

# Association between Medication Adherence and Perception of Disease among Hypertensive Patients visiting a Tertiary Care Teaching Hospital

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## DOI

[10.59779/jiomnepal.1327](https://doi.org/10.59779/jiomnepal.1327)

## Submitted

Sep 25, 2024

## Accepted

Dec 9, 2024

## ABSTRACT

### Introduction

Medication adherence level is influenced by disease type and its severity, patient characteristics, socioeconomic factors, type of treatment and its regimen. Proper adherence to treatment is very important to obtain a higher therapeutic benefit. The aim of this study was to study the association between medical adherence and perception of disease among hypertensive patients.

### Methods

It was a cross-sectional study involving 148 hypertensive patients based on convenience sampling technique conducted in the tertiary care Teaching hospital. Patients who have been taking antihypertensive medications for at least 6 months were enrolled. A structured questionnaire was used for data collection. JASP statistical software was used for data analysis.

### Results

In this study 148 hypertensive patients taking medications were enrolled. Out of them, 54 (36.5%), 58 (39.2%) and 36 (24.3%) had low, medium and high level of adherence; while 94 (63.51%) 31 (20.95%) and 23 (15.54%) had perceived their disease as low, medium and high threat.

### Conclusion

Medication adherence was found to be lower among the hypertensive patient, yet more than half had good perception. Regular monitoring and awareness program could be effective for the prevention of complications.

### Keywords

Hypertension, medical adherence, therapeutic benefit

## INTRODUCTION

Around 1.4 billion individuals worldwide are thought to have high blood pressure, yet only 14% of them have it under control, according to the World Health Organization (WHO).<sup>3</sup> Nepal reported the highest percentage of hypertensive individuals (33.8%) among South Asian countries.<sup>5</sup> Antihypertensive drugs are required to maintain optimal blood pressure and reduce cardiovascular events. To achieve a high therapeutic benefit, it is crucial to use medications as prescribed by a physician.<sup>6</sup>

WHO has defined medical adherence as individual behavior in taking medicine, adopting healthy diets, maintaining balance life style and following proper medical or health advice.<sup>7</sup> Medication adherence level depends upon type of disease and its severity, patients characteristics, socioeconomic factors, treatment plan, family support, awareness about disease, drug regimen that are prescribed by healthcare providers.<sup>8</sup> In order to lower the risks of non-adherence it is crucial to identify predictors and adherence barriers.

This study aimed to determine medication adherence and its effects in perception of illness among hypertensive patients.

## METHODS

This cross-sectional study was conducted among hypertensive patients attending in tertiary care teaching hospital. The study was carried out from April 2023 to Sept 2023 for period of six months after taking ethical clearance from institutional review committee. The inclusion criteria were adults aged 18 years or above on antihypertensive medication for at least six months. By using convenient sampling method, based on the presumption of prevalence of hypertension 148 sample size was calculated. Written informed consent was taken before enrolling in the study. Questionnaire were based on existing literatures.<sup>7,9,10</sup> The data collection tool was divided into three sections. The first section focused on gathering socio-demographic information, including age, sex, residence, educational level, employment status, marital status, and monthly income. The second section assessed medication adherence through eight questions. Questions 1 to 7 required "yes" or "no" responses, where "no" was scored as 1 and "yes" as 0, except for question 5, where "yes" was scored as 1 and "no" as 0. Question 8 utilized a 5-point Likert scale, with responses standardized by dividing the score (0–4) by 4 to compute a summated score. The total adherence score ranged from 0 to 8, with scores of 8 indicating high adherence, 6–7 indicating medium adherence, and scores below 6 indicating low adherence.

The third section evaluated illness perception

using the Brief Illness Perception Questionnaire (B-IPQ), a validated tool measuring eight aspects: consequences, timeline, personal control, treatment control, identity, concerns, understanding, and emotional representation.<sup>11</sup> Each aspect was scored on an 11-point Likert scale, where higher scores indicated a more threatening perception of the illness, while lower scores suggested a more benign view. The presence of comorbidities and related treatments was also documented.

