Original Article

Prevalence of medication adherence and its associated factors among patients with noncommunicable disease in rural Puducherry, South India – A facility-based cross-sectional study

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ABSTRACT

Background: Trends in morbidity and mortality due to noncommunicable diseases (NCDs) are rising because of poor control status. Medication nonadherence is one of the most common and modifiable causes of inadequate control status. **Objectives:** To determine the prevalence of drug adherence among patients with NCD in rural Puducherry. **Methods:** A facility-based cross-sectional study was done among 260 patients with NCD receiving treatment from rural primary health center in Puducherry during February and March 2018. Information regarding sociodemographic profile and household was collected using pretested semi-structured questionnaire. Morisky Medication Adherence Scale was done to assess the adherence. We calculated adjusted prevalence ratios (aPRs) to identify the factors associated with medication adherence. **Results:** Among the 260 participants, 42.7% belonged to elderly age group; 66.2% were females; 44% did not have any formal education; 70% were unemployed. The majority were suffering from hypertension (71.2%) followed by diabetes (56.2%). This study found that almost one-third (32.7%) of the study participants were not properly adherent to medications. Elderly [aPR 2.51 95% confidence interval (CI): 1.70–3.70] and female participants (aPR 1.64 95% CI: 1.04–2.58) were found to have more chance being nonadherent to medications after adjusting for possible confounding variables. **Conclusion:** This study reported that almost one-third of the study participants were nonadherent to medications. Elderly age group and female gender were found to be the determinants of nonadherence. Corrective measures need to be started at patient level first by motivating and educating them regarding the importance of drug intake.

Keywords: Diabetes mellitus, hypertension, medication adherence, moncommunicable diseases

Introduction

Noncommunicable diseases (NCDs) especially cardiovascular diseases and diabetes mellitus were found to be the leading cause of mortality worldwide.[1] Morbidity, mortality, and disability attributable to major NCDs account for almost 60% of all deaths and 47% of the global burden of disease.[2] The majority of deaths occur among low- and middle-income countries like India and China.[3] NCDs account for 53% of all deaths in India. The key contributor to the increasing burden of morbidity and mortality due to NCDs is poor control status of the patients.[4]

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Many factors contribute to the poor control status in patients with NCD which includes lack of integrated care at health system level, poor adherence to self-care recommendations, and compliance to medications.[5] Among these factors, medication nonadherence is one of the most common and potentially modifiable causes of inadequate control of the NCDs. Medication adherence has been defined by the International Society for Pharmacoeconomics and Outcomes Research as the "extent to which a patient acts in accordance with the prescribed interval and dose of a dosing regimen."[6]

Globally, it has been reported that full compliance to the treatment for chronic illness is 50%, and this is far less in case of developing countries like India.[7] Studies around India have reported varying prevalence of nonadherence among patients with NCD.[8-10] Poor medication adherence results in increased out-of-pocket expenditure due to outpatient care, emergency visits, and hospitalization for management of complications due to uncontrolled status. Hence, this study was done to determine the prevalence of medication adherence among patients with NCD in rural Puducherry, South India.

Methods

This was a cross-sectional survey done among patients with NCD attending JIPMER rural health care centre (JIRHC) to determine the prevalence of nonadherence. JIRHC caters to a population of around 10,000 spread over four villages, namely, Ramanathapuram, Thondamanatham, Pillaiyarkuppam, and Thuthipet. All the four villages were located within 4 km of the health center which was located in Ramanthapuram village. Health services were provided by medical officer, indergraduate intern trainees, postgraduates posted from the Department of Community Medicine, JIPMER, supported by nursing staff, and public health nurses. This study was conducted during February to March 2018.

