

Hypertension-Related Knowledge and Medication Adherence among Hypertensive Patients Residing in Urban Slums of Ahmedabad City: A Community-Based Cross-Sectional Study

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ABSTRACT

Background: Inadequate knowledge of hypertension may hinder effective self-management and long-term medication adherence, particularly in underserved communities.

Objectives: To assess the level of knowledge regarding hypertension, to study its association with medication adherence, and to identify the factors affecting the knowledge of hypertension among diagnosed patients residing in urban slums of Ahmedabad city.

Methods: A community-based cross-sectional study was conducted from September to December 2019 among 562 adults with diagnosed hypertension residing in urban slums of Ahmedabad city. Participants were selected using zone-wise probability-proportionate-to-population sampling followed by household-level sampling. Data were collected using a pre-tested semi-structured questionnaire. Hypertension knowledge was assessed using a 15-item scale and categorized as poor (≤ 8), average (9–12), or good (13–15). Medication adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS-8). Data were analysed using Microsoft Excel 2016 and the chi-square test, with $p < 0.05$ considered statistically significant.

Results: Of 562 participants, 413 (73.5%) had poor knowledge, 145 (25.8%) had average knowledge, and 4 (0.7%) had good knowledge. Overall, 240 (42.7%) participants were adherent and 322 (57.3%) were non-adherent. Adherence was higher among participants with average knowledge than among those with poor knowledge (74.5% vs 31.5%; $\chi^2 = 81.2$, $p < 0.05$). Age, educational attainment, family history of hypertension, and frequency of clinic attendance were significantly associated with knowledge.

Conclusion: Inadequate hypertension-related knowledge was common among patients residing in urban slums. Better knowledge was significantly associated with higher medication adherence. Repeated, patient-centred and literacy-sensitive counselling during routine care may be useful as part of comprehensive hypertension management.

Keywords: Hypertension, Knowledge, Medication adherence, urban slum

INTRODUCTION

Hypertension is one of the most common preventable and treatable chronic diseases and represents a major public health concern because of its substantial contribution to premature mortality and disability. [1,2] Asia bears a considerable proportion of the global population burden, with a correspondingly high prevalence of cardiovascular risk factors. [3] The World Health Organization estimates that approximately 1.28 billion adults aged 30–79 years worldwide have hypertension, with nearly two-thirds residing in low- and middle-income countries. Furthermore, almost half of individuals with hypertension are unaware of their condition. [4]

Despite the availability of effective antihypertensive therapies, the population-level effectiveness of hypertension management remains inadequate. Poor medication adherence is an important factor contributing to suboptimal treatment outcomes, and adherence to long-term therapies continues to represent a major challenge in the management of chronic diseases. [5] In addition to adverse effects and inadequate blood pressure (BP) control despite treatment, commonly reported factors associated with poor adherence include limited patient involvement in the treatment process, insufficient motivation to continue therapy, and inadequate knowledge regarding the disease and its management, particularly information concerning medication dosage. [6] Evidence suggests that patients with hypertension often have limited knowledge regarding normal BP values and the lifestyle modifications required during the course of treatment. [7]

Although adherence has been defined in various ways, its underlying concept remains consistent across definitions. It refers to “the extent to which patients stay with the recommendations of health care professionals.” [5] Thus, adequate adherence is an essential component of effective hypertension management and may play a

critical role in achieving optimal treatment outcomes and reducing the long-term burden of hypertension. A growing body of literature suggests that a patient's understanding of the chronic and largely asymptomatic nature of hypertension, its complications, and the rationale for continuous treatment strongly influences the likelihood of consistent medication-taking behavior. [8-10]

Poorly controlled or untreated hypertension can result in progressive and irreversible target-organ damage, increasing the risk of life-threatening complications and premature mortality. Effective hypertension management requires long-term adherence to pharmacological therapy in conjunction with comprehensive lifestyle modifications. These include reducing dietary salt and saturated fat intake, achieving and maintaining an appropriate body weight, engaging in regular physical activity, and following other prescribed therapeutic recommendations. Inadequate knowledge regarding treatment adherence may adversely influence patients' awareness, attitudes, and health-related behaviors, thereby posing a significant barrier to effective blood pressure control. Therefore, adequate patient knowledge and appropriate health education are essential components of comprehensive hypertension management and are considered crucial for achieving sustained blood pressure control and reducing the risk of hypertension-related complications. [11]