Data analysis was done using SPSS version 20. Quantitative data were summarized using means and standard deviations, while qualitative data were presented as frequencies and percentages. A multivariate binary logistic regression model was used to identify independent predictors of medication adherence, comparing adherence categories (high vs. low). The model analyzed binary outcomes in relation to predictors from the data collection form, using one category of each variable as the reference. Adjusted odds ratios (ORs) and confidence intervals (CIs) were calculated, with significant predictors identified as OR > 1 and CIs excluding the null value (0).

Additionally, Spearman's correlation and Chi-square tests were performed to examine the relationship between overall B-IPQ scores and adherence levels. A p-value of  $\leq 0.001$  was considered statistically significant.

## RESULTS

A total of 148 hypertensive patients taking antihypertensive medicine were participated in the study in which (46.6 %) were from the age group below 60 years and (53.4%) were from the age group above 60 years. There were 72 (48.6%) were male and 76 (51.4%) were female. 58% of the patients were from city areas whereas 42% of the patients were from urban areas. Similarly 39.2% of the patient have got graduation, 27% have got primary/secondary level education whereas 33.8 % have got only formal education. Based on occupation more than 55% were employed in government and private office whereas 23% were unemployed and 18% of the patients were retired, 43.9% were married 47.3% were divorced or widowed and 8.8% were single unmarried. Among them, 53.4% patients have average income of less than one lakh per annum whereas 46.4% have average income more than one lakh per annum. On the basis of disease 38.5% had only hypertension whereas 61.5% were associated with other disease along with hypertension.

Patients were grouped into adherent and non adherent to medication based on the sum of scores reported on various factors. On that basis 54 (36.5%) were adherent and 94 (63.5%) were non adherent to the medication.

**Table 1.** Socio-demographic information of respondents (n= 148)

Characteristics	Number (%)
Age (years)	
≤60	69 (46.6)
>61	79 (53.4)
Sex	
Male	72 (48.6)
Female	76 (51.4)
Residence	
City	86 (58.1)
Village	62 (41.9)
Education	
Formal education primary/secondary	50 (33.8)
Graduates/University	40 (27.0)
Occupation	
Government employee	58 (39.2)
Private employee	36 (24.3)
Unemployed	46 (31.1)
Retired	38 (25.7)
Marital status	
Married	28 (18.9)
Divorced /widowed	65 (43.9)
Single	70 (47.3)
Income	
<1 lakh per annum	13 (8.8)
>1 lakh per annum	65 (43.9)
Other Disease	
Other diseases	70 (47.3)
Only HTN	91 (61.5)
Duration of HTN	
< 5 yr	55 (37.2)
> 5 yr	93 (62.8)
Duration of treatment	
< 5 yr	78 (52.7)
> 5 yr	70 (47.3)

Patients were more likely to forget taking medication if they were elderly, poorly educated, unemployed, lower income and had any other disease/s additional to hypertension.

Patients perception on longevity of the illness, control over the treatment, help offered by the treatment, family support, availability of medicines and doctors locally available had a significant effect on medication adherence.

#### *Correlation between medication adherence and demographic factors*

Medication adherence was significantly correlated to the age ( $r = -0.16$ , 95% CI= -0.32 to -0.003,  $p=0.047$ ), income ( $r = 0.20$ , 95% CI= 0.04 to 0.35,

**Table 2.** Medicine adherence and perception of disease among respondents (n= 148)

Characteristics	Number (%)
Adherence category	
Low	54 (36.5)
Medium	58 (39.2)
High	36 (24.3)
Perception category	
Low threat	94 (63.5)
Medium threat	31 (20.9)
High threat	23 (15.5)

**Table 3.** Effect of demographic factors on medication adherence (n= 148)

Characteristics	Chi-square value (df)	p-value
Sex	2.61 (1)	0.11
Age	4.47 (1)	0.035*
Residence	2.56 (1)	0.11
Education	16.04 (2)	<0.001*
Occupation	12.28 (3)	0.006*
Marital	1.51 (2)	0.47
Income	6.03 (1)	0.014*
Other disease	9.53 (1)	0.002*
Therapy	0.96 (1)	0.33
Cost	3.14 (1)	0.08
Duration of disease	6.24 (1)	0.013*
Duration of treatment	8.37 (1)	0.004*

