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Original research article

A hospital-based assessment of the factors associated with awareness treatment and control of hypertension in rural Kashmir

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Abstract

Aim: We investigated factors affecting awareness, treatment, and control of hypertension, especially among the rural population of Kashmir.

Methods: The present observational study was conducted in the of Department of Medicine, Government Medical College (GMC) Anantnag, Jammu and Kashmir, India, for the period of 9 months, among 200 participants from the rural part of Jammu and Kashmir.

Results: The hypertensive participants compared to the participants without hypertension had a higher proportion of 40-49 age group, male, BMI ≥25.0 kg/m2, current smokers, and also having other comorbid diseases. The majority of the patients with hypertension were male 75% as compared to females 25%. 30% patients with hypertension had habit of smoking and drinking.

Conclusion: Among young adults with hypertension in Jammu and Kashmir, the factors possibly enhancing young people's attention on health were associated with higher hypertension management indices. Besides, the factors indicating obstacles to visit clinics hindered hypertension treatment and control, especially among young Kashmiri females.

Keywords: Hypertension; Disease management; Epidemiologic factor

Introduction

Hypertension is one of the most prevalent chronic diseases in many countries and is the most common modifiable risk factor for other severe chronic conditions such as heart disease, stroke, kidney disease, and subsequent morbidity and mortality [1]. It leads to 9.4 million deaths each year worldwide, with the condition disproportionately affecting low- and middle-income countries [2, 3].

Improved awareness and treatment of hypertension can lead to improved control of hypertension [4, 5]. Understanding which factors are associated with these rates is very important for developing appropriate strategies to improve hypertension control. Studies conducted in LMICs have investigated demographic and behavioral factors that can be associated with hypertension awareness, treatment, and control. Some of these studies suggest that, being a female, overweight or obese, non-smoker and non-drinker are associated with higher rates of hypertension awareness and/or treatment or control [6, 7]. Others have found higher waist-to-height ratio and having co-morbidities (e.g., diabetes and other chronic conditions) are associated with higher rates of hypertension awareness or treatment [8]; physical inactivity was associated with higher levels of treatment, and higher percent of body fat was associated with higher level of awareness, treatment, and control [9]. However, all these studies were cross-sectional; further prospective studies are needed to determine the predictors of these important rates in hypertension management. In addition, investigating other factors in addition to demographic and behavioral factors in relation to hypertension awareness, treatment, and control may also be important to help manage hypertension [10].

There are also psychosocial factors such as anxiety and depression that have been shown to be associated with the development/worsening of hypertension [11, 12], yet, they haven't been extensively explored in relation to awareness, treatment, and control of hypertension. Similarly, health-related quality of life has been shown to be poor in patients with hypertension [13], but it is not clear how it can be important in relation to hypertension awareness, treatment, and control.Social support, including family and friends' ties, was shown to be associated with less uncontrolled hypertension [10]. On the other hand, health service utilization factors, including easy access to health services and regular check of BP, were both found to be associated with higher hypertension awareness [9]. Taken together, more scrutiny is needed to

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further examine the role of a wider range of factors that includes not only demographic and behavioral factors, but also psychosocial factors in relation to hypertension awareness, treatment, and control.
In India, several studies have investigated the prevalence of hypertension awareness, treatment, and control [14-16]. Factors associated with these rates were only explored in cross-sectional studies and also, only a limited number of potential factors were investigated [9]. Considering all potential factors from different aspects mentioned above in relation to hypertension awareness, treatment, and control, not only in cross-sectional, but also in longitudinal studies, could enhance our understanding of the determinants of these rates and how to improve hypertension control in the population. This will help establish stronger evidence-based strategies to reduce the burden of cardiovascular diseases in India and other LMICs.
Therefore, we investigated factors affecting awareness, treatment, and control of hypertension, especially among the rural Kashmir population.

Methods
The present observational study was conducted in the of Department of Medicine, Government Medical College (GMC) Anantnag, Jammu and Kashmir, India for the period of 9 months, among 200 participants from the rural part of Jammu and Kashmir.

