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Original article

Prevalence of hypertension in Nepalese community triples in 25 years: a repeat cross-sectional study in rural Kathmandu

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KEYWORDS

Hypertension
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ABSTRACT

Aim/Objectives: The objective of the study was to examine if there has been any change in the prevalence of hypertension (HTN) in the Nepalese population in the last two and half decades.
Methods: A population-based cross-sectional study was done in Bhadrabas village area of Kathmandu valley to estimate the prevalence of HTN and the findings were compared to the study done in the same location 25 years ago.
Findings: The study shows that there has been a three-fold increment in the prevalence of HTN in the same location. The major causes behind this increment appear to be increased salt intake and increased body mass index (BMI).
Conclusion: This is the first repeat cross-sectional study on blood pressure (BP) in a Nepalese population. There is a very high prevalence as well as a sharp rise in HTN prevalence in this society largely because of changing lifestyle which is most likely because of socio-economic transition.

Introduction

Hypertension (HTN) is a global public health problem with 1/4 adults worldwide estimated to have high blood pressure (BP).[1] The first scientific HTN survey in Nepal was done in 1981 by Mrigendra Samjhana Medical Trust.[2] The prevalence of HTN according to the then used World Health Organization (WHO) criteria (160/95 mmHg)[3] in the various parts of the country was as follows: 5.3% in Mountains (Jumla), 6% in rural Kathmandu (Bhadrabas and Alapot), 8.1% in Terai plains (Parsauni), and 9.9% in urban Kathmandu.[4] Since then, there has been a few studies done in various parts of Nepal.[5] These studies done in different geographical settings indicate towards a high prevalence of HTN in the Nepalese population. For example, a BP study in Dharan town of Eastern Nepal in 2005 found a prevalence of almost 23% according to the Jet Navigation Chart (JNC) VII guidelines.[6]

Because all these were one-time cross-sectional studies, these studies cannot show any trend, i.e. if there is a rise in the prevalence of HTN in these populations in the last few years or decades. A robust evidence of HTN trend can only be produced if a methodologically comparable study on HTN in the same location after a certain period yields a rising trend. To fill this particular gap in information regarding HTN in Nepal, a repeat cross-sectional study was planned. Thus, after 25 years since the initial study, a repeat survey was done in 2006 in the Bhadrabas area (consisting of adjoining Bhadrabas and Alapot villages) in the outskirts of Kathmandu valley. The main objectives of the study were to find out the prevalence of HTN in the urbanising area of a developing country and to compare the findings with the 1981 study done in the same location.[7]

Methods

Bhadrabas and Alapot are villages in Kathmandu valley located approximately 15 Km Northeast of the Kathmandu city. The details of the methodology used in the 1981 study were published a long-time back in Indian Heart Journal.[8] In brief, the survey was carried out from the beginning of March to the end of April 1980. The study population included 1405 individuals (639 males and 766 females) of the total 1547 people, aged ≥21 years. A single casual BP, using a mercury manometer was recorded. The criteria for diagnosing HTN were those recommended by the WHO Expert Committee, 1978 (systolic

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BP [SBP] ≥ 160 mmHg and/or diastolic BP [DBP] ≥ 95 mmHg).[3] Physical activity was classified arbitrarily into three broad groups: light (mainly sedentary, no regular physical exercise), moderate (manual farming or regular exercise like walking, cycling) and heavy (heavy manual work like carrying heavy loads). Determination of overweight was done with Broca's index (weight [kg] × 100/height [cm] − 100).

For the 2006 study, the latest JNC-7 guideline for diagnosis of HTN was used (SBP ≥140 mmHg and/or DBP ≥90 mmHg).[9] However, for appropriate comparison with the 1981 study, the higher cut-off of 160/95 was also used. Similarly, though body mass index (BMI) of >23 kg/m^2 was considered as overweight for the 2006 study as per the cut-off recommended for South Asians,[10] Broca's index was also calculated for making comparison with the 1981 study.

To determine the amount of daily salt consumption at the household level, the enumerators carried small sachets with 5 g, 10 g, 20 g, 50 g, and 100 g of salt. They were shown to the respondent to determine which sachet-size matched their daily salt used for cooking. The *per capita consumption* was then calculated by taking into account all the family members of the household and presuming that children aged 0–2 years consumed zero units, those aged 2–12 years consumed half unit while those aged ≥12 years consumed one unit. Besides home-cooked food, the enumerators took into calculation the salt consumed in pickles and other high salt-containing fast food items such as chips and noodles etc. taken outside, which have become popular in Nepal during the last decade or so. Other measurements and variables were similar to the 1981 study.