**Table 4.** Effect of disease perception on medication adherence (n= 148)

Characteristics	Chi-square value (df)	p-value
Illness affect	3.63 (2)	0.16
Illness last	11.51 (2)	0.003*
Control Illness	6.30 (2)	0.043*
Treatment help	58.35 (2)	<0.001*
Feel symptoms	0.83 (2)	0.66
Worried	19.27 (2)	<0.001*
Family support	7.89 (2)	0.019*
Medicines availability	12.77 (2)	0.002*
Doctors availability	25.67 (2)	<0.001*
Society awareness	1.48 (1)	0.048

$p=0.014$ ), presence of other disease ( $r = 0.25$ , 95% CI= 0.10 to 0.40,  $p=0.002$ ), duration of HTN ( $r = -0.21$ , 95% CI= -0.36 to -0.05,  $p= 0.012$ ) and duration the participant was on treatment for HTN ( $r = -0.24$ , 95% CI= -0.38 to -0.08,  $p= 0.004$ ). There was no correlation of medication adherence with sex, residence, occupation, marital status, type of drug the participant was using and cost of treatment.



### Correlation between medication adherence and disease perception

Medication adherence was significantly correlated with perception on help offered by treatment towards the cure of disease ( $r = -0.30$ , 95% CI =  $-0.44$  to  $-0.15$ ,  $p < 0.001$ ) and worries on the illness ( $r = 0.25$ , 95% CI =  $0.09$  to  $0.39$ ,  $p = 0.002$ ). The correlation of medication adherence with perception on how illness affected one's life, longevity of the illness, feeling of control with the disease, feelings on disease symptoms, family support on treatment, societal awareness on the disease and availability of medicines and doctor's locally availability were not statistically significant.

## DISCUSSION

This study aimed to assess the medication adherence of patients to antihypertensive agents. According to World Health Organisation, lower adherence is considered as the main factor contributing to uncontrolled blood pressure.<sup>12</sup> The present study found that 36.5 % patients had adherence to their antihypertensive medications. similar study done in Saudi Arabia reported (36.3%)<sup>7</sup>. A survey conducted by Algabbani et al in the Riyadh region of the KSA found a slightly higher proportion (42%) adherence.<sup>13</sup> this variation in adherence mainly occurs due to diverse study populations ,study period and varied scales used for measurement. Another study conducted in eastern Nepal revealed 56.5% adherent to antihypertensive therapy<sup>14</sup>. However in similar other studies conducted among Swedish adults (87.3%),<sup>15</sup> have found higher adherence the possible reasons for the differences in the percentage of adherence rate could be variation in the methods applied to determine adherence. Other reasons could be due to variation in the educational level of the participants, complexity of drug regimens, participants' knowledge, and health conditions.

In our study it was found that (63.5%) of the patients were non adherent to the medication similar study done in Malaysia reported lower adherence rate of 53.4%.<sup>16</sup> The major reason for non adherence to antihypertensive medication would be lack of knowledge, fear of side effects of medicine, financial burdens, poor communication, lack of education, forgetfulness and low social support.

Medication adherence was significantly correlated to the age ( $r = -0.16$ , 95% CI =  $-0.32$  to  $-0.003$ ,  $p = 0.047$ ), income ( $r = 0.20$ , 95% CI =  $0.04$  to  $0.35$ ,  $p = 0.014$ ), presence of other disease ( $r = 0.25$ , 95% CI =  $0.10$  to  $0.40$ ,  $p = 0.002$ ), duration of HTN ( $r = -0.21$ , 95% CI =  $-0.36$  to  $-0.05$ ,  $p = 0.012$ ) and duration the participant was on treatment for HTN ( $r = -0.24$ , 95% CI =  $-0.38$  to  $-0.08$ ,  $p = 0.004$ ). The present study's findings related to age were similar with the study conducted in eastern Nepal (AOR = 0.96, 95%

CI =  $0.93$ – $0.99$ ,  $p = 0.021$ )<sup>14</sup> and studies by Hyre et al in New Orleans.<sup>17</sup> In contrast, to present findings, many studies have shown better association of treatment adherence with demographic variables, lower adherence is associated with age >50, males, uneducated, unemployed, retired, and having comorbidities<sup>18</sup>. Good adherence is associated with urban residents, married, high annual household income, taking fewer medicine daily and having good education and knowledge of disease and its treatment<sup>19</sup>.

