A Comparative Study to Assess Medication Adherence of Patients with Communicable and Non-Communicable Diseases attending Primary Health Centres, a rural hospital in India

Abstract

Introduction:

Medication adherence is an important factor in aiding the efficacy of a treatment plan for communicable and non-communicable diseases alike. Non-adherence to medication leads to several detrimental effects on the health of a person and also leads to strain on the health system due to the overload of managing patients with complications.

Objective:

This study aims to assess medication adherence of communicable and non-communicable disease treatment under different parameters like age, sex of the patients, type of disease and socioeconomic status.

Methods:

The cross-sectional study was conducted by face to face interview with 330 patients,165 in each group attending Primary Health Centres in selected area for the treatment. Interviews were conducted using the MARS scale by following proper protocols to maintain privacy and the data was recorded in real time for analysis.

Results:

30.9% patients in the age group of 31-40 years were from communicable disease group, 31.5% were in the age group of 61-80 years from the NCDs group, 51.5% of the total participants were males in both the groups. The study reveals insightful information, as 41.7% and 58.3% of study subjects were non adherent to medication in the Communicable disease and NCD's group respectively. 36% non-adherence was seen among 61-80years of agegroup. Majority of NCD's group patients were having Diabetes (30.3%), Hypertension (27.2%) and Asthma (21.2%). Communicable diseases group include Tuberculosis (27.2%), URTI (21.2%) and Diarrhoea (21.2%). 55.7% of Males showed low adherence to medication as compared to females (44.3%) ($p<0.05$). Important reasons of non-adherence to medication were forget to take medicine (78% & 54%), careless approach (68% &41%) and feeling better after taking medication so stopped (75%& 60%) in the NCD's & Communicable Diseases group respectively.

Conclusion: Adherence to medication was poor among patients having non-communicable diseases, elderly patients, among males in the age group of 21 to 40 years and who were unemployed.

Keywords: Medication Adherence, Communicable diseases, NCDs, Diabetes, Tuberculosis, MARS

Introduction

Medication adherence is defined by WHO as "the degree to which a person's behaviour corresponds with the agreed recommendations from a healthcare provider"[1]. Globally, among patients suffering from chronic diseases who are on long-term treatment, only 50% have been reported to be adherent whereas this number is even lower in developing countries like India [2].

Non-communicable disease(NCDs) have emerged as a major public health challenge in recent times especially since the Covid-19 pandemic. NCDs contribute to 71% of all global deaths each year [3]. The majority of these deaths occur in middle to low income developing countries like India. 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]. One of the common reasons for poor control status is medication non-adherence.

On the other hand, maintaining medication adherence is also a rising issue in communicable diseases. Treatment of Tuberculosis which is an airborne infectious disease, poses a challenge due to non-adherence to therapy which then leads to multidrug as well as extended drug resistant tuberculosis [5,6]. Similarly, resistance to chloroquine and primaquine, drugs used for treatment of malaria, has increased worldwide [7].

It is an ever-rising problem in healthcare as the consequence of non-adherence is waste of medication, leading to disease progression, reduced functional abilities, a lower quality of life, increased use of medical resources such as nursing homes, hospital visits and hospital admissions [8].

The purpose of this study was to assess and compare medication adherence of communicable and non-communicable diseases and any associated factors to it in a rural hospital in India.

Methodology:

Setting:

A cross-sectional study was conducted in three Primary Health Centres(Nere, Apta &Wawanje PHCs) in Raigad District, Maharashtra, India which arerandomly selected from the field practice area of Department of Community Medicine, MGM Medical College. These centres provide in-patient, out-patient, maternity as well as emergency services and cater approximately 2,90,000 population. These centres have daily OPD of 50 to 60 patients and IPD 10-15 patients . The study was conducted over a period of 1 yr (Jan 24 to Dec 24). The sample size was calculated using the formula $n= 4PQ/ delta^2$. With the reference of literature available on this topic, we found that 60% to 70% of patients from communicable and non-communicable disease were adhered to medication.

