Research Article

Effect of antihypertensives on falls among the elderly in urban areas of Puducherry: A case–control study

Suguna A, Surekha A, Jayaramachandran S

Department of Community Medicine, Mahatma Gandhi Medical College and Research Institute, Puducherry, India

Correspondence to: Surekha A, E-mail: surecommed87@gmail.com

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ABSTRACT

Background: Hypertension is one of the most common medical conditions in the elderly, and antihypertensive medications used to treat hypertension are among the most widely prescribed drugs for this age group. There are raised concerns about the risk of falls associated with antihypertensive medications in older adults. **Objectives:** The objectives of this study are as follows: (1) To assess the risk of falls associated with antihypertensive medications among the elderly in urban areas of Puducherry and (2) to assess the postural blood pressure changes among the elderly in urban areas of Puducherry. **Materials and Methods:** We conducted a case–control study in the Urban Health Training Center in the field practice area of our college, Puducherry, between January and June 2017. Based on purposive sampling, cases and controls were selected for the study. After obtaining written informed consent, a pre-designed and a pre-tested semi-structured questionnaire was administered. **Results:** Among our cases, we found an increased risk of falls with current prescribing of calcium channel blockers (adjusted odds ratio 1.11; 95% confidence interval 0.83–1.47) while we found a reduced risk for prescribing of other drugs. There was no significant association of falls with orthostatic hypotension. **Conclusion:** Falls/orthostatic hypotension is not routinely looked for in primary care practices. There should be regular screening for orthostatic hypotension and falls among the elderly on antihypertensive so as to avoid the risk of falls.

KEY WORDS: Falls and Antihypertensive; Elderly; India

INTRODUCTION

Hypertension is one of the most common medical conditions in the elderly, and antihypertensive medications used to treat hypertension are among the most widely prescribed drugs for this age group.[1,2] There are raised concerns about the risk of falls associated with antihypertensive medications in older adults.[3] Mortality data from the global burden of disease studies have revealed the fact that non-communicable diseases (NCDs) account for 63% of all deaths and 80% of NCD deaths (29 million) occur in low- and middle-income countries.[4] According to the WHO report (2002), cardiovascular diseases will be the largest cause of death and disability in India by 2020. Hypertension is one of the most common medical conditions in the elderly, and antihypertensive medications used to treat hypertension are among the most widely prescribed drugs for this age group.[1,2] Blood pressure (BP) control is a central component of myocardial infarction and stroke risk reduction guidelines.[5-7] A recent multispecialty task force, however, raised concerns about the risk of falls and postural BP changes associated with antihypertensive medications in older adults.[8]

At present, there are only limited studies that demonstrate an increased risk of falls during the initiation of antihypertensive drugs.[9,10] Therefore, there is a need to perform a case–control study to determine the role of antihypertensive medications in older people with fall and postural BP change.

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Objectives

The objectives of this study are two-fold:

1. To assess the risk of falls associated with antihypertensive medications among the elderly in urban areas of Pondicherry.
2. To assess the postural BP changes among the elderly in urban areas of Pondicherry.

MATERIALS AND METHODS

A case–control study was carried out in the Urban Health Training Center (UHTC) in the field practice area of our college, Puducherry, between January and June 2017. The study population comprised of (inclusion criteria) the elderly (>60 years) residing in field practice area of UHTC of MGMCRI. Cases were the elderly who have experienced fall in the past 1 year, and controls were those who have not experienced any fall. The elderly who were seriously ill and could not able to hear and comprehend were excluded from the study

The sample size was calculated based on the prevalence of the previous studies.

Sample size calculation according to Kelsey *et al*.

$n1 = (Z\ \alpha/2+Z\ 1-\beta)^2\ pq\ (r+1)/\ r\ (p1-p2)^2$

Whereas 2-sided confidence interval $(1-\alpha)$ is 95%

Power = 80%

Ratio of control to cases 1:1

By calculating from the above formula,

Hypothetical proportion of control with exposure = 40

Hypothetical proportion of cases with exposure = 47

OR = 2

Hence, approximately we had taken 90 cases and 90 controls for this study.

The list of people was obtained from the Medical officer/Nurse (UHTC). The elderly were selected by purposive sampling, and the details of them were collected. After obtaining the informed consent, the study participants were interviewed to collect the information. All the details were collected using a pre-tested and validated questionnaire (validated by panel of experts). A structured interview schedule was used to collect relevant data from the respondents.

The interview schedule had the following parts: Sociodemographic details such as age, gender, socioeconomic status, occupation, duration of disease, use of medications and information regarding falls, use of antihypertensive medications, and comorbidities.

Orthostatic hypotension was assessed among all the study population.

A fall is defined as a sudden, unintentional landing on the floor or ground with or without loss of consciousness or injury, other than as a consequence of the sudden onset of paralysis, an epileptic seizure, or overwhelming external force (in the past 1 year).