Urban slum populations represent a particularly vulnerable subgroup within this landscape. Because most community-based surveys in India classify slum dwellers under the broader "urban" category, slum-specific data on hypertension burden and its determinants remain limited, despite slums having distinct patterns of overcrowding, limited healthcare access, and lower literacy that can influence both disease risk and health-seeking behaviour. [12] A door-to-door study conducted in the urban slums of

Kochi, Kerala, found a hypertension prevalence of 34.8%, of whom only two-thirds were aware of their hypertensive status, underscoring persistent gaps in detection even in relatively well-served urban settings. [12]

Knowledge about hypertension — its risk factors, complications, and the need for lifelong management — is widely recognized as a prerequisite for effective self-management and sustained medication adherence. A very low level of knowledge regarding hypertension and other cardiovascular conditions has frequently been reported among populations across the continent. [13] Patients who understand the chronic and often asymptomatic nature of hypertension may be better positioned to participate in long-term disease management. [14] Multiple studies have demonstrated that non-adherence is common even among patients with regular access to care, and that the level of disease-related knowledge is one of the modifiable factors significantly associated with adherence outcomes. [15]

Despite the growing body of literature on hypertension prevalence and control at the national level, there remains a paucity of population-based data specifically examining the interrelationship between hypertension knowledge and medication adherence among residents of urban slums a population that is disproportionately affected by structural barriers to healthcare access, lower educational attainment, and limited exposure to sustained health education. Understanding this relationship at the community level is essential for designing targeted interventions that can improve both disease awareness and long-term treatment adherence. The present study was therefore undertaken to assess the prevalence of hypertension knowledge and medication adherence, and to examine their association along with associated socio-demographic factors, among adults residing in an urban slum through a population-based door-to-door survey.

MATERIALS & METHODS

This study was undertaken to assess the level of hypertension-related knowledge, to examine its association with medication adherence, and to identify the socio-demographic factors influencing knowledge among diagnosed hypertensive patients residing in the urban slums of Ahmedabad city. A community based cross sectional study was conducted from September to December 2019 among adults residing in urban slum area of Ahmedabad city. The sample size was calculated using the prevalence of hypertension was taken 24%. [16] Sample size was estimated at 5% level of significance with allowable error of 15% of the estimated prevalence, using the formula $4pq/L^2$. Thus, the study was conducted among 562 hypertensive patients who have been taking antihypertensive treatment for last six months.

As per Atlas of Ahmedabad slum population, Zone wise Ahmedabad slum population and number of participants were selected as per probability proportionate to population size sampling. [17] A lower-side prevalence estimate of 20% hypertension was assumed for operational feasibility during household surveys, considering variations in reported prevalence of hypertension in urban slum settings from previous community-based studies. [18,19] Furthermore, assuming a 50% probability of identifying hypertensive patients during household visits, zone-wise simple random sampling was carried out for participant selection. In this study, hypertensive patients who were from 18 years and above and willing to participate were included. Hypertensive patients that were too ill to participate, pregnancy induced hypertension and newly diagnosed (less than six months) were excluded from the study.

Data were collected using a pre-designed, pre-tested, semi-structured questionnaire covering Socio-demographic details, Patient's Knowledge about Hypertension and Medication Adherence. Adherence was assessed using Morisky Medication Adherence Scale-8 (MMAS-8). A scoring

scheme of “Yes” = 0 and “No” = 1 was used for the first seven items of the MMAS-8, except for item 5, for which the scoring of “Yes” and “No” responses were reversed. For the last item, a five-point Likert scale was used with the response options “never”, “occasionally”, “sometimes”, “usually”, and “always”. An MMAS-8 score of less than 6 was considered non-adherent, whereas a score of 6 or higher was considered adherent.^[20] Knowledge of hypertension was assessed by using a validated 15-item scale, on which a score of less than 8 represented poor knowledge, a score of 9–12 represented average knowledge, and a score of 13–15 represented adequate knowledge.^[21]

The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) of B. J. Medical College, Ahmedabad (IEC Reference No.:148/2019). Verbal informed consent was obtained from all participants prior to their enrollment in the study.

