8)	1.0	
No	1096	147 (13.4)	1.7 (0.7-4.0)	1.6 (0.5-4.8)
Not Recorded	246	51 (20.7)	2.7 (1.1-6.4)	2.0 (0.5-8.5)
Tobacco Use				
Yes	169	20 (11.8)	1.0	
No	1237	183 (14.8)	1.3 (0.8-1.9)	1.0 (0.6-1.7)
Disease Type				
Hypertension only	340	129 (16.0)	1.5(1.1-2.1)	1.5(1.1-2.1) †
Diabetes only	806	37 (10.8)	1.0	
Both	260	37 (14.2)	1.3(0.9-2.0)	0.9(0.7-1.1)
Disease Duration (years)				
<1	209	23 (11.0)	1.0	
1-3	466	74 (15.9)	1.4 (0.9-2.2)	1.4 (0.7-2.9)
3-5	536	69 (12.9)	1.2 (0.8-1.8)	1.2 (0.5-3.2)
>5	195	37 (19.0)	1.7 (1.1-2.8)	1.3 (0.5-3.9)
Regimen				
Once daily	759	98 (12.9)	1.0	
Twice daily	581	94 (16.2)	1.3 (1.0-1.6)	1.0 (0.7-1.4)
Thrice daily	66	11 (16.7)	1.3 (0.7-2.3)	1.2 (0.7-1.9)
Number of Medication				
One to two	565	55 (9.7)	1.0	
Three to Four	721	118 (16.4)	1.7 (1.2-2.3)	1.6 (1.1-2.4) †
More than Five	120	30 (25.0)	2.6 (1.7-3.8)	2.8 (2.2-3.6) †

PR-PREVALENCE RATIO †- SIGNIFICANT ASSOCIATION

8, and good adherence as a score of 8.¹⁷⁻¹⁹ The questions were translated and back translated to Tamil and English respectively by two separate bi-linguistic persons for content verification. The interview schedule was administered by trained NCD Staff nurses who were well versed in local language Tamil. The study protocol was approved by the Institutes Ethics committee.

Operational Definitions:

Adherence to medication: Patient with scores of <6 were considered to have low adherence. Patient with scores of 6 to < 8 were considered to have moderate adherence. Patients having a score of 8 were considered to have good adherence.

Duration of Disease: Duration of either diabetes or hypertension whichever was detected first in the patient eg: Patient is having Hypertension and Diabetes since two years and one year respectively, then duration of disease is considered as two years.

Dosage: Patients dosage is considered Once Daily, Twice Daily or Thrice Daily if he/she is consuming at least one drug once in a day, two times a day or three times a day respectively.

Number of drugs: Total number of different drugs that the patient has been prescribed by attending medical doctor to consume per day.

Statistical methods

The data was entered in Epidata software V 3.1 and was analyzed using Stata 11 software. The continuous data like age, duration of disease and number of drugs received were converted into categorical data according to relevance. All the categorical data were presented as percentages. The association between low adherence and categorical variables like age group, gender, education status, occupation, and type of disease, duration of disease, dosage and number of drugs was tested using univariate binomial regression. The variables with p value less than 0.1 in univariate binomial regression were taken for generalized linear models and factors with p value was less than 0.05 were considered as statistically significant.²⁰ The strength of association was mentioned in terms of prevalence ratio (PR) with 95% CI.

RESULTS

Of the 1406 participants, the mean (SD) age was 56.3 (\pm 11.4) years; 831 (59.1%) were females. Among participants, 734 (52.2%) were uneducated, 488 (34.7%) were homemakers and 482(34.3%) were belonging to

backward caste. Of the total, 64(4.6%) and 169(12.0%) participants reported current use of alcohol and tobacco respectively. Socio-demographic details of study participants are shown in Table 1.

Of the total participants, 806(57.3%) had only diabetes, 340(24.2%) had only hypertension and 260 (18.5%) had both hypertension and diabetes mellitus. Of the total participants, 536(38.1%) had disease duration of 3-5 years and 466(33.1%) had disease duration of 1-3 years. Of the total participants, 759 (54.0%) were consuming drugs only once in a day and around 647 (46.0%) had to consume two to three drugs per day. Morbidity profile of study participants are shown in Table 1.

Low, moderate and Good adherence to medication was seen in 203 (14.4%) 602(42.8%) and 601(42.7%), participants respectively as shown in Figure 1. Low adherence to medication was seen in 203 (14.3%, 95%CI-9.8%-19.9%) of the study participants. The proportion of low adherence was found to be higher in those having only hypertension (16.0%) compared to those having only diabetes (10.8%) or having both disease conditions (14.2%) and was found to be statistically significant.