BP was recorded using Omron's digital BP apparatus or Mercury based sphygmomanometer.

Orthostatic hypotension is defined as a decrease in systolic BP (SBP) of 20 mm Hg and/or in diastolic BP (DBP) of 10 mm Hg within 3 min of standing.

For each case, we randomly selected two general population controls who had no recorded falls, matching on age and gender [Figure 1].

This study was approved by the Institutional Ethical Committee. After establishing rapport with the Medical Officers, the purpose and procedure of the study were explained. Informed written consent was obtained from the participants, and the interview schedule was administered to the participants.

Statistics and Analysis of the Data

Data collection: Using a pre-designed and a pre-tested semi-structured questionnaire. Data were entered into Excel

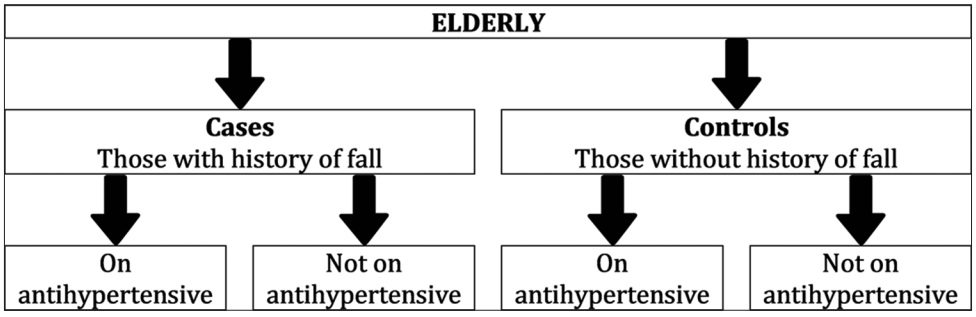

Figure 1: Study flowchart

format for analysis using SPSS. Results were expressed in percentages and frequencies.

RESULTS

A total of 180 elderly were included in this study - 90 as cases and 90 were controls, (mean [standard deviation] age of the cases, 65 ± 4.64 years, whereas of the controls 66 ± 6.39). 50% of cases and controls were males. The other characters are given in detail in Table 1. Each of our cases was successfully matched to at least one control of the same age and sex. Of the cases, 14 (15.6%) while among controls 29 (32%) had hypertension and 19 (21.1%) had both diabetes and hypertension among cases, 16 (18%) had both among

Table 1: Description of cases and controls

Variable	Frequency (%)	
	Cases	Controls
Age		
Mean age	65±4.64	66±6.39
60–69	76 (84.4)	64 (71.1)
70–79	12 (13.3)	20 (22.2)
>80 years	2 (2.2)	6 (6.7)
Gender		
Male	45 (50)	41 (45.5)
Female	45 (50)	49 (54.5)
Religion		
Hindu	88 (97.8)	80 (88.9)
Muslim	1 (1.1)	7 (7.8)
Christian	1 (1.1)	3 (3.3)
Education		
Illiterate	31 (34)	37 (41)
Primary	20 (23)	20 (22)
Secondary	31 (34)	28 (32)
Higher secondary	5 (6)	1 (1)
Graduate	3 (3)	4 (4)
Occupation		
Unemployed	37 (41)	30 (33)
Unskilled	10 (11)	11 (12)
Skilled	8 (9)	5 (6)
Professionals	4 (4)	4 (5)
Retired	31 (35)	40 (44)
Socioeconomic class (based on modified BG Prasad classification)		
I	9 (10)	6 (6.7)
II	15 (16.7)	13 (14.4)
III	23 (25.6)	30 (33.3)
IV	25 (27.8)	23 (25.6)
V	18 (20)	18 (20)
Marital status		
Single	1 (1.1)	2 (2)
Married	70 (77.8)	62 (69)
Separated	3 (3.3)	2 (2)
Widow	16 (17.8)	24 (27)
Currently living with		
Living alone	8 (8.9)	12 (13.3)
Spouse	45 (50)	40 (44.4)
Children	28 (31.1)	25 (27.8)
Relatives	9 (10)	13 (14.5)
Family type		
Nuclear	65 (72.2)	61 (67.8)
Joint	24 (26.7)	28 (31.1)
Three generation	1 (1.1)	1 (1.1)
Primary care giver		
Self	46 (51.1)	47 (52.2)
Spouse	25 (27.8)	21 (23.3)
Children	18 (20)	20 (22.2)
Grandchildren	1 (1.1)	2 (2.3)
Financial dependence		
Dependent	39 (43.3)	54 (60)
Partially dependent	19 (21.1)	17 (18.9)
Independent	32 (35.6)	2 (2.2)
Habits		
Tobacco	10 (11.1)	11 (12.2)
Alcohol	6 (6.7)	5 (5.6)
Both	5 (5.6)	5 (5.6)
None	69 (76.6)	69 (76.7)

(*Contd...*)

Table 1: (***Continued***)