There was no correlation of medication adherence was found with sex, residence, occupation, marital status, type of drug the participant was using and cost of treatment. similar study done in India also found no association between demographic characteristics such as gender, socioeconomic status, number of drugs, cost of drugs, duration of disease or duration of drug therapy<sup>20</sup>. Another study conducted in china by Zhang et al. showed that non-adherence was statistically associated with age, residence, education, yearly household income, and out-patient medical reimbursement ( $p < 0.05$ ),<sup>21</sup> which counteract to the results of our study. This indicates that the percentage of non-adherence was much greater among patients who lived in rural areas, had low yearly incomes, and did not receive medical insurance coverage.

In our study we observed that patients were more likely to forget taking medicine were elderly, poorly educated, unemployed, lower income and having additional disease along with hypertension. similar study done by Rao CR et al,<sup>22</sup> found that aging is one of the factors to contribute non adherence to medication because they may have difficulty in remembering to take medicine along with co morbid conditions ,impairment of memory leads to confusion in taking medicine. Similar studies have reported forgetfulness and absence of symptoms of hypertension side effects of drugs and drugs out of supply were the major factor for non adherence<sup>23</sup>.

Education is a critical factor in medication adherence. Individuals with limited education may lack the necessary knowledge and communication skills to fully understand their treatment plans, which can lead to non-adherence. Similarly, unemployment can add financial strain, directly impacting adherence due to the inability to afford medications. Studies have shown that patients who are well-informed—knowing their medication names, how to take them, what to do if they miss a dose, and how to manage potential side effects—demonstrate significantly better adherence<sup>24</sup>. Our findings, along with those of similar studies, also highlight the importance of financial support in preventing complications, especially in hypertensive patients. Physicians can play a role in alleviating financial burdens by minimizing the number of prescribed medications

when appropriate, helping to enhance adherence<sup>25</sup>.

Patients' perceptions about the duration of their illness, their control over treatment, the benefits of the treatment, family support, and the local availability of medicines and doctors significantly influenced medication adherence. Similarly, a study by Hu et al. in the Chinese community found that greater family social support was positively associated with adherence, with a 10-unit increase in family support raising the odds of medication adherence by 1.39 (95% CI, 1.03–1.87).<sup>26</sup> In Nigeria, Osamor's study also showed that patients with support from friends and family exhibited improved adherence to treatment, underscoring the value of social support across diverse communities.<sup>27</sup> Medication adherence was significantly correlated with perception on help offered by treatment towards the cure of disease ( $r = -0.30$ , 95% CI =  $-0.44$  to  $-0.15$ ,  $p < 0.001$ ) and worries on the illness ( $r = 0.25$ , 95% CI =  $0.09$  to  $0.39$ ,  $p = 0.002$ ). Patients with strong beliefs in treatment efficacy and lower distress tend to be more adherences. Patients with view of fewer symptoms and who perceived higher treatment control with positive treatment perceptions improve adherence.

The study's findings indicate that while several factors were examined in relation to medication adherence—including personal perceptions about the illness's impact on life, longevity, control over the disease, symptom-related feelings, family support, societal awareness, and local availability of healthcare resources—none showed statistically significant correlations. Similar study done in European population has implicated that patient perception and attitudes towards health have been recognized as one of the barriers for adherence.<sup>28</sup> This suggests that these factors may not play a direct or strong role in influencing adherence in this context. However, this could vary depending on individual beliefs, healthcare systems, or cultural attitudes, and may indicate that other personal or external influences play a more substantial role in adherence behavior.

In relation to associated disease 38.5% of the patients have only hypertension whereas 61.5% of them have other associated diseases in which type 2 diabetes mellitus is the most common disease followed by respiratory diseases and renal disease. In similar study it was revealed that most common co morbid disease with hypertension was Diabetes mellitus followed by heart failure then renal impairments. Similarly more than 60% of the patients were using combination drug therapy for the treatment of hypertension in which calcium channel blockers group of drug was most commonly used to reduce blood pressure whereas in similar other study it was found that beta blockers were the most commonly used medication followed by

calcium channel blockers.<sup>29</sup> Similarly more than 60% of the patient were taking medicine on combination therapy which indicates more than one drugs other similar studies done by Zulig LL et al<sup>30</sup> also indicates that taking more than one tablets of medication has significant medication adherence which suggests that combination therapy is more effective in controlling blood pressure.