All the adult patients attending the NCD clinic were included in the study. The sample size was calculated by OpenEpi (v 3.01 updated on 2013, USA), using prevalence of low adherence among patients with chronic disease, to be 74% based on a previous study[8]; with absolute precision of 6% and a confidence interval (CI) of 95%, the sample size was estimated to be 206. However, all the patients satisfying the inclusion criteria were included in the study. Since all the patients attending the NCD clinic during the study period were included in the study, no sampling technique was followed.

Three medical interns posted in rural health center were chosen as data collectors. They were sensitized regarding the objectives of the study, confidentiality of information, participant's right, and informed consent, and were also trained to administer the questionnaire to the individuals. Postgraduates posted in the same rural health center supervised the data collection procedure by reviewing all questionnaires at the end of each day to ensure completion of data collection forms as well as addressed any issue faced by the data collectors.

The purpose of the study and procedure involved in the study were explained to the individuals before administration of the questionnaire. Individuals were also assured regarding confidentiality of the information, and data collection was started after obtaining informed consent. The interview consisted of three sections: the first section consisted of sociodemographic characteristics; the second section comprised questions related to behavioral characteristics such as current tobacco, alcohol use, and adequacy of physical activity; current tobacco users were participants who had used tobacco daily or occasionally in the past 1 month before the study period; current alcohol users were participants who had used alcohol in the past 1 year; 150 min of moderate intensity physical activity or 75 min of vigorous intensity physical activity per week was considered to be adequate physical activity as per World Health Organization (WHO) global recommendations on physical activity for health; and the third section consisted of Morisky Medication Adherence Scale (MMAS)-4 to determine low adherence among the study participants.

MMAS-4 is a short, easily administered four-item scale which measures a specific medication-taking behavior. Each item is rated as 0 or 1 based on the yes/no response to the individual questions. Cronbach's alpha reliability of the questionnaire was reported to be 0.83.[11] MMAS had been standardized for our research by forward translation, expert panel back translation, pretesting, and cognitive interviewing and concluded with the preparation of final version. Based on the scores obtained, participants who scored less than 6 were categorized as low adherence.

Analysis

Data were entered into EpiData v 3.01 software (manufactured by EpiData association in 1999 in Denmark), and analysis was done using SPSS version 19.0. Continuous variables were summarized as mean (standard deviation). Prevalence of low adherence was summarized as proportion with 95% CI. Bivariate analysis (chi-square test/Fisher's exact test) was used to find the association between sociodemographic factors and medication adherence. Determinants of low adherence to medication (independent effects) were identified using multivariate logistic regression analysis, considering medication adherence as dependent variable and gender, age category, education, and occupation as explanatory variables. Adjusted prevalence ratio (PR) ratio with 95% CI was calculated. *P* value less than 0.05 was considered statistically significant.

Results

There were totally 277 patients satisfying the eligibility criteria who attended the chronic disease clinic, of which 260 patients (93.8% response rate) were included in the study. Seventeen patients were not included in the study as they did not give consent to participate in the study.

The sociodemographic characteristics of the study participants are described in Table 1. The majority of the study participants (42.7%) belonged to elderly age group; two-thirds (66.2%) were females; almost 44% of the study subjects did not have any formal education; almost three-fourth (70%) were unemployed; more than half of them (56.5%) belonged to nuclear family; the majority were suffering from hypertension (71.2%) followed by diabetes (56.2%).

Table 2 shows the behavioral characteristics. Less than 10% of the study participants were current tobacco users; 28 (10.8%) of the participants were current alcohol users; more than half of the participants (60%) were physically inactive.