Measurements
Blood pressure was measured 3 times by using a standard mercury sphygmomanometer (Baumanometer wall unit 33; WA Baum Co., New York, NY, USA) with 5-minutes-resting beforehand. The measuring equipment was calibrated periodically, andquality control was performed at every survey waves. The mean of the last 2 measurements of systolic blood pressure (SBP) and diastolic blood pressure (DBP) was used in this study. The prevalence, awareness, treatment, and control rate of hypertension were assessed with the blood pressure measurements and a questionnaire-based health interview. The prevalence of hypertension was defined as SBP ≥140 mmHg or DBP ≥90 mmHg or self-reported antihypertensive medication use. We defined the awareness rate of hypertension as the proportion of people who reported to be diagnosed with hypertension from physicians, the treatment rate as the proportion of people who reported to use antihypertensive medication at least 20 days per month, and the control rate as SBP <140 mmHg and DBP <90 mmHg, among the prevalent hypertensive people.
Several variables were included in the analysis to investigate the factors associated with hypertension management status among the rural Kashmir population. Age was divided into 2 groups: 30-39 years and 40-49 years. Obesity was defined as body mass index (BMI) ≥25.0 kg/m2 and overweight as 23.0 to 24.9 kg/m2 according to the Asian and Pacific perspective of the World Health Organization. The residence places of participants were categorized based on their current addresses. Marital status was classified as "never married," "currently married and cohabitated," and "others," which includes the separated, bereaved, divorced, etc. Education level was divided by the completion of college/university, high school, or else, and we redefined them into a binary variable for analysis: over- vs. under- college graduate. We classified the occupation of the participants by 4 categories: "white-collar" as managers, professionals, and office workers; "blue-collar" as indoor service providers, salesclerks, farmworkers, fishery workers, machinery workers, general laborers, and professional soldiers; "housewives"; and "unemployed." We classified male homemakers as "unemployed" because of the tiny sample size (3 out of 732 hypertensive men). Current smokers were defined as those who had smoked at least 100 cigarettes lifetime and are still smoking. We defined current drinkers as who had consumed alcohol at least once a month on average in the past year. Physical inactivity was assessed using the Global Physical Activity Questionnaire. Those who reported participating in moderate to vigorous-intensity physical activity (PA) less than 150 minutes a week, 1 minute of vigorous PA is equal to 2 minutes of moderate PA, were considered as physically inactive.19) Daily sodium intake was estimated by using a 24-hour dietary recall, and sodium consumption ≥2,000 mg/day was defined as sodium over-intake.20) Dyslipidemia was defined as the presence of one or more of the following conditions: 1) hypercholesterolemia defined as fasting blood cholesterol level ≥240 mg/dL; 2) hypertriglyceridemia defined as fasting blood triglyceride level ≥200 mg/dL; 3) hyper-low-density-lipoprotein (LDL)-cholesterolemia defined as fasting blood LDL-cholesterol level ≥160 mg/dL; 4) hypo-high-density-lipoprotein (HDL)-cholesterolemia defined as fasting blood HDL-cholesterol level ≤40 mg/dL; 5) the self-reported use of lipid-lowering medication.21) Diabetes mellitus (DM) was defined as fasting blood glucose level ≥126 mg/dL or reporting to be diagnosed from physicians or currently on medication or insulin injection. Past-history of CVD was obtained from participants' reporting of ever being diagnosed from physicians with stroke or myocardial infarction or angina pectoris. Experience of unmet medical needs was reported by participants in response to the following question: "During the past year, have you ever been unable to get medical care when needed?" Participants also reported health examination experience in the past 2 years by answering the following question: "Have you ever gotten health examination in the past 2 years for health management purposes?"

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Statistical analyses

The study population's general characteristics were reported as the number of participants with a weighted proportion by factors (SURVEYFREQ procedure, SAS v9.4; SAS Institute Inc., Cary, NC, USA). Hypertension management status-awareness, treatment, control rate-was estimated among participants with hypertension. We performed logistic regression models (SURVEYLOGISTIC procedure, SAS v9.4; SAS Institute Inc.) to calculate odds ratios (ORs) with 95% confidence interval (CI) to assess the association of the factors with hypertension awareness, treatment, and control. We further adjusted the models by incorporating each factor for age, obesity, region, marital status, education, occupation, smoking status, drinking status, sodium over-intake, physical inactivity, dyslipidemia, DM, past-history of CVD, unmet medical needs in the past year, and health examination in the past 2 years.

