

Exploring the iceberg of hypertension: A community based study in an eastern Nepal town

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Abstract

Objectives: Hypertension is an important public health challenge in the developing and the developed world alike. However, community-based studies on cardiovascular diseases including hypertension in a developing country like Nepal have been limited. The primary aim of this study is to measure the prevalence of hypertension in the Dharan town of Eastern Nepal and to explore the 'iceberg phenomenon' of hypertension in the study population.

Methods: A population-based cross-sectional analytical study was undertaken in the Dharan municipality in 2004-5 with one thousand males aged 35 years and above as participants. The subjects were recruited by simple random sampling of the households in each ward.

Results: The overall prevalence of hypertension in the study population was 22.7% which was comparable to the studies from Northern and Western India. The comparison between the population with normal and high blood pressure at time of study shows significant differences in terms of age, religion, current job status, occupation, socio-economic status, physical activity and tobacco use.

Conclusion: The study shows that while a vast majority of the hypertensive population was not aware of their high blood pressure status, at the same time, a large fraction of the population with increased blood pressure did not have their blood pressure under control. A surveillance system to detect population with high blood pressure, follow up the detected cases of hypertension, as well as motivate and/or counsel the 'hard-to-treat' cases for regular follow-up should be valuable.

Key words: hypertension, community-based, iceberg, Eastern Nepal

About a quarter of the world's population have been estimated to have hypertension at the turn of the millennium.¹ It has remained an important public health challenge in the developing and the developed world alike,^{2,3} The burden of chronic conditions such as hypertension has been likened to an iceberg phenomenon in which the cases that we see are only a part of the whole problem. Even within the 'visible' portion, there are different strata of hypertension with or without controlled blood pressure.

Despite the fact that it is the developing world that is and will be facing the epidemic of hypertension and other chronic diseases¹, research on cardiovascular diseases in a developing country such as Nepal has been limited. Furthermore, community-based studies on specific cardiovascular condition such as hypertension have been too few and far apart⁴⁻⁶. These studies were mostly limited to the estimation of prevalence of hypertension. Hence, a study was conducted in the urbanizing town of Dharan in Eastern Nepal with the objective of measuring the prevalence of hypertension and associated risk

factors amongst the adult males as well as to explore the 'iceberg phenomenon' of hypertension in the study population. In addition, the study compares the prevalence of hypertension in the study population with the prevalence studies in other parts of the country and abroad.

Materials and methods

Dharan lies in the Sunsari District of Koshi zone in the Eastern Developmental region of Nepal. It is situated at an altitude ranging from 305 to 610m above the sea level. The total population of Dharan municipality according to the 2001 national census is 116 491. BPKIHS (B.P. Koirala Institute of Health Sciences) is a 700-plus bedded tertiary care hospital in Dharan that caters to the whole of the Eastern Developmental region of Nepal.

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For this population-based cross-sectional analytical study, one thousand males aged 35 years and above were undertaken from the Dharan municipality in 2004-5. Sample size was calculated with a standard formula ($4pq/L^2$) with the value of 'p' taken as 0.1 taking in to account previous studies from Nepal.⁴ Sampling of the subjects was done by random sampling method with application of population proportionate to size technique. The subjects were recruited by simple random sampling of the households in each ward. Using a random table, households in required quantity were selected for each ward. The questionnaires were pre-tested and probed in a group of people different from the area of study (Rangeli). Verbal consent was taken from those willing to participate and counseling and/or referral to BPKIHS was done whenever required.

All the subjects were questioned about demographic profile, socio-economic profile, dietary profile, physical activity⁷, medical history, family history, stress history, tobacco and alcohol taking habits, etc. Standard classification systems were applied for categorization of ethnicity and socio-economic status⁸.