Adherence to Medication: P= 70 %, Therefore, Q= (100-70) =30%, Confidence Interval of Study = 95%, therefore Z= 1.96 at the level of significance, L= 5%, therefore, the formula for sample size estimation is

$N= Z^2 PQ/L^2$

= 1.96 x 1.96 x70 x30 / 5x 5

N= 336, Therefore, total sample size is = N = 336

Study Population:

We included all the patients aged 21-80 years. with either diabetes and/or hypertension who were already registered at the NCD clinic at these PHCs at least four weeks prior to the date of interview. Institutional Ethics Committee approval was obtained before the start of the study. All the patients attending the clinic during the months of Jan to September 24 were included in the study.

Study tool and Study variables:

Pre-designed, semi-structured questionnaire was used to collect information about socio demographic profile of study subjects & adherence to medication. Pilot study was done in 10 patients who had diabetes and hypertension and then appropriate changes were done in the questionnaire.

Tools of Data Collection:

A) Socio Demographic proforma: a semi structured proforma to collect the socio-economic data of the participants as well as information on type of medication and duration of illness was collected.

B) Medication Adherence Report Scale (MARS, Professor Rob Horne) [(9)]:

The MARS is a 10-item multidimensional scale. It mainly comprises of three dimensions:medication adherence behaviour (items 1-4), attitude toward taking medication (items 5-8) and negative side effects and attitudes to psychotropic medication (items 9-10).Scores for each dimension are obtained by summing the items within each dimension. Each question has a yes or no response. A response consistent with non-adherence is coded as 0, whereas a response consistent with adherence is coded as 1. For questions 1-6 and 9-10, a no response is indicative of adherence and is coded as 1, while for questions 7 and 8, a yes response is indicative of adherence and is coded as 1. Total scores on the MARS may range between 0 and 10, with a higher score indicating better medication adherence.

Method:

Data collection was done through face-to-face interviews. Participants were approached in a suitable setting where privacy was maintained and minimal distraction was ensured. The purpose of the study was explained and due consent was taken from the participants and the

questions from the MARS questionnaire were then asked verbally, and the responses were recorded in real-time using Google Forms. This approach allowed for real-time data entry, reducing the chances of errors or omissions in the data collection process.

Results:

There were a total of 330 patients who had participated in the study, of which 165 study subjects were from NCDs group and 165 patients from communicable disease.

The sociodemographic data of the study participants: (Table 1)

In terms of age distribution, the majority of participants were in the age group of 31-40 years (30.9%) from communicable disease group and 61-80 years (31.5%) from NCDs group, 51.5% of the total participants were males in both the groups. All the participants were either from Lower or Upper lower socioeconomic class. The maximum duration of illness noted for communicable disease was 8-15 days whereas for NCDs it was 1-3 years. 49.1% study participants from the communicable group & 68.5% study participants from non-communicable group were unemployed respectively.

With respect to education, the majority of individuals were High school (25.5%) passed in communicable group as compared to NCDs group where majority of the participants were illiterate (27.9%) followed by 22.4% individuals who were middle school passed and primary school (18.2%) passed.

Table 1 Sociodemographic profile of Study Participants

Sociodemographic profile of Study Participants	Communicable Disease N= 165	Non Communicable diseases N= 165
	N (%)	N (%)
Age		
21-30	26(15.8)	24(14.5)
31-40	**51(30.9)**	32(19.4)
41-50	**41(24.8)**	31(18.8)
51-60	23(13.9)	26(15.8)
61-80	24(14.5)	**52(31.5)**
Gender		
Female	80(48.5)	79(47.8)
Male	85(51.5)	86(52.1)
Socioeconomic status		
Lower	80(48.4)	86(52.1)
Upper Lower	85(51.5)	79(47.8)
Occupation		
Employed	**84(50.9)**	52(31.5)
Unemployed	81(49.1)	**113(68.5)**
Education		
Professional degree	4(2.4)	4(2.4)
Graduate	40(24.2)	25(15.2)
Primary school	28(17.0)	30(18.2)
Middle school	25(15.2)	37(22.4)
High school	42(25.5)	23(13.9)
Illiterate	**26(15.8)**	**46(27.9)**
Duration of Disease		
0-7 days	32(20)	-
8-15 days	**72(43.6)**	-
16-29 days	8(4)	-
1 month-2 months	11(6)	-
>2 months-1 year	34(20.6)	2(1.21)
>1 year -3 years	2(1.2)	**81(49.0)**
>3 years-5 years	5(30.3)	33(20)
>5 years	1(0.6)	49(29.6)