Results

Table 1: General characteristics of Kashmir population

Variables	Total (n=200)	Without hypertension (n=100)	With hypertension (n=100)
Age (years)			
30-39 years	97 (48.5%)	48 (48%)	49 (49%)
40–49	103 (51.5%)	52 (52%)	51 (51%)
Sex			
Male	123 (61.5%)	48 (48%)	75 (75%)
Female	77 (38.5%)	52 (52%)	25 (25%)
BMI (kg/m2)			
<23.0	65 (32.5%)	48 (48%)	17 (17%)
≥23.0- <25.0	40 (20%)	22 (22%)	18 (18%)
≥25.0	95 (47.5%)	30 (30%)	65 (65%)
Marital status			
Never married	34 (17%)	16 (16%)	18 (18%)
Currently married	152 (76%)	80 (80%)	72 (72%)
Others	14 (7%)	4 (4%)	10 (10%)
Education			
Elementary–middle school	9 (4.5%)	4 (4%)	5 (5%)
High school	72 (36%)	32 (32%)	40 (40%)
College	119 (59.5%)	64 (64%)	55 (55%)
Unhealthy lifestyle			
Current smoking	55 (27.5%)	25 (25%)	30 (30%)
Current drinking	20 (10%)	10 (5%)	10 (5%)
Physical inactivity	40 (20%)	20 (20%)	20 (20%)
Sodium over-intake	40 (20%)	20 (20%)	20 (20%)
Comorbidity			
Dyslipidemia		25 (25%)	50 (50%)
DM		4 (4%)	12 (12%)
Past-history of CVD		1 (1%)	3 (3%)

The hypertensive participants compared to the participants without hypertension had a higher proportion of 40-49 age group, male, BMI ≥25.0 kg/m2, current smokers, and also having other comorbid diseases. The majority of the patients with hypertension were male 75% as compared to females 25%. 30% patients with hypertension had habit of smoking and drinking.

Table 2: Factors affecting hypertension awareness, treatment, and control rate among rural Kashmiri males

Factors	Awareness		Treatment		Control	
	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Age: 40–49 vs. 30–39 (years)	2.64 (1.30–5.35)	2.87 (1.34–6.15)	2.93 (1.39–6.16)	3.30 (1.51–7.24)	3.15 (1.37–7.26)	3.92 (1.64–9.36)
BMI: ≥25.0 vs. <25.0 (kg/m2)	0.93 (0.56–1.53)	0.81 (0.44–1.49)	0.96 (0.58–1.59)	0.82 (0.45–1.50)	0.80 (0.47–1.37)	0.68 (0.36–1.29)
Currently married (cohabitated) vs. not	0.87 (0.35–2.14)	0.73 (0.33–1.62)	1.18 (0.46–3.04)	1.04 (0.42–2.56)	1.17 (0.43–3.14)	0.93 (0.34–2.50)
Under vs. over college graduate	1.33 (0.77–2.31)	0.82 (0.42–1.59)	1.40 (0.80–2.46)	0.91 (0.46–1.80)	1.41 (0.81–2.46)	1.00 (0.50–1.98)
Current smoker vs.	0.76 (0.32–	0.74 (0.30–	0.51 (0.21–	0.46 (0.16–	0.63 (0.25–	0.52 (0.18–

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ex-/never-smoker	1.82)	1.86)	1.26)	1.33)	1.58)	1.55)
Current drinker vs. non-drinker	0.75 (0.45–1.26)	0.89 (0.51–1.56)	0.77 (0.46–1.30)	0.97 (0.55–1.71)	0.88 (0.51–1.51)	1.14 (0.63–2.06)
Physical inactivity† (yes vs. no)	0.95 (0.57–1.57)	0.89 (0.51–1.55)	0.91 (0.55–1.51)	0.82 (0.47–1.43)	0.97 (0.56–1.66)	0.94 (0.52–1.67)
Sodium over-intake‡ (yes vs. no)	0.50 (0.28–0.90)	0.44 (0.23–0.83)	0.65 (0.36–1.18)	0.51 (0.27–1.11)	0.59 (0.32–1.08)	0.52 (0.27–1.00)
Dyslipidemia (yes vs. no)	1.98 (1.15–3.41)	2.19 (1.19–4.01)	2.05 (1.19–3.55)	2.29 (1.26–4.16)	2.31 (1.33–4.02)	2.69 (1.50–4.83)
DM (yes vs. no))	2.08 (1.01–4.29)	2.79 (1.14–6.82)	1.84 (0.90–3.74	2.34 (0.99–5.52)	1.26 (0.60–2.64)	1.34 (0.57–3.18)
Past-history of CVD (yes vs. no)	4.37 (0.51–37.3)	1.47 (0.21–9.97)	5.07 (0.60–43.19)	2.74 (0.36–21.0)	6.73 (0.79–57.2)	5.13 (0.61–43.5)