A standard mercury sphygmomanometer with an adequate cuff size was used. Systolic pressure (SBP) was taken by the first heard sound (Korotkoff phase I). Diastolic pressure (DBP) was recorded at the level when the sound just disappeared (Korotkoff phase V). Two readings were taken on the right arm at least five minutes apart. Subjects were resting for at least 5 minutes, and had not smoked for at least 30 minutes before this measurement. The subjects were classified according to the WHO classification⁹; those with blood pressures of normal and pre-hypertensive level were grouped as 'normal' and those in the hypertensive stages 1 and 2 were categorized as 'hypertensive'. Furthermore, 'diagnosed and controlled' meant those who was documented to have high blood pressure and had normal blood pressure at the time of study. Likewise, 'diagnosed and not controlled' denoted those which documented

hypertension and having high blood pressure at the time of study, and, 'undiagnosed and hypertensive' meant those who had no documentation of having hypertension and were having high blood pressure at the time of study.

Collected data were entered in Windows EXCEL. SPSS version 11.5 was used for data analysis. Chi-square test was applied.

Result

The overall prevalence of hypertension in the study population was 22.7%. The comparison between the background and lifestyle variables of the population with normal and high blood pressure at time of study shows significant differences in terms of age, religion, current job status, occupation, socio-economic status, physical activity and tobacco use (Tables 1 and 2). A two-way comparison is done in Fig 1: distribution of the study population according to whether they are hypertensive or normotensive and according to the blood pressure status at the time of study. Fig 2 illustrates the iceberg phenomenon in the hypertensive population.

In the Tables 3 and 4, the background and lifestyle characteristics of the 'diagnosed and controlled', 'diagnosed and not controlled' and 'undiagnosed and hypertensive' are compared. Those with diagnosed and controlled blood pressure tended to be of younger age group, currently employed, into professional and technical or business, of high socio-economic status, past or non-users of tobacco and moderately alcohol drinkers. However, unexpectedly, physical activity deemed to have a negative impact on blood pressure control but a possible explanation is the temporal relation of the development of hypertension and physical activity. Odds ratios of the main variables with their 95% confidence interval for hypertension shown in Table 5, indicate significant associations with age, religion, employment status and occupation, socio-economic status, physical activity and obesity.

Table 1: Background characteristics of the population with and without high blood pressure at the time of the study

| Characteristics | Normal pressure N (%) | Hypertension N (%) | Total N (%) | p-value |
|--------------------------------|--------------------------|-----------------------|----------------|---------|
| Age | | | | |
| 35-49 years | 406(85.5) | 69(14.5) | 475(100.0) | <0.001 |
| 50-64 years | 219(67.4) | 106(32.6) | 325(100.0) | |
| 65 years or more | 148(74.0) | 52(26.0) | 200(100.0) | |
| Religion | | | | |
| Hinduism | 437(81.2) | 101(18.8) | 538(100.0) | 0.001 |
| Kirat | 204(70.8) | 84(29.2) | 288(100.0) | |
| Buddhism | 111(73.0) | 41(27.0) | 152(100.0) | |
| Others | 21(95.5) | 1(4.5) | 22(100.0) | |
| Marital Status | | | | |
| Currently married | 740(77.2) | 218(22.8) | 958(100.0) | 0.82 |
| Unmarried | 11(73.3) | 4(26.7) | 15(100.0) | |
| Separated, divorced or widower | 22(81.5) | 5(18.5) | 27(100.0) | |
| Current Job Status | | | | |
| Unemployed | 38(76.0) | 12(24.0) | 50(100.0) | <0.001 |
| Employed | 528(81.7) | 118(18.3) | 646(100.0) | |
| Retired/unable to work | 207(68.1) | 97(31.9) | 304(100.0) | |
| Occupation | | | | |
| Agriculture | 125(77.2) | 37(22.8) | 162(100.0) | <0.001 |
| Ex-military | 85(64.4) | 47(35.6) | 132(100.0) | |
| Professional | 44(86.3) | 7(13.7) | 51(100.0) | |
| Sales | 223(80.5) | 54(19.5) | 277(100.0) | |
| Administrative work | 56(65.1) | 30(34.9) | 86(100.0) | |
| Skilled labourer | 79(83.2) | 16(16.8) | 95(100.0) | |
| Unskilled labourer | 115(83.3) | 23(16.7) | 138(100.0) | |
| Unemployed | 40(80.0) | 10(20.0) | 50(100.0) | |
| Others | 6(66.7) | 3(33.3) | 9(100.0) | |
| Socio-economic status | | | | |
| Low | 360(80.4) | 88(19.6) | 448(100.0) | 0.03 |
| Middle | 346(73.6) | 124(26.4) | 470(100.0) | |
| High | 67(81.7) | 15(18.3) | 82(100.0) | |