Distribution of communicable and non-communicable diseases among the study population.

The following communicable diseases were found in the study population -Tuberculosis (27.2%), Upper Respiratory Tract Infection (URTI) (21.2%), Diarrhoea (21.2%), Malaria (12.1%), Dengue (9.09%), and Sexually Transmitted Diseases (STD) (9.09%).

These findings suggest that Tuberculosis was the most prevalent communicable disease reported, followed by URTI and Diarrhoea in the study area.

In the Non- Communicable disease group, following diseases were commonly found: Diabetes (30.3%), hypertension (27.2%), asthma (21.2%), chronic kidney disease (9.09%), cancer (6.06%), and depression (6.06%). The results indicate that Diabetes was the most prevalent among the study population in the non-communicable group, followed by Hypertension and Asthma.

Table No:2 Distribution of Diseases among Communicable & Non- Communicable disease group

Communicable disease Group	No (%)	Non-communicable disease group	No (%)
Tuberculosis	**45(27.2)**	**Diabetes**	**50(30.3)**
URTI	**35(21.2)**	**Hypertension**	**45(27.2)**
Diarrhoea	**35(21.2)**	**Asthma**	**35(21.2)**
Malaria	**20(12.1)**	Chronic kidney disease	15(9.09)
Dengue	15(9.09)	Cancer	10(6.06)
STD	15(9.09)	Depression	10(6.06)

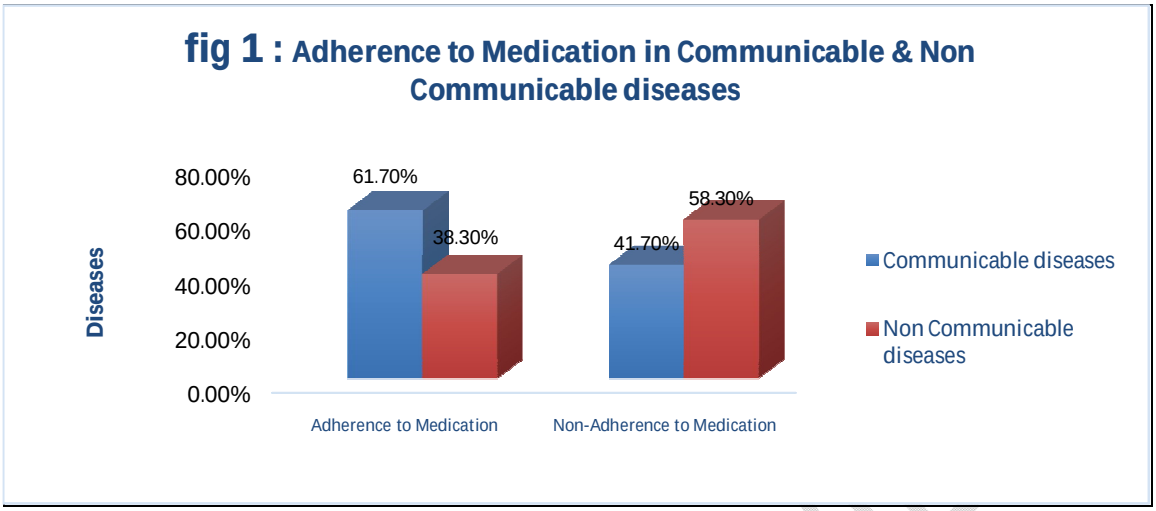
Association of Sociodemographic factors with Medicine adherence: (Table 3)

Overall, 41.7% of study subjects in the Communicable disease group had no adherence to medicine as compared to 58.3% of study subjects in the Non-Communicable group were non-adherent to medicines.