The Data were entered and analyzed using Microsoft Excel 2016, and the chi-square

test was used to assess the association between knowledge and medication adherence. A p-value of less than 0.05 was considered statistically significant.

RESULT

Knowledge about Hypertension:

Out of the 562 participants, 413 (73.5%) had a knowledge score of ≤ 8 , indicating poor knowledge regarding hypertension. A knowledge score of 9–12 was observed in 145 (25.8%) participants, while only 4 (0.7%) participants achieved a score of 13–15, indicating good knowledge about hypertension. Overall, the findings demonstrate that the majority of participants had inadequate knowledge regarding hypertension.

Drug Adherence of Hypertensive patient:

Overall, 240 (42.7%) participants were adherent with treatment, whereas 322 (57.3%) were non-adherent according to the MMAS-8 scale. The mean Morisky Medication Adherence Scale-8 (MMAS-8) score was 5.3 ± 1.3 SD.

Figure: 1 Association of hypertension medication adherence with patient’s knowledge about hypertension (n= 562)

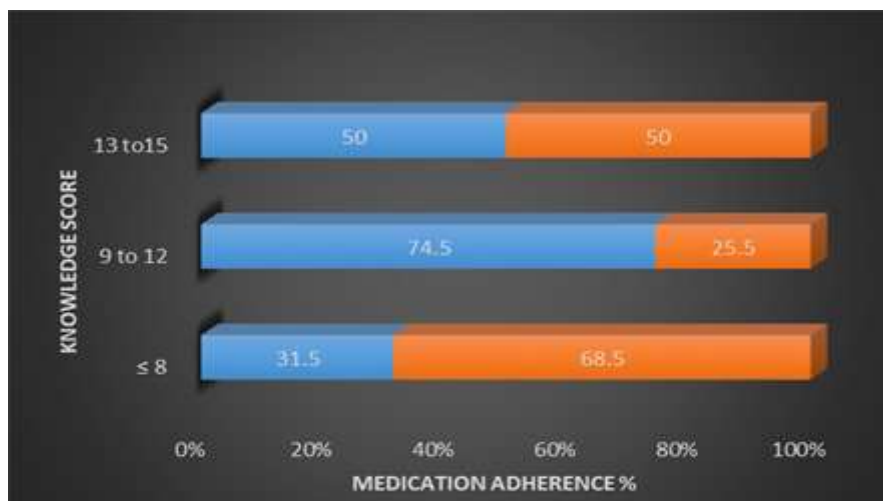


Figure 1 illustrates the association between hypertension knowledge score and medication adherence among the study participants (n = 562). A significant association was observed between knowledge level and medication adherence. Among participants with a knowledge score

of ≤ 8 , only 130 (31.5%) were adherent, whereas 283 (68.5%) had poor adherence. In contrast, among those with a knowledge score of 9–12, 108 (74.5%) were adherent and 37 (25.5%) had poor adherence. Among the four participants with the highest

knowledge score (13–15), 2 (50.0%) were adherent and 2 (50.0%) were non-adherent. Overall, medication adherence was substantially better among participants with higher hypertension-related knowledge. The association between knowledge score and

medication adherence was statistically significant ($\chi^2 = 81.2$, $p < 0.05$), suggesting that better knowledge about hypertension was associated with improved adherence to prescribed antihypertensive medication.

Table: 1 Factors affecting knowledge of hypertension (n= 562)