Table 2: Lifestyle characteristics of the population with and without high blood pressure at the time of the study

| | Normal pressure N (%) | Hypertension N (%) | Total N (%) | p-value |
|----------------------------------|--------------------------|-----------------------|----------------|---------|
| Dietary habit | | | | |
| Vegetarian | 82(77.4) | 24(22.6) | 106(100.0) | 0.99 |
| Non-vegetarian | 691(77.3) | 203(22.7) | 894(100.0) | |
| Salt consuming habit | | | | |
| Normal | 581(76.4) | 179(23.6) | 760(100.0) | 0.25 |
| Extra/added | 192(80.0) | 48(20.0) | 240(100.0) | |
| Physical activity | | | | |
| Sedentary | 53(67.9) | 25(32.1) | 78(100.0) | 0.02 |
| Light physical Activity | 275(75.8) | 88(24.2) | 363(100.0) | |
| Moderate physical Activity | 267(76.9) | 80(23.1) | 347(100.0) | |
| Heavy physical Activity | 178(84.0) | 34(16.0) | 212(100.0) | |
| Stress history | | | | |
| Never or very rarely | 143(75.3) | 47(24.7) | 190(100.0) | 0.38 |
| Sometimes (< 5 episodes / month) | 454(77.1) | 135(22.9) | 589(100.0) | |
| Often (> 5 episodes / month) | 139(81.8) | 31(18.2) | 170(100.0) | |
| Always (> 5 times / week) | 37(72.5) | 14(27.5) | 51(100.0) | |
| tobacco use | | | | |
| Current users | 404(79.2) | 106(20.8) | 510(100.0) | 0.01 |
| Past users | 161(70.0) | 69(30.0) | 230(100.0) | |
| Non-users | 208(80.0) | 52(20.0) | 260(100.0) | |
| Alcohol intake | | | | |
| Never | 237(80.6) | 57(19.4) | 294(100.0) | 0.15 |
| Once a month or so | 18(69.2) | 8(30.8) | 26(100.0) | |
| 1-3 times in a month | 71(81.6) | 16(18.4) | 87(100.0) | |
| 1-4 times in a week | 128(79.0) | 34(21.0) | 162(100.0) | |
| 5 times or more in a week | 176(71.8) | 69(28.2) | 245(100.0) | |
| Previously drinking | 143(76.9) | 43(23.1) | 186(100.0) | |