Table 2 shows the factors affecting hypertension management status among male participants. The odds of being aware of hypertension was 2.98-fold (95% CI, 1.87–4.75) higher in older (40–49 years) age group compared to younger (30–39 years) age group. The older age group also showed 2.65-fold (95% CI, 1.63–4.34) higher odds of being treated, and 2.54-fold (95% CI, 1.42–4.53) higher odds of controlling the disease compared to the younger age group. Those with higher BMI (≥25.0 kg/m2) showed higher odds of being aware of hypertension (OR, 1.68; 95% CI, 1.07–2.64) and being treated (OR, 1.52; 95% CI, 0.94–2.44), but the control rate was not significantly higher than the lower BMI (<25.0 kg/m2) group. Marital status was associated with hypertension management status in a crude model, but not statistically significant after covariates adjustment. Having DM was associated with a higher awareness rate (OR, 3.07; 95% CI, 1.73–5.46), treatment rate (OR, 2.28; 95% CI, 1.24–4.22), and control rate (OR, 2.24; 95% CI, 1.15–4.24). The male participants with past-history of CVDs were more likely to be aware (OR, 8.80; 95% CI, 1.28–60.67) of hypertension and to be treated (OR, 10.85; 95% CI, 1.47–80.26), but not to be controlled (OR, 1.40; 95% CI,0.33–5.88).

Table 3: Factors affecting hypertension awareness, treatment, and control rate among rural Kashmiri females

Factors	**Awareness**		**Treatment**		**Control**	
	Unadjusted OR (95% CI)	**Adjusted OR* (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted OR* (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted OR* (95% CI)**
Age: 40–49 vs. 30–39 (years)	2.64 (1.30–5.35)	2.87 (1.34–6.15)	2.93 (1.39–6.16)	3.30 (1.51–7.24)	3.15 (1.37–7.26)	3.92 (1.64–9.36)
BMI: ≥25.0 vs. <25.0 (kg/m2)	0.93 (0.56–1.53)	0.81 (0.44–1.49)	0.96 (0.58–1.59)	0.82 (0.45–1.50)	0.80 (0.47–1.37)	0.68 (0.36–1.29)
Currently married (cohabitated) vs. not	0.87 (0.35–2.14)	0.73 (0.33–1.62)	1.18 (0.46–3.04)	1.04 (0.42–2.56)	1.17 (0.43–3.14)	0.93 (0.34–2.50)
Under vs. over college graduate	1.33 (0.77–2.31)	0.82 (0.42–1.59)	1.40 (0.80–2.46)	0.91 (0.46–1.80)	1.41 (0.81–2.46)	1.00 (0.50–1.98)
Current smoker vs. ex-/never-smoker	0.76 (0.32–1.82)	0.74 (0.30–1.86)	0.51 (0.21–1.26)	0.46 (0.16–1.33)	0.63 (0.25–1.58)	0.52 (0.18–1.55)
Current drinker vs. non-drinker	0.75 (0.45–1.26)	0.89 (0.51–1.56)	0.77 (0.46–1.30)	0.97 (0.55–1.71)	0.88 (0.51–1.51)	1.14 (0.63–2.06)
Physical inactivity† (yes vs. no)	0.95 (0.57–1.57)	0.89 (0.51–1.55)	0.91 (0.55–1.51)	0.82 (0.47–1.43)	0.97 (0.56–1.66)	0.94 (0.52–1.67)
Sodium over-intake‡ (yes vs. no)	0.50 (0.28–0.90)	0.44 (0.23–0.83)	0.65 (0.36–1.18)	0.51 (0.27–1.11)	0.59 (0.32–1.08)	0.52 (0.27–1.00)
Dyslipidemia (yes vs. no)	1.98 (1.15–3.41)	2.19 (1.19–4.01)	2.05 (1.19–3.55)	2.29 (1.26–4.16)	2.31 (1.33–4.02)	2.69 (1.50–4.83)
DM (yes vs. no)	2.08 (1.01–4.29)	2.79 (1.14–6.82)	1.84 (0.90–3.74)	2.34 (0.99–5.52)	1.26 (0.60–2.64)	1.34 (0.57–3.18)
Past-history of CVD (yes vs. no)	4.37 (0.51–37.3)	1.47 (0.21–9.97)	5.07 (0.60–43.19)	2.74 (0.36–21.0)	6.73 (0.79–57.2)	5.13 (0.61–43.5)

The factors affecting hypertension management among female participants were presented in Table 3. The older (40–49 years) age group showed higher odds of being aware (OR, 2.87; 95% CI, 1.34–6.15), being treated (OR, 3.30; 95% CI, 1.51–7.24), and being controlled of hypertension (OR, 3.92; 95% CI, 1.64–9.36). Females who reported to take sodium more than the recommendation for daily intake had a lower likelihood of being aware (OR, 0.44; 95% CI, 0.23–0.83), control (OR, 0.52; 95% CI, 0.27–1.00) of hypertension. The participants with dyslipidemia showed a higher likelihood of controlling the disease

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with OR of 2.19; 95% CI, 1.19–4.01; as well as of being aware of and being treated. Having DM was associated with a higher awareness rate (OR, 2.79; 95% CI, 1.11–6.82), treatment rate (OR, 2.34; 95% CI, 0.99–5.52) similar to maleparticipants, but not control rate (OR, 1.34; 95% CI, 0.57–3.18).