For both the studies, a door-to-door visit to all the households present in the area was done with the intention of including all the adults aged ≥21 years. Those who consented to participate were enrolled. The response rate was 91% in the 1981 study whereas in 2006, 84% out of the total eligible 1450 adults consented to get enrolled for the study.

Ethical clearance was taken and informed consent was obtained from the participants. Data for the 2006 study was analysed with SPSS version 13.0. Comparisons with the 1981 study were based on the results published in a monograph[11] as well as in the Indian Heart Journal.[12] Multivariate logistic regression analyses were performed to study the strength of association of HTN with the following five risk factors: high salt intake, physical inactivity, tobacco consumption, high waist circumference, and BMI (>23 kg/m^2). For each multivariate logistic regression analysis, the other four variables along with age and sex were adjusted.

Results

Description of the study population

A total of 1218 adults aged 21 years were enrolled; 527 of them were males while the remaining 691 were females (Table 1). The demographic characteristics of the 2006 study are described and compared with the 1981 population in Table 1. The mean age of the study population in 2006 was 40.54 (±16) years (41.48 ± 15.24 for males and 39.83 ± 16.53 for females).

Prevalence of hypertension

The prevalence of HTN in Bhadrabas in 2006, according to the JNC VII classification was found to be 33.8% (males: 38.3%, females: 30.8%).

Association of various risk factors with hypertension

Multivariate logistic regression analysis of the common risk factors is shown in Table 2. All risk factors particularly physical inactivity, high salt intake and obesity were associated with high BP. All the variables in the table: high salt intake, physical inactivity, tobacco, high waist circumference, BMI (>23 kg/m^2) have been adjusted for age and sex, and then with one another. For example, for high salt intake: age, sex, physical activity, tobacco, high waist, and BMI were adjusted.

Table 1
Comparison of study population in 1981 and 2006 studies.

Year	1981			2006		
Sample size	1405			1218		
Male/female (ratio)	639/766 (1:1.2)			527/691 (1:1.3)		
Mean age (SD)	39.61 (14.76)			40.54 (16)		
Age distribution (yr)	Male *n* (%)	Female *n* (%)	Total *n* (%)	Male *n* (%)	Female *n* (%)	Total *n* (%)
21–30	232 (36.3)	253 (33)	485 (34.5)	135 (25.6)	233 (33.7)	368 (30.2)
31–40	115 (18)	187 (24.4)	302 (21.5)	148 (28.1)	153 (22.1)	301 (24.7)
41–50	109 (17.1)	155 (20.2)	264 (18.8)	85 (16.1)	110 (15.9)	195 (16)
51–60	91 (14.2)	86 (11.2)	177 (12.6)	73 (13.9)	86 (12.4)	159 (13.1)
61–70	60 (9.3)	63 (8.2)	123 (8.7)	57 (10.8)	57 (8.2)	114 (9.4)
>70	32 (5)	22 (2.9)	54 (3.8)	29 (5.5)	52 (7.5)	81 (6.7)
Total	639 (100)	766 (100)	1405 (100)	527 (100)	691 (100)	1218 (100)
SBP (mean/SD)	119.2 (11.4)	117.7 (12.2)	118.4 (11.8)	122.31 (16.2)	119.69 (18)	120.82 (17.3)
DBP (mean/SD)	75.3 (7.8)	74.1 (9.6)	74.6 (8.8)	81.84 (10.9)	78.85 (11.3)	80.14 (11.2)

DBP: diastolic blood pressure, SBP: systolic blood pressure, SD: standard deviation.

Table 2
Odds ratios with 95% confidence intervals of risk factors for being hypertensive in the 2006 study (Multivariate logistic regression*).

	Odds ratio (95% CI)	*P* value
High salt intake (≥5 g)	1.54 (1.00–2.35)	0.049
Physical inactivity	2.34 (1.59–3.44)	<0.001
Tobacco	1.34 (1.04–1.72)	0.025
High waist circumference	2.24 (1.65–3.05)	<0.001
BMI (>23 kg/m^2)	1.95 (1.52–2.50)	<0.001

*For each of the five multivariate logistic regression analyses, the other four variables along with age and sex were adjusted. BMI: body mass index, CI: confidence intervals.