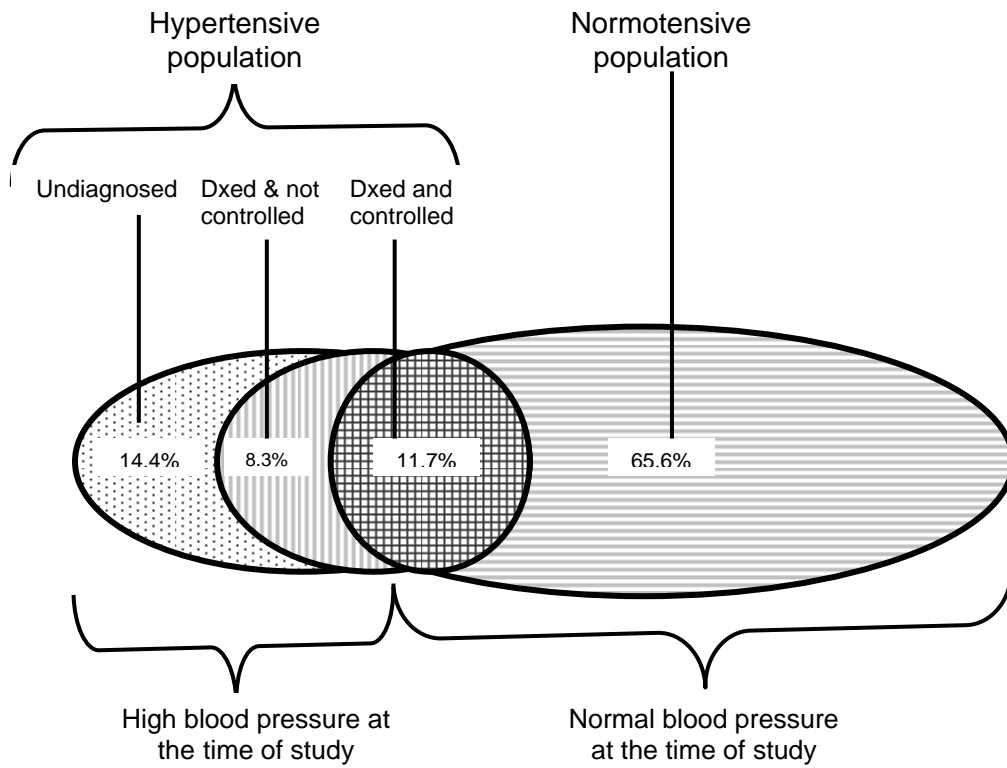


Fig 1: Diagram showing the distribution of the study population according to their diagnosis of hypertension and according to the blood pressure status at the time of study (n=1000)

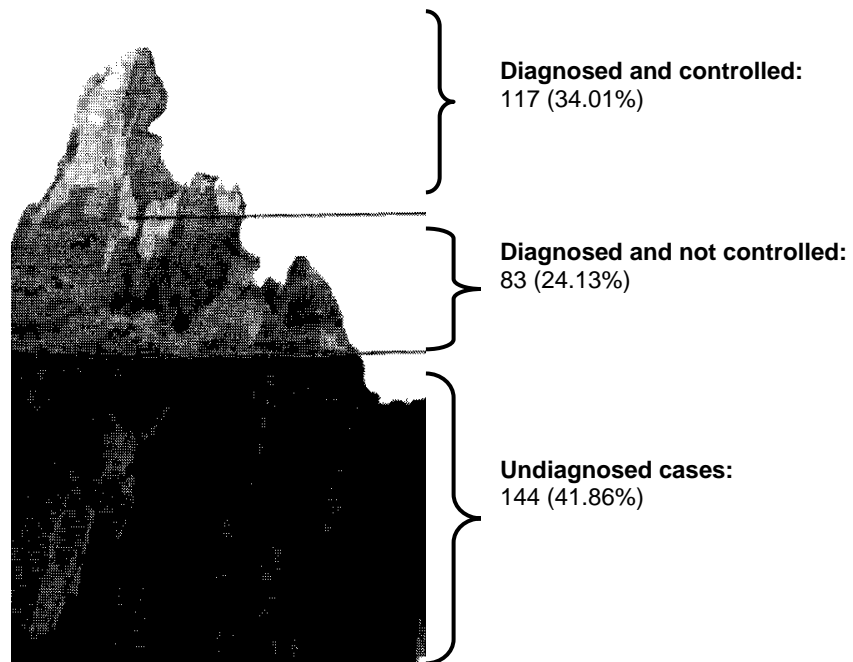


Fig 2: Distribution of the cases of hypertension according to the iceberg phenomenon (N=344)