Table 1: Sociodemographic characteristics of patients attending noncommunicable disease clinic in a primary healthcare center of rural Puducherry (*n*=260)

Sociodemographic characteristics	Frequency, *n* (%)
Age category (in years)	
18-45	52 (20.0)
46-59	97 (37.3)
≥60	111 (42.7)
Gender	
Male	88 (33.8)
Female	172 (66.2)
Education (class)	
No formal education	113 (43.5)
Primary and upper primary (1-8)	61 (23.5)
Secondary (9-10)	65 (25.0)
Higher secondary (11-12)	15 (5.8)
Graduates	6 (2.2)
Occupation	
Unemployed*	182 (70.0)
Employed	78 (30.0)
Family type	
Nuclear	147 (56.5)
Joint	67 (25.8)
Three-generation	46 (17.7)
Noncommunicable disease	
Hypertension	185 (71.2)
Diabetes milletus	146 (56.2)
Bronchial asthma	39 (15.0)

*Includes homemaker, pensioner, and students

Table 2: Behavioral characteristics of the patients attending noncommunicable disease clinic in a primary healthcare center in rural Puducherry (*n*=260)

Behavioral characteristics	Frequency, *n* (%)
Current tobacco user (in past 1 month)	
Yes	22 (8.5)
No	238 (91.5)
Current alcohol user (in past 1 year)	
Yes	28 (10.8)
No	232 (89.2)
Physical activity	
Adequate	104 (40.0)
Inadequate	156 (60.0)

The prevalence of low adherence among the study population was 32.7% (95% CI: 27.2–38.6). Table 3 shows the factors associated with low adherence among patients attending noncommunicable disease clinic in a primary healthcare center in rural Puducherry. Age group more than 60 years, female gender, and unemployed participants were found to have more chance being nonadherent to medication by bivariate analysis. Multivariable logistic regression analysis for association of sociodemographic variables with low adherence to medication was done by taking age group, gender, education, and occupation into the model. Participants age more than or equal to 60 years were found to have more than twice the chance of being nonadherent to medications (aPR 2.51 95% CI: 1.70–3.70) when compared with participants age less than 60 years. Females were found to have higher risk of being nonadherent to medications (aPR 1.64 95% CI: 1.04–2.58) when compared with males. Education and occupation were not associated with low adherence to medications after adjusting for age group and gender.

Discussion

This was a facility-based cross-sectional study conducted among patients with NCD attending a primary healthcare center in rural Puducherry. The main objective of this study was to determine the prevalence of low adherence and factors associated with it. The prevalence of low adherence to medications was found to be 32.7%. Elderly and female participants were found to have more chance being nonadherent to medications after adjusting for possible confounding variables.

This study found that almost one-third (32.7%) of the study participants were not properly adherent to medications. A contrast finding was found in a study done in Kerala which reported 74% prevalence of nonadherence.[8] However, findings similar to this study were reported in other south Indian studies carried out in Andhra and Karnataka where almost one-third of the participants were nonadherent to medications.[9,10]

One of the major strengths of study was the use of validated scale to measure drug adherence. However, we could not get the exact pill count missed as the tool used to measure adherence has questions related to forgetfulness or carelessness and attitude of the patients toward drug intake. Higher response rate (93.8%) and exploring barriers to nonadherence for multiple NCDs also add to the strength of the study.

However, the study had certain limitations. This study is done as a single cross-sectional interview, and hence causal relationship between nonadherence and factors associated cannot be determined, apart from the linkages which were stated directly by the respondents. While most of the responses were recall-based, bias might be possible.

Good adherence to medications is essential for achieving better control status for patients with NCD. This needs to be ensured by

Table 3: Factors associated with low adherence among patients attending noncommunicable disease clinic in a primary healthcare center in rural Puducherry (*n*=260)