Similarly the proportion of low adherence was found to be higher in those consuming five to nine drugs per day (25%) compared to consuming three to four drugs (16.4%) or consuming one to two drugs (9.7%) and was found to be statistically significant. Other variables adjusted and not significant were age, gender, education, occupation, alcohol use, tobacco use, duration of disease and regimen. Disease type and Number of drugs/day were significantly associated with low adherence on adjusting for other factors. Having only hypertension (PR-1.5, (95% CI-1.1–2.1)), consuming more than two class of drugs (PR-1.7,(95% CI-1.1–2.4)) and more than four (PR-2.8,(95% CI-2.3-3.6)) were independently associated with low adherence as shown in Table 2.

DISCUSSION

Our study conducted among patients with either hypertension and/or diabetes in 6 Primary Health Centers (PHCs) showed that 14.4% of the study participants had low adherence to medication. Patients having only hypertension and consuming more number of drugs were found to be independent risk factors for low adherence to prescribed medication in our study.

Arulmozhi and Mahalakshmy, in a study from Puducherry using MMAS-8 scale reported low adherence to medication in 39% patients.¹² This study was conducted among diabetes in-patients who have got complications and are admitted to hospital unlike in our study where patients are not having any complications. Steps taken to improve adherence in patients without complications like in our study can lessen the chances of them developing in the future.

Similarly another community based cross-sectional study conducted in a rural village of Tamil Nadu showed 75.9% of the hypertensive patients to be less adherent to medication (using MMAS-4).²¹ A community based cross-sectional study conducted in rural village of Kerala

showed 74% of diabetic patients to be less adherent to medication (using MMAS-8).²² The proportion of low adherence was found to be comparatively low in our study as the NCD staff Nurses have been stressed about the importance of Health education on life style modifications and how it helps in improving the treatment outcome. In the same study done in Tamilnadu, factors related to medication like increase in number and frequency of drugs were associated with low adherence.

The similar findings were reported seen in a single PHC study conducted in Puducherry, South India. A facility based cross-sectional study conducted in a public primary care clinic in China showed 32.6% of the hypertensive patients to have low adherence to medication.²³ As in our study MMAS-8 was used to assess adherence and a score of less than six was considered to be less adherent. Younger age, shorter duration of treatment and being employed were associated with low adherence. On the contrary in our study, patients with older age and longer duration of treatment had higher risk for low adherence.

The current study has a few strengths; firstly this study reported adherence among patients with diabetes and/ or hypertension attending a public, primary health center (PHC). The majority of these patients seek care only from PHC and also the national program promotes follow-up of these patients at PHC's. Hence, detecting the adherence level and its correlates at a PHC will help to find at risk groups for targeted interventions. Secondly Large Sample Size compared to other studies involving multiple primary health centers. Thirdly, using of cluster adjusted models with prevalence ratio to find the factors associated with low adherence. We used pretested questionnaire with validated MMAS-8 scale for adherence to medication; hence it has better internal validity and also comparability. Lastly using Epidata software V 3.1 for data entry for accurate data capturing.

As the interview was conducted by the healthcare provider, there might have been a social desirability in reporting non-adherence and we might have underestimated low-adherence to medication. To partly overcome this, the interviews were conducted on a one to one basis by the residing NCD staff Nurses after the patients purpose of visit is completed on the day of follow-up.

Our study has a few implication and recommendations. Firstly, the study results shows that there is a great need on the part of health care providers to not only prescribe medications but also make sure they are adherent to the prescribed drugs. Secondly, focused health education sessions addressing the importance of adherence to medications need to be carried out regularly other than routine Lifestyle modification advice provided. These sessions can be planned during the NCD clinic day which is now incorporated in all PHC's of the country. Thirdly, NPCDCS follow-up card has only one time entry regarding the life style behaviour of the patient like diet, physical activity, alcohol consumption, tobacco usage, etc. There can be an additional check box added in order to ascertain whether the patient had brought about the

recommended life style modification as per the counselling. Lastly, this study emphasizes the need for more studies addressing the cost-effectiveness of improvement in adherence and thus reducing the complications and also health care costs.

There are very few studies in these regions which explore the adherence to medication in hypertensive and diabetic patients that too in multiple centers at primary level. There is need for finding factors which are associated with low adherence. In our study, even educated individuals had low adherence to medication; hence qualitative studies will help to find the reason for this low adherence in educated. Without rectifying these reasons, health promotion segment of the national programs will not be able to deliver desirable treatment outcomes.

Conclusion

Among the diabetic and/or hypertensive patients though 85.3% of the study population showed moderate to good level of adherence, around one out of seven were found to be less adherent to prescribed medications in 6 PHCs of South India. Having only hypertension and consuming more number of drugs were identified independently as risk factors for low adherence to medication.

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