Patients in the age group of 21-40 years (44.8%) and 61-80 years (36.1%) had low adherence to medications whereas adherence to medicine was good in the age group of 41 to 60 years of study subjects (61.8%). 55.7% of Males showed low adherence to medication as compared to females (44.3%) ($p<0.05$). Socioeconomic status of the studysubjects had not shown any significant association with adherence of treatment at 0.05 level. Occupation showed significant relation to adherence as study subjects who were employed showed good adherence to treatment (92.2%) and those who were unemployed (96.8%) showed low adherence to medications. Similarly, Education also played an important role as study subjects with higher education backgrounds like professional degrees and graduates showed good adherence (99.9%) to treatment in the Non- communicable group. In contrast to above findings, those patients with lower education backgrounds like and illiterate, primary school and middle school showed low adherence (98.9%) in the communicable group.

Table 3 Association of Sociodemographic factors with Adherence to medication among Communicable &Non Communicable Group:

Variables	Categories	Non -adherence N(%) 194	Good adherence N(%) 136	P value
Type of Disease	Communicable Disease	**81 (41.7)**	84 (61.7)	**P<0.05**
	Non-Communicable Disease	**113(58.3)**	52 (38.3)	
	Total	194(100)	136 (100)	
Age (in years)	21-30 31-40 41-50 51-60 61-80	**39 (20.1)** **48(24.7)** 21(10.9) 16(8.2) **70(36.1)**	17(12.5) 29(21.3) **51(37.5)** **33(24.3)** 6(4.4)	**P<0.000**
	Total	194(100)	136(100)	
Sex	Female Male	**86(44.3)** **108(55.7)**	73(53.6) 63(46.4)	**P<0.05**
	Total	194(100)	136 (100)	
Socio-economic status	Lower Upper lower	**99(51.0)** **95(49.0)**	67(49.3) 69(50.7)	P < 0.41
	Total	194(100)	136 (100)	
Occupation	Employed Unemployed	**11(5.7)** **183(94.3)**	130(95.6) 6(4.4)	**P<0.0001**
	Total	194(100)	136 (100)	
Education	Professional degree Graduate High school Middle school Primary school Illiterate	0(0.0) 0(0.0) 2(1.0) 62(31.9) **58(29.9)** **72(37.1)**	8(5.8) 65(47.8) 63(46.3) 0(0) 0(0) 0(0)	
	Total	194(100)	136 (100)	



Medication adherence report score (Table No 4)

The table No 4, revealed data from the Medication Adherence Report Scale among patients suffering from communicable and Non-communicable diseases. For each question respondents answered either “YES” or “NO”. There were quite a few notable differences in medication adherence of the two groups.

We found that, with respect to both communicable and non-communicable diseases, a significant percentage of participants admitted that they forgot their medicine (53.9%,78.1%) respectively and were careless about taking medicine (41.8%,68.4%). 60.0% of study subjects from communicable diseases and 75.1% for non-communicable diseases reported that they stopped taking their medications when they felt better. However, the majority of study subjects said that medication improved their ability to think clearly (92.7%) and helped them stay healthy (95.7%). The study subjects also reported feeling fatigued and sluggish (49%) and worried about feeling like a "zombie" (10.3%).

Socio demographic factors like sex, socioeconomic status, education were not associated with nonadherence to medicine except age group of study subjects among communicable & Non-communicable disease groups. 60.5% of study subjects in the age group of 31 to 50 years were non-adherent to medicine among the communicable disease group whereas 53.9% of

study subjects in the age group 41 to 60 years were non-adherent to treatment. The difference was statistically significant at 0.05 level.