Characteristics	*n*	Low adherence, *n* (%)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)	*P*
Age category					
<60 years	149	30 (20.1)	1.00 (Ref)	1.00 (Ref)	-
≥60 years	111	55 (49.5)	2.46 (1.69-3.56)	2.51 (1.70-3.70)	<0.001*
Gender					
Male	88	21 (23.9)	1.00 (Ref)	1.00 (Ref)	
Female	172	64 (37.2)	1.55 (1.02-2.37)	1.64 (1.04-2.58)	0.03*
Education					
No formal education	113	44 (38.9)	1.00 (Ref)	-	-
1-10	126	37 (29.4)	0.75 (0.52-1.07)	0.85 (0.61-1.18)	0.12
>10	21	4 (19.0)	0.48 (0.19-1.21)	0.72 (0.28-1.88)	0.12
Occupation					
Employed	78	16 (20.5)	1.00 (Ref)	1.00 (Ref)	-
Unemployed	182	69 (37.9)	1.84 (1.14-2.97)	1.07 (0.62-1.84)	0.27
Family type					
Nuclear	147	50 (34.0)	1.00 (Ref)	-	-
Joint	67	21 (31.3)	0.92 (0.60-1.40)	-	0.70
Three-generation	46	14 (30.4)	0.89 (0.54-1.46)	-	0.65

*P value < 0.05. PR: Prevalence ratio; CI: Confidence interval

family physicians and primary care physicians who provide healthcare services to a majority of patients with NCD in our country.

Recommendations

Improvement in drug intake should start from the patient level first. Patients need to be motivated enough to adhere to the drugs properly. Health education sessions targeting family and community members can be conducted to discuss regarding the NCDs in which one of the domains can be importance of adherence to medications.

Counseling for patients can be given at least in groups if not possible to give individually because of high case load. However, further research needs to be done by conducting interventional trial comparing the effectiveness of individual counseling and group counseling for improving patient's drug adherence, to see whether they are equally effective. Large-scale study involving multiple stakeholders and experts can be done to see what can be done at health system level to improve drug adherence among patients with NCD.

Conclusion

This study reported that almost one-third of the study participants were nonadherent to medications. Elderly age group and female gender were found to be the determinants of nonadherence. Corrective measures need to be started at patient level first by motivating and educating them regarding the importance of drug intake, and family level and community level measures such as awareness campaigns in the community and health education sessions at the clinic can be conducted. All these activities need to be co-ordinated at the health system level to achieve high adherence level among all the patients with NCD.

Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization. Deaths from cardiovascular diseases and diabetes [Internet]. WHO. [Last cited 2018 May 01]. Available from: http://www.who.int/gho/ncd/mortality_morbidity/cvd/en/.

2. Ghaffar A, Reddy KS, Singhi M. Burden of non-communicable diseases in South Asia. BMJ 2004;328:807.

3. World Health Organization. Cardiovascular diseases (CVDs) [Internet]. WHO. [Last cited 2018 May 01]. Available from: http://www.who.int/mediacentre/factsheets/fs317/en/.

4. Currie CJ, Peyrot M, Morgan CL, Poole CD, Jenkins-Jones S, Rubin RR, *et al*. The impact of treatment noncompliance on mortality in people with type 2 diabetes. Diabetes Care 2012;35:1279-84.

5. Egede LE, Gebregziabher M, Echols C, Lynch CP. Longitudinal effects of medication nonadherence on glycemic control. Ann Pharmacother 2014;48:562-70.

6. Cramer JA, Roy A, Burrell A, Fairchild CJ, Fuldeore MJ, Ollendorf DA, *et al*. Medication compliance and persistence: Terminology and definitions. Value Health 2008;11:44-7.

7. World Health Organization, diabetes mellitus fact sheet, number 238, 2002. Available from: http://www.who.int/chp/knowledge/publications/adherence_full_report. [Last accessed on 2018 May 01].

8. Sankar UV, Lipska K, Mini GK, Sarma PS, Thankappan KR. The adherence to medications in diabetic patients in rural Kerala, India. Asia Pac J Public Health 2015;27:NP513-23.

9. Yusuff KB, Obe O, Joseph BY. Adherence to anti-diabetic drug therapy and self-management practices among type-2 diabetics in Nigeria. Pharm World Sci 2008;30:876-83.

10. Cramer JA. A systematic review of adherence with medications for diabetes. Diabetes Care 2004;27:1218-24.

11. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medicationadherence measure in an outpatient setting. J Clin Hypertens 2008;10:348-54.