Variable		Knowledge score		Total	p value
		≤ 8	9 to 15		
Age group	<30	10(55.6)	8(44.4)	18(3.2)	$\chi^2=13.6$ $p < 0.05$
	31-40 years	96(72.2)	37(27.8)	133(23.7)	
	41-50 years	133(73.1)	49(26.9)	182(32.4)	
	51-60 years	129(82.2)	28(17.8)	157(27.9)	
	>60 years	45(62.5)	27(37.5)	72(12.8)	
Gender	Male	169(69.5)	74(30.5)	243(43.2)	$P > 0.05$
	Female	244(76.5)	75(23.5)	319(56.8)	
Education	No formal education	113(79.6)	29(20.4)	142(25.3)	$\chi^2=56.6$ $P < 0.05$
	Primary (up to 8 th class)	233(82.3)	50(17.7)	283(50.3)	
	Secondary & Higher secondary	56(48.7)	59(51.3)	115(20.5)	
	Graduate and above	11(50)	11(50)	22(3.9)	
Family history	Yes	263(79.5)	68(20.5)	331(58.9)	$\chi^2=14.7$ $P < 0.05$
	No	150(64.9)	81(35.1)	231(41.1)	
Clinic attendance	Every 1 to 3 months	108(54.3)	91(45.7)	199(35.4)	$\chi^2=61.6$ $P < 0.05$
	Every 6 months	214(86.3)	34(13.7)	248(44.1)	
	Annually	61(82.4)	13(17.6)	74(13.2)	
	Never	30(73.2)	11(26.8)	41(7.3)	
Total		413(73.5)	149(26.5)	562(100)	

Table: 1 presents the socio-demographic factors associated with the level of knowledge regarding hypertension. As only four participants had a good knowledge score (13–15), the average (9–12) and good (13–15) knowledge categories were combined for statistical analysis. Almost three-fourths of the study participants had poor knowledge about hypertension. Our study showed that age below 30 years was significantly associated with better knowledge score. Education, family history of hypertension in first degree relatives and regular clinic follow up were statistically significant factors associated with knowledge. Participants with higher educational attainment had higher knowledge scores, and participants attending regular follow-up visits had better knowledge.

DISCUSSION

The present study highlights a substantial gap in hypertension-related knowledge

among patients residing in urban slums of Ahmedabad. Nearly three- fourth of participants 73.5% had a poor knowledge, with only 0.7% having a good knowledge. This finding is comparable to a study among Polish patients with arterial hypertension, where 63% of patients were found to have a low level of disease-related knowledge on a validated hypertension knowledge-level scale. [22] A community-based study among young adults in an urban slum of Mumbai reported 58.7% participants had poor hypertension knowledge in a comparable slum setting, reinforcing that knowledge deficits are a consistent finding across Indian urban slum populations. [23] This indicates that inadequate knowledge about hypertension was common in the study population. Limited understanding of the chronic nature of hypertension, its complications, treatment requirements, and the importance of lifestyle modification may make it difficult for patients to effectively participate in their long-term disease

management.

In the present study, medication adherence was also suboptimal. Only 42.7% of participants were classified as adherent according to the MMAS-8, whereas 57.3% were non-adherent. The mean MMAS-8 score was 5.3 ± 1.3 . Poor adherence to antihypertensive medication remains an important challenge in the long-term management of hypertension. The World Health Organization has emphasized that effective hypertension management requires sustained treatment and patient engagement, while inadequate adherence can compromise achievement of blood pressure control. [24]

A significant association was observed between hypertension-related knowledge and medication adherence ($\chi^2 = 81.2$, $p < 0.05$). Among participants with a knowledge score of ≤ 8 , only 31.5% demonstrated good medication adherence, compared with 74.5% among those scoring 9–12. Thus, participants with better knowledge were considerably more likely to demonstrate good adherence. This finding was similar to that reported in Cameroon. [25] This finding is consistent with the study by Jankowska-Polańska et al., which reported that patients with higher hypertension-related knowledge had better medication adherence and identified knowledge as an important determinant of adherence. [22] Similarly, another study found that knowledge regarding the purpose of medication, causes of hypertension and target blood pressure was associated with higher treatment adherence. [26] These findings suggest that understanding the disease and its treatment may contribute to patients' ability and willingness to follow prescribed antihypertensive regimens.

However, the results in the highest knowledge category should be interpreted cautiously. Only four participants had a knowledge score of 13–15, of whom two were adherent and two were non-adherent. Therefore, the 50% adherence observed in this group should not be interpreted as evidence that the association weakens at the

highest level of knowledge. The very small number of participants in this category makes the estimate unstable.

Factors associated with hypertension-related knowledge

The present study also identified significant associations between knowledge level and age group, educational attainment, family history of hypertension and frequency of clinic attendance. Age was significantly associated with knowledge ($\chi^2 = 13.6$, $p < 0.05$). Participants aged <30 years had the highest proportion of participants with a knowledge score of 9–15 (44.4%), whereas those aged 51–60 years had the lowest proportion (17.8%). In an urban clinic-based study, older age and lower educational attainment were associated with lower hypertension knowledge. [7] The relatively better knowledge among younger participants in the present study may partly reflect greater exposure to health information through formal education and other information sources, although this explanation cannot be established from the present cross-sectional data.