In this study of the Nepalese population, factors contributing to low adherence include negligence, limited education, inconsistent follow-up visits, misunderstanding of medication instructions, insufficient guidance from healthcare providers, a high prevalence of multiple health conditions, and the complexity of managing multiple medications.

## CONCLUSION

In our study we observed that patients were more likely to forget taking medicine were elderly, poorly educated, unemployed, lower income and having additional disease along with hypertension. The major reason for non adherence to antihypertensive medication is lack of knowledge, fear of side effects of medicine, financial burdens, poor communication, Lack of education, forgetfulness and low social support. Patients' perceptions about the duration of their illness, their control over treatment, the benefits of the treatment, family support, and the local availability of medicines and doctors significantly influenced medication adherence. Patients with strong beliefs in treatment efficacy and lower distress tend to be more adherences. Furthermore, enhancing counseling services across the country could raise awareness among patients and their families about hypertension management, including medication adherence. Providing counseling in both hospital and community settings would be beneficial for patients. These results highlight the importance of disease awareness, patient education and perception of illness regarding use of medicine in managing hypertension and preventing further complications.

## ACKNOWLEDGEMENT

We express our sincere gratitude towards all the faculties, residents, participants, staffs of Medicine Department of KMCTH tertiary care hospital for their help during this study.

## FINANCIAL SUPPORT

The author(s) did not receive any financial support for the research and/or publication of this article.

## CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.



## REFERENCES

1. Bhushal L, Pathak DB, Dhakal B, et al. Determination of level of self-reported adherence of antihypertensive drug(s) and its associated factors among patient with hypertension at a tertiary care center. *J Clin Hypertens (Greenwich)*. 2022 Nov;24(11):1444-50.
2. Hodis JD, Gottesman RF, Windham BG, et al. Association of hypertension according to new American college of cardiology/ American heart association blood pressure guidelines with incident dementia in the Aric study cohort. *J Am Heart Assoc*. 2020; 9(22): e017546.
3. Hypertension. Key facts. 13 September 2019 [website] (<https://www.who.int/news-room/factsheets/detail/hypertension>, accessed on 29 dec 2022).
4. Shrestha DB, Budhathoki P, Sedhai YR, et al. Prevalence, awareness, risk factors and control of hypertension in Nepal from 2000 to 2020: a systematic review and meta-analysis. *Public Heal Pract*. 2021; 2: 100119
5. Ranjitkar S, Sharma S. Prevalence of Hypertension and its Associated Factors among Retired Army in Pokhara. *Janapriya Journal of Interdisciplinary Studies*. 2021 Dec 31;10(01):140-8.
6. Gavrilova A, Bandere D, Rutkovska I, et al. Knowledge about Disease, Medication Therapy, and Related Medication Adherence Levels among Patients with Hypertension. *Medicina (Kaunas)*. 2019 Oct 28;55(11):715
7. Thirunavukkarasu A, Naser Abdullah Alshahrani A, Mazen Abdel-Salam D, et al. Medication Adherence Among Hypertensive Patients Attending Different Primary Health Centers in Abha, Saudi Arabia: A Cross-Sectional Study. *Patient Prefer Adherence*. 2022 Oct 19; 16:2835-44.
8. Jankowska-Polanska, B.; Uchmanowicz, I.; Dudek, K, et al. Relationship between patients' knowledge and medication adherence among patients with hypertension. *Patient Prefer Adherence* 2016, 10, 2437–47.
9. Lam WY, Fresco P. Medication adherence measures: an overview. *Biomed Res Int*. 2015; 2015:217047.
10. Broadbent E, Petrie KJ, Main J, et al. The brief illness perception questionnaire. *J Psychosom Res*. 2006;60(6):631–7.
11. Uchmanowicz B, Jankowska EA, Uchmanowicz I, et al. Self-reported medication adherence measured with morisky medication adherence scales and its determinants in hypertensive patients aged  $\geq 60$  years: a systematic review and meta-analysis. *Front Pharmacol*. 2019; 10:168.
12. De Geest S, Sabaté E. Adherence to Long-Term Therapies: Evidence for Action. *European Journal of Cardiovascular Nursing*. 2003;2(4):323. doi:10.1016/S1474-5151(03)00091-4.
13. Algabbani FM, Algabbani AM. Treatment adherence among patients with hypertension: findings from a cross-sectional study. *Clin Hypertens*. 2020;26(1):18. doi:10.1186/s40885-020-00151-1
14. Bhandari B, Bhattarai M, Bhandari M, et al. Adherence to antihypertensive medications: population based follow up in Eastern Nepal. *J Nepal Health Res Counc*. 2015;13(29):38–42
15. Hedna K, Hakkarainen KM, Gyllensten H, et al. Adherence to antihypertensive therapy and elevated blood pressure: should we consider the use of multiple medications? *PLoS One*. 2015;10(9):e0137451. doi:10.1371/journal.pone.0137451
16. Ramli A, Ahmad NS, Paraidathathu T. Medication adherence among hypertensive patients of primary health clinics in Malaysia. *Patient Prefer Adherence*. 2012;6:613–622. doi:10.2147/PPA.S34704
17. Hyre AD, Krousel-Wood MA, Muntner P, et al. Prevalence and predictors of poor antihypertensive medication adherence in an urban health clinic setting. *J Clin Hypertens*. 2007;9(3):179–186. doi:10.1111/j.1524-6175.2007.06372.x
18. Joseph N, Chiranjeevi M, Sen S, et al. Awareness on hypertension and its self-management practices among hypertensive patients attending outreach clinics of a medical college in South India. *Kathmandu Univ Med J*. 2016;14(55):202–209.
19. Teshome DF, Bekele KB, Habitu YA, et al. Medication adherence and its associated factors among hypertensive patients attending the Debre Tabor General Hospital, northwest Ethiopia. *Integr Blood Press Control*. 2017;10:1–7. doi:10.2147/IBPC.S128914
20. Jhaj R, Gour PR, Kumari S, et al. Association between medication adherence and blood pressure control in urban hypertensive patients in central India. *Int J Non-Commun Dis* 2018;3:9-14.
21. Zhang Y, Li X, Mao L, et al. Factors affecting medication adherence in community-managed patients with hypertension based on the principal component analysis: evidence from Xinjiang, China. *Patient Prefer Adherence*. 2018;12:803–812. doi:10.2147/PPA.S158662
22. Rao CR, Kamath VG, Shetty A, Kamath A. Treatment Compliance among Patients with Hypertension and Type 2 Diabetes Mellitus in a Coastal Population of Southern India. *Int J Prev Med*. 2014;5(8):992–98.
23. Gupta MC, Bhattacharjee A, Singh H. Evaluation of medication adherence patterns amongst anti-hypertensive drug users in a tertiary care hospital in north India. *Int J Basic Clin Pharmacol* 2016;5:2261-6.
24. Mekonnen GB, Gelayee DA. Low medication knowledge and adherence to oral chronic medications among patients attending community pharmacies: a cross-sectional study in a low-income country. *Biomed Res Int*. 2020;2020:4392058. doi:10.1155/2020/4392058.
25. Ebrahim Aliafsari Mamaghani, Edris Hasanpoor, Esmaiel Maghsoodi, et al. Barriers to Medication Adherence among Hypertensive Patients in Deprived Rural Areas. *Ethiop J Health Sci*. 2020;30(1):85. doi:http://dx.doi.org/ 10.4314/ejhs.v30i1.11
26. Nieuwlaat R, Wilczynski N, Navarro T, et al. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev*. 2014;20(11):CD000011. doi:10.1002/14651858.CD000011.pub4
27. Osamor PE. Social support and management of hypertension in south-west Nigeria. *Cardiovasc J Afr*. 2015;26(1):29–33. doi:10.5830/CVJA-2014-066
28. Osterberg L, Blaschke T (2005) Drug therapy: Adherence to medication. *New England Journal of Medicine* 353: 487–497. [DOI] [PubMed] [Google Scholar]
29. Hamza SA, El Akkad RM, Abdelrahman EE, et al. Non adherence to Antihypertensive medications among hypertensive elderly patients in outpatient geriatric clinic. *Arch Gerontol Geriatr*. 2019;6(1):1–7. doi:10.21608/ejgg.2019.30888.
30. Zullig LL, Stechuchak KM, Goldstein KM, et al. Patient-reported medication adherence barriers among patients with cardiovascular risk factors. *Journal of managed care & specialty pharmacy*. 2015;21(6):479-85.