Table 3: Comparison of the background variables amongst the population with ‘diagnosed and controlled’ hypertension, ‘diagnosed and uncontrolled’ hypertension and those who are ‘undiagnosed and hypertensive’

| | Diagnosed & controlled | Diagnosed & not controlled | Undiagnosed & hypertensive | total | p-value |
|------------------------------|-----------------------------------|---------------------------------------|---------------------------------------|--------------|----------------|
| Age | | | | | |
| 35-49 years | 49 (41.5) | 21(17.8) | 48 (40.7) | 118 (100.0) | 0.05 |
| 50-64 years | 39(26.9) | 45(31.0) | 61(42.1) | 145(100.0) | |
| 65 years or more | 29(35.8) | 17(21.0) | 35(43.2) | 81(100.0) | |
| Religion | | | | | |
| Hinduism | 62(38.0) | 37(22.7) | 64(39.3) | 163(100.0) | 0.18 |
| Kirat | 35(29.4) | 33(27.7) | 51(42.9) | 119(100.0) | |
| Buddhism | 16(28.1) | 13(22.8) | 28(49.1) | 57(100.0) | |
| Others | 4(80.0) | 0(0.0) | 1(20.0) | 5(100.0) | |
| level of education | | | | | |
| Can not read and write | 15(23.8) | 17(27.0) | 31(49.2) | 63(100.0) | 0.80 |
| No formal education | 17(37.8) | 9(20.0) | 19(42.2) | 45(100.0) | |
| Less than primary school | 10(28.6) | 10(28.6) | 15(42.9) | 35(100.0) | |
| Primary school | 5(35.7) | 3(21.4) | 6(42.9) | 14(100.0) | |
| Secondary school | 25(32.9) | 16(21.1) | 35(46.1) | 76(100.0) | |
| SLC or equivalent | 22(38.6) | 15(26.3) | 20(35.1) | 57(100.0) | |
| 10+2 or equivalent | 8(32.0) | 7(28.0) | 10(40.0) | 25(100.0) | |
| Graduate | 13(50.0) | 6(23.1) | 7(26.9) | 26(100.0) | |
| Post-graduate or higher | 2(66.7) | 0(0.0) | 1(33.3) | 3(100.0) | |
| Marital Status | | | | | |
| Currently married | 112(33.9) | 80(24.2) | 138(41.8) | 330(100.0) | 0.88 |
| Unmarried | 1(20.0) | 1(20.0) | 3(60.0) | 5(100.0) | |
| Separated or widower | 4(44.4) | 2(22.2) | 3(33.3) | 9(100.0) | |
| Current job status | | | | | |
| Unemployed | 4(25.0) | 1(6.3) | 11(68.8) | 16(100.0) | 0.09 |
| Employed | 66(35.9) | 40(21.7) | 78(42.4) | 184(100.0) | |
| Retired/unable to work | 47(32.6) | 42(29.2) | 55(38.2) | 144(100.0) | |
| Occupation | | | | | |
| Agriculture | 16(30.2) | 11(20.8) | 26(49.1) | 53(100.0) | 0.04 |
| Ex-military/ Lahures | 28(37.3) | 22(29.3) | 25(33.3) | 75(100.0) | |
| Professional/ technical | 9(56.3) | 2(12.5) | 5(31.3) | 16(100.0) | |
| shopkeeper/business | 38(41.3) | 26(28.3) | 28(30.4) | 92(100.0) | |
| Administrative work | 9(23.1) | 11(28.2) | 19(48.7) | 39(100.0) | |
| Skilled labourer | 9(36.0) | 4(16.0) | 12(48.0) | 25(100.0) | |
| Unskilled labourer | 49(14.8) | 5(18.5) | 18(66.7) | 27(100.0) | |
| Unemployed | 3(23.1) | 1(7.7) | 9(69.2) | 13(100.0) | |
| Others | 1(25.0) | 1(25.0) | 2(50.0) | 4(100.0) | |
| Socio-economic status | | | | | |
| Low | 23(20.7) | 24(21.6) | 64(57.7) | 111(100.0) | <0.001 |
| Middle | 75(37.7) | 53(26.6) | 71(35.7) | 199(100.0) | |
| high | 19(55.9) | 6(17.6) | 9(26.5) | 34(100.0) | |