Table 4 :Medication Adherence Report Scale among patients suffering from communicable and Non-communicable diseases.

SR NO.	Questions	Communicable diseases (N= 165)		Non-communicable diseases (N= 165)	
		YES N(%)	NO N(%)	YES N(%)	NO N(%)
1.	Do you ever forget to take your medication?	**89 (53.9)**	76(46.0)	**129(78.1)**	36(21.8)
2.	Are you careless at times about taking medications?	69(41.8)	96(58.1)	**113(68.4)**	52(31.5)
3.	When you feel better, do you stop taking your medications?	99(60.0)	66(40.0)	**124(75.1)**	41(24.8)
4.	Sometimes if you feel worse when you take the medication, do you stop taking it?	**88(53.3)**	77(46.6)	73(44.2)	92(55.7)
5.	I take my medication only when I am sick.	73(44.2)	92(55.7)	65(39.3)	100(60.6)
6.	It is unnatural for my mind and body to be controlled by medication.	5(3.03)	160(96.9)	41(24.8)	124(75.1)
7.	My thoughts are clearer on medication.	**153(92.7)**	12(7.27)	**122(73.9)**	43(26.0)
8.	By staying on medication I can prevent getting sick.	**158(95.7)**	7(4.24)	**138(83.6)**	27(16.3)
9.	I feel weird like a “zombie” on medications	17(10.3)	148(89.6)	17(10.3)	148(89.6)
10.	Medication makes me feel tired and sluggish.	**81(49.0)**	84(50.9)	**81(49.0)**	84(50.9)

Factors associated with nonadherence to medication among communicable and non-communicable group: (Table 5)

In both communicable and Non-communicable groups, there were no significant differences about low adherence to medication in relation to sex, education and socio-economic class of study subjects except age group. In Both Communicable and Non-Communicable group, adherence to medication was low among males as compared to females (51.9% in communicable to 58.4% in non-communicable group), lower socioeconomic status (50.6%

in communicable to 55.6% in non-communicable group) & study subjects who were having education up to middle school . In the Communicable disease group, adherence to medication is low among study subjects who were in the age group of 20 years to 40 yearswhereas in non Communicable age group , it was more in the age group 41 to 60 years of age group.

Table 5: Association of Sociodemographic factors with Non -Adherence to treatment among Communicable & Non Communicable Group:

	Non-adherent to Medicine among Communicable diseases	**Non adherent to medicine among Non-Communicable Diseases**	
	No (%) (N=81))	**No (%)(N=113)**	**P value**
Gender			
Male	**42(51.9)**	**66(58.4)**	P>0.05
Female	39(48.1)	47 (41.6)	
Total	81(100)	113(100)	
Age Group			
21-30	15(18.5)	15(13.3)	**P<0.05**
31-40	23(28.4)	19(16.8)	
41-50	**26(32.1)**	**31(27.4)**	
51-60	**12(14.8)**	**30(26.5)**	
61-80	5(6.2)	18(15.9)	
Total	81 (100)	113(100)	
Socioeconomic Class			
Lower	**41(50.6)**	**63(55.6)**	P>0.05
Upper lower class	40 (49.4)	50 (44.4)	
Total	81 (100)	113 (100)	
Education			
Illiterate	**15(18.5)**	**29(25.7)**	P>0.05
Primary school	**24(29.6)**	**32(28.3)**	
Middle school	**17 (21.0)**	**32(28.3)**	
High school	14(17.3)	8 (7.1)	
Graduate & Professional	11(15.0)	12(10.6)	
Total	81 (100)	113 (100)	

DISCUSSION:

This was a hospital based cross-sectional study conducted in a Primary Health Centres, ruralareas of Panvel, District Raigad, India. The objective of this study was to compare the medication adherence of communicable and non-communicable diseases and determine the factors associated with it. The study found that overall 41.7 % of the study participants showed poor adherence to medications in the communicable disease group and 58.3 % participants showed poor adherence in the NCDs group. Our study found that the medication adherence in communicable diseases is better as compared to Non-Communicable Diseases. Similar results were revealed by Arulmozhi and Mahalakshmy, in a study from Puducherry using MMAS-8 scale, 39% patients were low adherence to medication[(12)]