Table 2: Health profile of study participants

Variable	Frequency (%)	
	Cases	Controls
H/O Fall		
Within 6 months	68 (76)	-
6 months–1 year	22 (24)	-
Health problems		
Diabetes	52 (57.8)	36 (40)
Hypertension	14 (15.6)	29 (32)
Both	19 (21.1)	16 (18)
None	5 (5.5)	9 (10)
H/O giddiness		
Present	62 (68.9)	39 (43.3)
Absent	28 (31.1)	51 (56.7)
Orthostatic hypotension		
Present	8 (8.9)	2 (2.2)
Absent	82 (91.1)	88 (97.8)

Table 3: Association between fall and antihypertensive medication

Medications	Cases (%)	Controls (%)	OR	95% CI	Adjusted OR (95% CI)
CCB	38 (52.8)	34 (47.2)	1.204	(0.662–2.187)	1.11 (0.83–1.47)
Thiazide	14 (58.3)	10 (41.7)	0.70	(1.05–1.16)	0.75 (0.70–1.00)
Beta blocker	26 (54.2)	22 (45.8)	1.12	(1.04–1.21)	0.95 (0.87–1.03)
ACE inhibitor	21 (58.3)	15 (41.7)	1.14	(1.07–1.21)	0.98 (0.92–1.04)
Angiotensin-II receptor antagonist	8 (57.2)	6 (42.8)	1.05	(0.99–1.11)	0.90 (0.85–0.96)

OR: Odds ratio, ACE: Angiotensin-converting enzyme, CI: Confidence interval, CCB: Calcium channel blocker

controls (Table 2). Mean SBP of cases was 138.86 ± 22.4, while mean DBP was 83.93 ± 11.1. Mean SBP of controls was 142.11 ± 17.7, while mean DBP was 85.11±11.9. The medications used by the patients are given in Table 3.

76% of patients had falls within 6 months, and 24% of patients had falls in the past 1 year. Antihypertensive therapy, especially calcium channel blocker (CCB) (odds ratio, 1.11, 95% confidence interval [CI] 0.83–1.47), was associated with increased risk for falls when compared to other medications. The association between overall antihypertensive medication use and all falls was done (where it was highly significant $P < 0.001$). Orthostatic hypotension was present in 11% of patients. Antihypertensive therapy was not associated with an increased risk for orthostatic hypotension. BP decreased to 132 (33)/82 (16) mm Hg in those taking antihypertensive medications after standing for 1 min.

DISCUSSION

In this case–control study of older people using prospectively collected data, we found that the commonly prescribed antihypertensive therapies included angiotensin-converting enzyme inhibitors (ACEIs), CCBs, angiotensin receptor blockers, and beta-blockers with diuretics prescribed less frequently. This is consistent with other reports and indicates that clinicians tend to prefer newer antihypertensive drugs (ACEIs and CCBs) to those usually recommended by guidelines (diuretics and beta-blockers).[11] We found that the risk of first fall for people for prescribed CCBs was higher than for the other drugs.

The relationship between falls and drug therapy relies on observational studies such as this one because falls usually are not classified as an adverse drug reaction in clinical trials. The association between cardiovascular drugs and falls is controversial. Some studies have shown an association, with the mechanism often considered to be orthostatic hypotension.[12] However, orthostatic hypotension is more likely to produce syncope, which often is excluded from research-based definitions of falls. In a meta-analysis of published studies, Leipzig *et al*.[13] reported that the pooled odds ratios for falls were 1.20 (95% CI, 0.92–1.58) for ACEIs, 1.16 (95% CI, 0.87–1.55) for centrally acting antihypertensives, 1.08 (95% CI, 1.02–1.16) for diuretics, 1.06 (95% CI, 0.97–1.16) for thiazide diuretics, 0.94 (95% CI, 0.77–1.14) for CCBs, and 0.93 (95% CI, 0.77–1.11) for beta-blockers. We found a negative association (i.e., a protective effect) between the drugs other than CCBs and falls.

Strengths and Limitations

The details about elderly people with falls associated with antihypertensives in Urban India are limited, and also, the prevalence of orthostatic hypotension and falls observed in this study is not similar/different from that reported in various other groups of older people in other parts. This case–control study is limited by some biases, including recall bias and social desirability bias

Recommendation

While treating the medical conditions with drugs such as the antihypertensives, the treating people should have the risks in mind and need an address. To reduce the falls and also mobility in old people, they will have to be trained by medical personnel in such a way as to avoid falls, for example, using a cane while walking, using rails while walking, and getting up from sitting posture. This needs integrated approach and training.

CONCLUSION

Antihypertensive therapy was associated with increased risk of falls while not for orthostatic hypotension, in this case–control study of elderly. Falls/orthostatic hypotension is not routinely looked for in primary care practices. There should be regular screening for orthostatic hypotension and falls among the elderly on antihypertensive so as to avoid the risk of falls.

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