Table 4: Comparison of the lifestyle variables amongst the population with ‘diagnosed and controlled’ hypertension, ‘diagnosed and uncontrolled’ hypertension and those who are ‘undiagnosed and hypertensive’

| | Diagnosed & controlled | Diagnosed & not controlled | Undiagnosed & hypertensive | total | p-value |
|------------------------------|-----------------------------------|---------------------------------------|---------------------------------------|--------------|----------------|
| Dietary habit | | | | | |
| Vegetarian | 16(40.0) | 11(27.5) | 13(32.5) | 40(100.0) | 0.44 |
| Non-vegetarian | 101(33.2) | 72(23.7) | 131(43.1) | 304(100.0) | |
| Salt consuming habit | | | | | |
| Normal | 99(35.6) | 66(23.7) | 113(40.6) | 278(100.0) | 0.43 |
| Extra | 18(27.3) | 17(25.8) | 31(47.0) | 66(100.0) | |
| Fruit consuming habit | | | | | |
| Never or very rarely | 25(29.8) | 15(17.9) | 44(52.4) | 84(100.0) | <0.001 |
| 1-2 days in a week | 56(30.3) | 44(23.8) | 85(45.9) | 185(100.0) | |
| 3-5 days in a week | 31(54.4) | 16(28.1) | 10(17.5) | 57(100.0) | |
| Every day | 5(27.8) | 8(44.4) | 5(27.8) | 18(100.0) | |
| Physical activity | | | | | |
| Sedentary | 15(37.5) | 9(22.5) | 16(40.0) | 40(100.0) | 0.03 |
| Light | 50(36.2) | 38(27.5) | 50(36.2) | 138(100.0) | |
| Moderate | 43(35.0) | 31(25.2) | 49(39.8) | 123(100.0) | |
| Heavy | 9(20.9) | 5(11.6) | 29(67.4) | 43(100.0) | |
| Stress history | | | | | |
| Never or very rarely | 31(39.7) | 18(23.1) | 29(37.2) | 78(100.0) | 0.58 |
| Sometimes | 62(31.5) | 47(23.9) | 88(44.7) | 197(100.0) | |
| Often | 16(34.0) | 10(21.3) | 21(44.7) | 47(100.0) | |
| Always | 8(36.4) | 8(36.4) | 6(27.3) | 22(100.0) | |
| tobacco use | | | | | |
| Current users | 44(29.3) | 26(17.3) | 80(53.3) | 150(100.0) | 0.002 |
| Past users | 46(40.0) | 36(31.3) | 33(28.7) | 115(100.0) | |
| Non-users | 27(34.2) | 21(26.6) | 31(39.2) | 79(100.0) | |
| Alcohol intake | | | | | |
| Never | 28(32.9) | 24(28.2) | 33(38.8) | 85(100.0) | <0.001 |
| Once a month or so | 2(20.0) | 5(50.0) | 3(30.0) | 10(100.0) | |
| 1-3 times in a month | 12(42.9) | 9(32.1) | 7(25.0) | 28(100.0) | |
| 1-4 times in a week | 15(30.6) | 7(14.3) | 27(55.1) | 49(100.0) | |
| 5 times or more in a week | 25(26.6) | 14(14.9) | 55(58.5) | 94(100.0) | |
| Previously drinking | 35(44.9) | 24(30.8) | 19(24.4) | 78(100.0) | |