There were a few sociodemographic factors which showed association with adherence. Age was one of the significant factors wherein participants in the age groups of 21-40 (44.8%) in communicable disease and 61-80 (36.1%) in Non communicable diseases showed poor adherence to medication. This could be because individuals in the age range of 21-40 lead a busy and demanding lifestyle which can lead to a lack of time or prioritization for medication adherence and failure to develop a routine which is necessary especially in NCD drug regime,Older individuals on the other hand can have memory and cognitive decline, physical limitations and lack of awareness. Forgetfulness, carelessness and side effects to medications are some of the common factors attributable to both age groups as evidenced by the MARS scale findings. Similar study conducted in rural west Bengal by Ankush Banerjee et al. showed significant predictors associated with nonadherence were increasing age, female gender, lower socioeconomic status, decreasing patient empowerment, and decreasing trust in the medical profession.

In our study, Females showed better adherence to medication (53.6%) as compared to males (46.4%). A study which assessed adherence to CHF therapy also presented the same

finding[11]. However, a few comparable studies suggest a connection between female gender and low adherence[12].

In terms of Occupation and Education, participants who were unemployed and those who had lower education backgrounds such as middle school, primary school and illiterate participants were found to be poorly adherent to medications. Lack of health literacy and awareness, financial constraints, limited access to healthcare could be some of the reasons. This warrants the need of educational health interventions in these areas. A study in rural Puducherry showed no association of occupation and education to adherence [13] however, according to the findings of Taira DA, Gutierrez MM on their respective studies of adherence to antihypertensives, found that there was a relation between adherence and the level of education [14]. A study in Iran on treatment adherence in type 2 diabetes mellitus showed that health literacy and income were main predictors of treatment adherence[15].

Measuring medication adherence can be challenging. The MARS-Scale can be used either to measure the extent or frequency of medication non-adherence or the reasons for medication non-adherence. The 10-item scale helps to identify reasons for non-adherence which can be assessed by the clinicians to bring about both micro and macro level interventions.

The responses to questions 1-4 suggest that forgetfulness and carelessness are common reasons for medication non-adherence among both populations. However, the data also highlights some differences between the two populations. A higher proportion of individuals with NCDs reported being forgetful (78.1%) and careless (68.4%) about taking medication as compared to communicable diseases (53.9%, 41.8% respectively). The higher rate of forgetfulness and carelessness can be due various factors like long duration of treatment, greater number of medications or its side effects. On the other hand, communicable diseases often require shorter periods of treatment and the patients are less likely to forget to take the medication.

Individuals with NCDs (75.1%) were more likely to stop taking medication once they felt better and a greater proportion of individuals with communicable diseases (53.3%) reported stopping the medication when they felt worse after taking it.

Questions 5-8 depict attitudes of patients towards taking medications. Interestingly, there were differences in medication attitudes between the two groups. Individuals with communicable diseases were more likely to report taking medication only when sick and also believed by staying on medication they can prevent getting sick. The data also revealed negative side effects of medications in questions 9-10 and its impact on adherence. Around 49% of individuals of both populations reported feeling tired and sluggish on medication. This finding suggests that side effects of medications can negatively impact adherence.

Also, a higher proportion of individuals with communicable diseases (92.7%) reported that their thoughts are clearer on medication as compared to those with non-communicable diseases (73.9%). This finding may reflect the relief that comes from taking medication that treats the symptoms of acute illnesses. The above findings support the result that the overall medication adherence of communicable diseases is better than NCDs. This finding highlights the importance and need of education on the role of medication in preventing disease progression among individuals with non-communicable diseases.