Educational attainment showed a strong association with hypertension knowledge ($\chi^2 = 56.6$, $p < 0.05$). Only 17.7% of participants with primary education and 20.4% of those with no formal education had knowledge scores of 9–15, compared with 51.3% among participants with secondary/higher secondary education and 50.0% among graduates and above. This gradient supports the importance of education and health literacy in understanding chronic diseases. Previous research has similarly demonstrated that lower educational attainment and limited literacy are associated with poorer hypertension knowledge and control. [27] In the present study, therefore, improving health communication among individuals with limited formal education may be particularly important.

Family history of hypertension was also significantly associated with knowledge ($\chi^2 = 14.7$, $p < 0.05$). Participants with a family

history of hypertension had a lower proportion of adequate knowledge than those without a family history (20.5% vs. 35.1%). This finding is noteworthy because having an affected first-degree relative does not necessarily translate into better disease knowledge. Although individuals with affected family members may have greater exposure to hypertension-related information, the present findings suggest that family experience alone may not ensure adequate understanding of the disease. Previous research has shown that awareness of hypertension and treatment status can be associated with better knowledge of hypertension-related risk factors, but knowledge gaps may persist even among individuals aware of their condition. [28]

Frequency of clinic attendance was significantly associated with hypertension knowledge ($\chi^2 = 61.6$, $p < 0.05$). Participants attending the clinic every 1–3 months had the highest proportion of adequate knowledge (45.7%), whereas those attending every six months had a lower proportion (13.7%). This finding suggests that more frequent contact with healthcare providers may provide greater opportunities for counselling and reinforcement of information. Previous intervention studies have demonstrated that structured patient education can substantially improve knowledge about hypertension. [29] Regular healthcare encounters may therefore serve as an important opportunity for reinforcing information about the chronic nature of hypertension, complications, medication use, lifestyle modification and the importance of adherence.

The association between knowledge and medication adherence has important implications for hypertension management in urban-slum settings. Educational interventions should be simple, culturally appropriate and tailored to patients with low literacy. Counselling should focus on the purpose of antihypertensive treatment, the importance of taking medication regularly even when symptoms are absent, possible consequences of uncontrolled hypertension,

medication-related concerns and the need for continued follow-up. Evidence from systematic reviews suggests that educational interventions can improve medication adherence, particularly when education is repeated and accompanied by regular patient contact. [30]

Importantly, the present study identified associations rather than causal relationships. Although better knowledge was associated with better medication adherence, it cannot be concluded that increasing knowledge alone will necessarily improve adherence. Medication-taking behaviour is multifactorial and may also be influenced by medication cost and availability, treatment complexity, adverse effects, forgetfulness, family support, healthcare accessibility and patient beliefs. Therefore, educational interventions should ideally be integrated with broader adherence-support strategies.

The findings have practical implications for community-based hypertension programmes. Patients with lower educational attainment and poor hypertension knowledge may benefit from repeated counselling using simple language, pictorial materials and teach-back methods. Healthcare workers at primary-care and community levels can reinforce key messages during follow-up visits. Such approaches may be particularly relevant in urban slum populations where healthcare access and health literacy may be important barriers to effective chronic disease management.

Limitation

The study had certain limitations. Since information was collected through self-reporting, recall bias may have affected the accuracy of responses. Medication adherence was assessed using a subjective questionnaire-based method rather than objective tools such as pill counts or electronic monitoring systems.

CONCLUSION

A large proportion of hypertensive patients in this study had inadequate knowledge

about their condition, and this knowledge deficit was significantly associated with poorer medication adherence. Younger age, higher educational attainment, a negative family history of hypertension, and more frequent clinic follow-up were significantly associated with better knowledge, while gender showed no such association. These findings underscore the need for structured, follow-up-integrated patient education programmes, with particular emphasis on patients with limited formal education, to improve hypertension knowledge and, in turn, strengthen medication adherence and long-term blood-pressure control.

Declaration

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