Table 5: Odds Ratios with their 95% confidence intervals (95%CI) of the major variables for hypertension in the study population

| | Hypertensive (%) | Odds Ratio | 95%CI OR | p-value |
|---------------------------------------|------------------|------------|-----------|---------|
| Age | | | | |
| >50 years | 30.1 | 2.53 | 1.85-3.48 | <0.001 |
| <50 years | 14.5 | | | |
| Religion | | | | |
| Buddhism | 27.3 | 1.62 | 1.21-2.19 | 0.001 |
| Hinduism | 18.8 | | | |
| Education | | | | |
| Pre-school | 23.7 | 1.1 | 0.82-1.49 | 0.512 |
| Higher | 22.0 | | | |
| Marital status | | | | |
| Married | 22.8 | 1.08 | 0.51-2.29 | 0.841 |
| Single | 21.4 | | | |
| Employment status | | | | |
| Unemployed/retired | 30.8 | 1.99 | 1.47-2.69 | <0.001 |
| Employed | 18.3 | | | |
| Main occupation | | | | |
| Technical/administrative/sales | 25.3 | 1.39 | 1.03-1.88 | 0.033 |
| Agriculture/labour | 19.6 | | | |
| Socio-economic status | | | | |
| Middle/high | 25.2 | 1.38 | 1.02-1.86 | 0.038 |
| Low | 19.6 | | | |
| Dietary habit | | | | |
| Non-vegetarian | 22.7 | 1.00 | 0.62-1.62 | 0.988 |
| Vegetarian | 22.6 | | | |
| Salt consumption | | | | |
| Normal | 23.6 | 1.23 | 0.86-1.76 | 0.252 |
| Extra | 20.0 | | | |
| Fruit consumption | | | | |
| Infrequently | 22.9 | 1.06 | 0.72-1.56 | 0.781 |
| Frequently | 21.9 | | | |
| Physical activity | | | | |
| Sedentary/light | 25.6 | 1.34 | 1.00-1.80 | 0.050 |
| Moderate/heavy | 20.4 | | | |
| Family history of hypertension | | | | |
| Present | 25.8 | 1.19 | 0.53-2.70 | 0.675 |
| Absent/not known | 22.6 | | | |
| Stress | | | | |
| Never /sometimes | 23.4 | 1.19 | 0.83-1.72 | 0.348 |
| Often/Always | 20.4 | | | |
| Tobacco use | | | | |
| Never/Past | 24.7 | 1.25 | 0.93-1.68 | 0.140 |
| Current | 20.8 | | | |
| Alcohol intake | | | | |
| Current | 24.4 | 1.23 | 0.91-1.65 | 0.176 |
| Never/past | 20.8 | | | |
| BMI | | | | |
| Increased | 26.2 | 1.39 | 1.03-1.87 | 0.031 |
| Normal | 20.4 | | | |
| WHR | | | | |
| Increased | 26.5 | 1.47 | 1.09-1.97 | 0.011 |
| Normal | 19.7 | | | |

Table 6: Comparison of the present study with other Population-based Hypertension studies in Nepal and other countries