Conclusion &Recommendations:

Adherence to medication was poor among patients having non-communicable diseases, elderly patients, among males in the age group of 21 to 40 years and unemployed patients. To improve medication adherence in communicable & non-communicable diseases, health education and counselling, interaction of patients about importance of medication adherence, creating blame-free" environment, opting for less frequent dosing, improving patient education, assessing health literacy, and paying attention to rational nonadherenceshould be strengthened at Primary Health Centre Level.The multifactorial nature of poor medication

adherence implies that only a sustained, coordinated effort will ensure optimal medication adherence.

References

1. Sabaté E, Sabaté E, editors. Adherence to long-term therapies: evidence for action. World Health Organization; 2003.
2. *World Health Organization, diabetes mellitus fact sheet, number 238.* 2002. [Last accessed on 2018 May 01]. Available from: http://www.who.int/chp/knowledge/publications/adherence_full_report
3. World Health Organization. Fact-sheets about non-communicable diseases, www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases (2021, Accessed 15th April 2021)
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. Jain A, Dixit P. Multidrug resistant to extensively drug resistant tuberculosis: What is next? *J Biosci.* 2008;**33**:605–616. doi: 10.1007/s12038-008-0078-8.
6. Krasniqi Shaip, Jakupi Arianit, Daci Armond, Tigani Bahri, Jupolli-Krasniqi Nora, Pira Mimoza, Zhjeqi Valbona, Neziri Burim. Tuberculosis Treatment Adherence of Patients in Kosovo. *Tuberculosis Research and Treatment.* 2017;**2017**:1–8. doi: 10.1155/2017/4850324.
7. World Health Organization. World Malaria Report. Geneva: 2013.
8. Col N, Fanale JE, Kronholm P. The role of medication noncompliance and adverse drug reactions in hospitalizations of the elderly. *Arch Intern Med* 1990. Apr;150(4):841-845 10.1001/archinte.150.4.841
9. Chan AHY, Horne R, Hankins M, Chisari C. The Medication Adherence Report Scale: A measurement tool for eliciting patients' reports of nonadherence. Br J Clin Pharmacol. 2020 Jul;86(7):1281-1288
10. Banerjee A, Paul B, Dobe M, Bandyopadhyay L, Bhattacharyya M, Sahu M. Determinants of Treatment Adherence Among Patients Living With Noncommunicable Diseases: A Mixed-Method Study in a Rural Area of West Bengal. Journal of Patient Experience. 2021;8.
11. Monane M, Bohn RL, Gurwitz JH, Glynn RJ, Avorn J. Noncompliance With Congestive Heart Failure Therapy in the Elderly. *Arch Intern Med.* 1994;154(4):433–437.

12. Banerjee A, Paul B, Dobe M, Bandyopadhyay L, Bhattacharyya M, Sahu M. Determinants of Treatment Adherence Among Patients Living With Noncommunicable Diseases: A Mixed-Method Study in a Rural Area of West Bengal. Journal of Patient Experience. 2021

13. Yuvaraj K, Gokul S, Sivaranjini K, Manikandanesan S, Murali S, Surendran G, Majella MG, Kumar SG. Prevalence of medication adherence and its associated factors among patients with noncommunicable disease in rural Puducherry, South India - A facility-based cross-sectional study. J Family Med Prim Care. 2019 Feb;8(2):701-705. doi: 10.4103/jfmpc.jfmpc_350_18. PMID: 30984698; PMCID: PMC6436260.

14. Taira DA, Wong KS, Frech-Tamas F, Chung RS. Copayment level and compliance with antihypertensive medication: analysis and policy implications for managed care. Am J Manag Care. 2006;12(11):678–83.

15. Pourhabibi N, Mohebbi B, Sadeghi R, Shakibazadeh E, Sanjari M, Tol A, Yaseri M. Factors associated with treatment adherence to treatment among in patients with type 2 diabetes in Iran: A cross-sectional study. Front Public Health. 2022 Nov 1;10:976888. doi: 10.3389/fpubh.2022.976888. PMID: 36407991; PMCID: PMC9667890