Table 3
Comparison of prevalence of associated risk factors in the 1981 and 2006 studies.

Risk factors	Year		*P* value
	1981 *n*=1405 (%)	2006 *n*=1218 (%)	
HTN (>160/95 mmHg)	84 (6)	225 (18.5)	<0.001
Salt intake (≥5 g)	785 (55.9)	1090 (89.5)	<0.001
Overweight (Broca's index)	169 (12)	526 (43.2)	<0.001
Physical inactivity	157 (11.2)	123 (10.1)	0.37

HTN: hypertension.

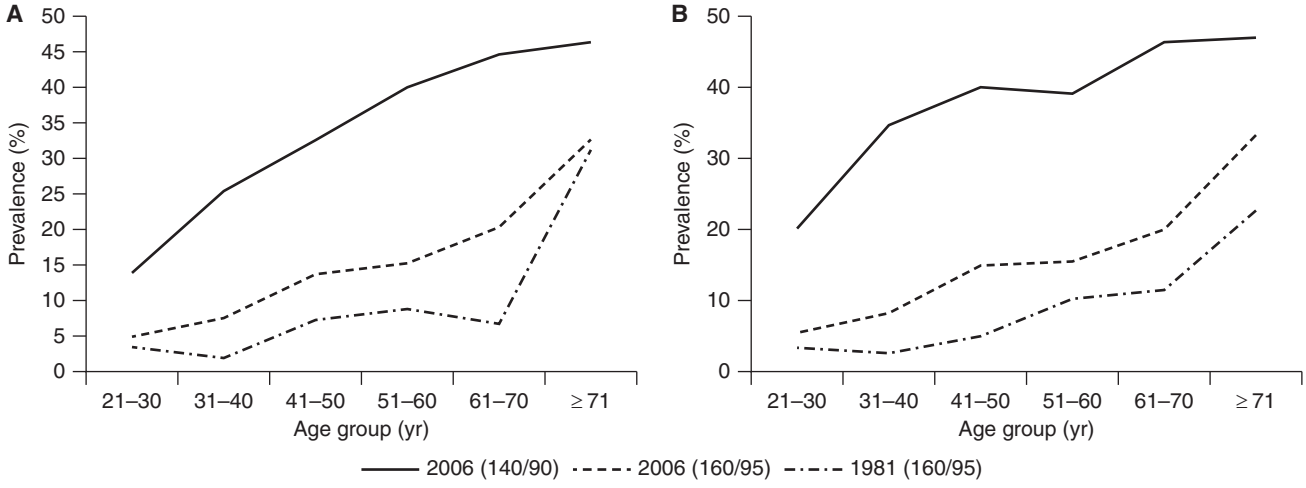

Figure 1 Age-wise comparison of prevalence of hypertension in (A) males and (B) females in 1981 (using WHO 1978 criteria of ≥160/95 mmHg) and 2006 (using JNC-VII criteria of ≥140/90 mmHg and the WHO 1978 criteria of ≥160/95 mmHg). WHO: World Health Organization.

Comparison of prevalence of hypertension in the Bhadrabas community in the 1981 and 2006 studies

To make a rational comparison between the 1981 and 2006 data, same cut-off points for defining HTN should be used for both the data. So, when the 2006 data was re-analysed using the old criteria of 1981, i.e. 160/95 mmHg, the prevalence of HTN in 2006 was calculated to be 18% which is still very high compared to the 6% prevalence in 1981 (Table 3). In other words, HTN had tripled (from 6% to 18%) in the same place in a span of 25 years. Comparisons in terms of age and sex in Figures 1 and 2, respectively show the trend to be similar for both sexes and all age groups.

Patient's awareness of hypertension status and treatment status in the 1981 and 2006 studies

In 1981, only 4 (4.8%) of the hypertensive people were aware of their high BP status while almost one-third (31.8%) of hypertensives in 2006 were aware. All four aware cases in 1981 and 97 (23.5%) of the hypertensives in 2006 were getting treatment. In 2006, BP was under control in 39 (9.5%) of the hypertensives.