| First Author/ Country | Year | Place | Urban/rural | Age of subjects (years) | Prevalence |
|---|---------------|---------------|-------------------|-------------------------|--------------|
| Nepal | | | | | |
| This study | 2004-5 | Dharan | Urban | ≥35 | 22.7% |
| Pandey MR ⁴ | 1983 | Bhadrabas | Rural (hills) | > 20 | 5.98% |
| Pandey MR ⁴ | 1983 | Kathmandu | Urban (hills) | > 20 | 9.98% |
| Pandey MR ⁴ | 1983 | Parsauni | Rural (plains) | > 20 | 8.11% |
| Pandey MR ⁴ | 1983 | Jumla | Rural (mountains) | > 20 | 5.30% |
| Pandey MR ⁵ | 1983 | Kathmandu | Urban (hills) | > 20 | 9.90% |
| Rawat BR ¹⁰ | 2001 | Dharan | Urban (plains) | >35 | 40.0% |
| India | | | | | |
| Kutty ⁸ | 1990-1 | Kerala | Rural | >25 | 18.8% |
| Gupta ¹¹ | 1995 | Jaipur | Urban | 20-80 | 10.99% |
| Malhotra ¹² | 1994-5 | North India | Rural | 21-70 | 5.5% |
| Singh ¹³ | 1997 | North India | Urban | 25-64 | 23.8% |
| Gupta ¹⁴ | 1995 | West India | Urban | >20 | 30.7% |
| Gupta ¹⁵ | 1994 | West India | Rural | >20 | 22.0% |
| Other selected countries¹ | | | | | |
| China | 2000-1 | National | | 35-74 | 27.7% |
| USA | 1988-94 | National | | ≥ 18 | 20.3% |
| England | 1998 | National | | ≥ 20 | 29.6% |
| Japan | 1980 | National | | 30-74 | 38.3% |
| Mexico | 1992-3 | National | | 20-69 | 33.5% |
| Egypt | 1991 | National | | 25-95 | 27.4% |
| South Africa | 1998 | National | | 15-65 | 22.0% |
| Zimbabwe | 1995 | Regional | | ≥25 | 33.1% |

Discussion

The prevalence of hypertension in the study population is higher when compared to the findings of other population based studies from Nepal (table 6). The difference in age groups recruited, temporal and spatial variation of the study and diagnostic criterion variability should all be considered before concluding on the variation. The estimates of hypertension in our study are comparable to the findings from other countries (table 5), particularly those from West and Northern India, and United States of America.

The study shows that while a vast majority of the hypertensive population was not aware of their high blood pressure status, and, at the same time, that a large fraction of the population with increased blood pressure did not receive optimal care. Thus the well-known 'rule of halves' still exists. The proportion of the diagnosed cases of hypertension in our study was 20% (200/1000), out of which 58.5% (117/200) had

blood pressure under control which can be considered satisfactory in comparison to a population-based suburban study from Kathmandu, in which the control rate was only 6%.¹⁶ Our study compares well with studies from India¹⁷ and Pakistan¹⁸ in which the proportion of diagnosed hypertensive population was 22% and 30% respectively. An Italian study¹⁹ showing that 78.8% of the patients were aware of their high blood pressure while 19.1% of them had their blood pressure under control goes to prove that not all cases of detection of hypertension leads to adequate control even in a western set-up. In other international studies,²⁰⁻²² the prevalence of unaware hypertensives among total patients of hypertension was 49% and 31% in the National Health and Nutrition Examination Survey I and III respectively.

In our study, the probability of being an undiagnosed hypertensive increased with illiteracy, single marital status, unemployment, jobs that were more physical

and less technical, and low socio-economic status (table3) indicating that poverty and social isolation probably are important underlying factors. These factors have been implicated by few other studies as well.²³⁻²⁷

Conclusion

While the primary prevention strategies shall no doubt be most useful, the secondary prevention by early diagnosis and treatment also must be equally advocated. Having said so, a study of this nature indeed leads to more challenges for our public health system, 'yielding' more cases to deal with. More 'exploration' means more 'new' cases and more 'old but not well managed' cases. Hence, we require a surveillance structure that not only detects the problem but also makes sure that the problem has been kept under control. Such an approach has been advocated by WHO in its STEPS approach²⁸ and its feasibility ascertained by studies from Indonesia.²⁹ Similar surveillance system has been successfully tried in Pakistan as well³⁰. In our context, as a surveillance system at the national level may take a while to get established, a micro-surveillance system may be set up at institutional level or even at the level of a private practitioner. Such a system can actively follow up the detected cases of hypertension, as well as motivate and/or counsel the 'hard-to-treat' cases for regular follow-up.

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