Discussion

In this representative sample of the rural Kashmiri population, we observed several factors associated with hypertension awareness, treatment, and control. The older (40≤ age <50), obese (BMI ≥25.0 kg/m2), having dyslipidemia, having DM, and having past-history of CVD participants were more likely to be aware of their hypertensive status among the young male population. Including the factors associated with higher hypertension awareness, having taken health examination in the past 2 years was positively associated with a higher treatment rate among young males. The participants who were older (40≤ age <50), having DM, and having taken health examination in the past 2 years were more controlled of hypertension among young males.The factors associated with higher awareness except sodium intake were positively associated with a higher treatment rate and not having experience of unmet medical needs in the past year was also positively associated. The female participants who were older (40≤ age <50), unemployed, not taking sodium over daily recommendation amount, having dyslipidemia, and not having experienced unmet medical needs in the past year were more likely to be controlled of hypertension.

The improvement of hypertension management status among young hypertension has been challenged due to the young population's lack of healthcare use, lack of knowledge, and their neglect of health management [18, 19, 20]. The age factor among young hypertension has been indicated the strongest challenging in relation to hypertension awareness and treatment [17, 19, 21] In the study conducted by Wu *et al*., [21]. Younger than 40 years of age group had 2-folds lower likelihood of being treated compared to the 40–49 years age group among the young Singaporean population. Kang *et al*. [17] also reported that awareness and treatment rates were lower in the 30–39 years-age group than the 40-49 years-age group (20.2% vs. 43.9% of awareness rate; 15.2% vs. 39.5% of treatment rate in the 30s vs. 40s, respectively). They suggested that younger people would have had lesser symptoms and comorbid diseases, which made them less recognize the dangers of the disease. In this study, we also observed that 40-49 years-age group had around 3-folds higher likelihood of being aware and treated in both males and females compared to the 30-39 years-age group.

Having comorbid diseases such as DM, dyslipidemia, and CVD elevated the likelihood of being aware of, treated, and controlled hypertension in our study. It suggests that young people with comorbid diseases might visit clinics more frequently than people without, which led them to take care more about their hypertension status [22, 23]. Females visits healthcare facilities more often than males for birth control and regular gynecological check-up [22, 24]. This also explains the higher awareness and treatment rate among females in our study.

In our study, the factors related to enhancing attention on health conditions such as older age, obesity, comorbid diseases, or health examination, increased awareness and treatment rates among Kashmiri adults. Moreover, some factors partially related to more frequent clinic visits increased treatment and control rates among young Kashmiri females. An international commission group on hypertension emphasized creating a healthy environment and health education through a life-course approach [25]. Johnson *et al*. [24] indicated that numerous life stressors and conflicting demands could have decreased visit adherence among young hypertension, especially females who are socially required to balance being a household mom with work responsibilities. Creating a more comfortable environment to seek healthcare services by alleviating such conflicting conditions could lead to young hypertension to visit clinics.

This study has several limitations. Because we excluded those who missed statistical weight values in our analysis, there is a possibility of confounding by indication. However, by properly using the statistical weight to the analysis, the estimates we made can be interpreted as representative of the Kashmiri population. Second, there could be residual confounders or unobserved interactions between the factors. Further consideration of other additional factors or interaction between each factor needs to be drawn in the future since we simply aimed to investigate the factors associated with hypertension management in the current study. Lastly, since we conducted a cross-sectional study, factors affecting young hypertension should be explored in a longitudinal manner to see if those factors determine further disease progression in the real world.

Conclusion

Among young adults with hypertension in Kashmir, the factors possibly enhancing young people's attention on health were associated with higher hypertension management indices. Besides, the factors indicating obstacles to visit clinics hindered hypertension treatment and control, especially among young Kashmiri females. Considering the factors associated with hypertension awareness, treatment, and control may help establish effective strategies to improve hypertension management status among the young population.

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