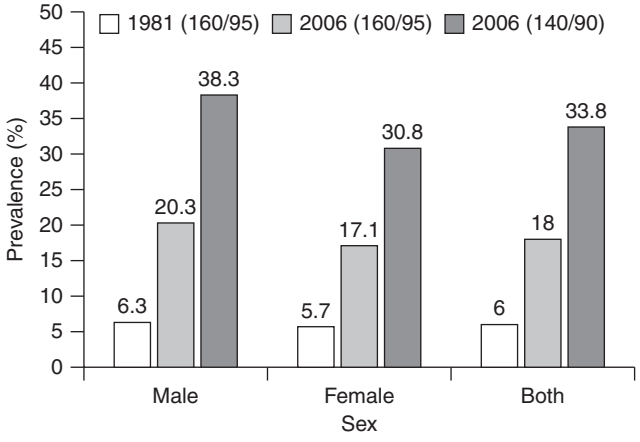

Figure 2 Sex-wise comparison of prevalence of hypertension in 1981 (using WHO 1978 criteria of ≥160/95 mmHg) and 2006 (using JNC-VII criteria of ≥140/90 mmHg and WHO 1978 criteria of ≥160/95 mmHg). Mean age of participants were 39.61 (±14.76) in 1981 and 40.54 (±16) in 2006. WHO: World Health Organization.

Discussion

The study has shown that the prevalence of HTN has indeed increased in the last quarter century in the rural Bhadrabas and Alapot community in the outskirts of Kathmandu. Given

the similar socio-developmental transition in many other parts of the country—particularly in the rapidly urbanising regions—it may be said that this rise in HTN could well be true for various other urbanising areas of Nepal.

The prevalence of HTN given by this study is marginally higher than other contemporary studies from Nepal on HTN.[12] Important contributors for this rise seem to be increased salt intake and rising level of obesity (Table 3). A well-designed study in 1998 has already established the role of salt in genesis of HTN in the Nepalese population.[13] Since physical inactivity level has remained the same at least in this community, change in the dietary habit appear to be the key factor.

Rise in the awareness level regarding the HTN status from <5% to almost a third is a large increase. This may be partly attributed to increasing general and cardiovascular literacy as well as the health programmes run in the community by Mrigendra Samjhana Medical Trust. The awareness, treatment, and control rates of the 2006 study are comparable to another suburban Kathmandu study in 2005 (31.8% vs 41.1%, 23.5% vs 26%, 9.5% vs 6%).[14] In a study conducted in an Eastern Hilly town of Nepal called Dharan, almost 60% of the hypertensives were aware of their disease with 50% of the hypertensives having their BP under control.[15] Presence of a tertiary care academic hospital with community-oriented programmes is a possible reason for this better awareness and control rates in Dharan.

This is the first published repeat cross-sectional study on HTN in Nepal. In fact, there are not many such studies in the other parts of the world too.[16] The intention of seeing a trend of BP in the population has been fulfilled often with longitudinal cohort studies. The merits and demerits of both the options can be debated.[16] In a resource-limited setting like ours, a repeat cross-sectional study may be cost-beneficial as well as adequately effective. Such studies can in fact also be employed to observe effects of intervention over a certain period of time in a community.[17]

Certain limitations of the study can put the result under scrutiny. The difference in the prevalence can be argued to be because of various confounders. But given the fact that the demographic structure of the community has remained more or less the same except for some possibility of out-migration among the youth, and similarity in data collection methods including the similarity in the age–sex structure of the sampled population in the two studies, the increase in HTN prevalence does seem real. Measurement of salt consumption had to be arbitarily done because of lack of accurate technicality to measure urinary sodium output in Nepal in 1981 and we wanted to do both the estimations by the same method. Nonetheless, renowned studies such as National Health and Nutrition Examination Surveys (NHANES)[18] have also used 24-hour recall method to estimate salt intake, and causal associations with cardiovascular events based on such estimations have been reported as well.[19]

This repeat cross-sectional study has shown that prevalence of HTN has increased three-fold in a rural community of Nepal. It shall be important to follow this population in the future to see the trend of BP in the Nepalese population. The study also has indirectly pointed out there is inadequacy from the perspective of public health and that we have not been able to do enough to prevent the problem. So, Nepal needs to seriously implement programmes to address HTN and its consequences.

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