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Research Article

Logistic Regression Analysis on Hypertension and Lifestyle Risk Factors in Rural India

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ABSTRACT

Background: Hypertension is the most important risk factor for chronic disease burden in India. The numbers of peoples affected and the prevalence of hypertension in rural India are expected to increase over the next decade. Aim and Objectives: To determine the prevalence and associated lifestyle risk factors of hypertension in rural India.

Materials & methods: A community based cross sectional study was done among age group 40 years & above in rural area of eastern UP, India. Multistage and probability proportional to size sampling procedure was used. Statistical analysis: Data of 1856 individuals for prevalence of hypertension and associated risk factors were analysed and 2 value for each of the risk factors were calculated. Logistic regression analysis was used to predict hypertensive population associated with different risk factors also Adjusted Odd Ratio and corresponding Forest plot were also discussed in detail for each lifestyle risk factors.

Results: The overall prevalence of hypertension was found to be 29.1%. Obesity and diabetes were strongly associated with hypertension. Compared to age group (40-49) years, others groups (50-59), (60-69), (70& above) were 2.44, 3.67, 5.33 times (AOR=2.44, 3.67, 5.33) more likely to have hypertensive population. Hypertension occurs nearly equal in both male and female (AOR=1.007; 95%CI: 0.77-1.32). In this study smokers, obese and diabetic person are more likely to have hypertension. Smokers have 1.38 times more chance to become hypertensive (AOR=1.380; 95%CI: 1.01-1.88) than non-smokers while in alcoholic and non-alcoholic population have equal chance (AOR=1.009; 95%CI=0.74-1.37) to become hypertensive.

Conclusion: There is need to implement comprehensive lifestyle modification program such as promotion of healthy dietary habits, physical activity, tobacco cessation, avoidance of excessive intake of alcohol and stress, which may play major role in prevention of new hypertensive cases.

Keywords: Cardio vascular diseases (CVD); Lifestyle modification; Lifestyle risk factors; Odds ratio

INTRODUCTION

High blood pressure is the leading cause of CVD and deaths worldwide. It is associated with 7.6 million deaths per year globally, which accounts for 13.6% of all deaths, which makes it leading cause for CVD. Hypertension responsible for substantial public health burden on cardiovascular health status and healthcare systems in India. Hypertension is directly associated with 57% of all deaths due to stroke and 24% of all deaths due to cardiovascular diseases in India. [1] World Health Organization also confirms hypertension as one of the most important causes of premature death worldwide. The Global and Regional Burden of Disease and Risk Factors Study, 2001 in a systematic analysis of population health data for deaths and disease burden, have ranked hypertension in South Asia as second. Hypertension is also going to be an epidemic in future and nearly one third of the world population would suffer from hypertension in year 2020. [3]

Hypertension is the most important risk factor for chronic disease burden in India. Studies from various parts of India have reported high prevalence of hypertension. These studies have also reported that hypertension is increasing and there are low awareness and control. In 90% patients, the cause is idiopathic. Around 50% of the population remain undiagnosed. The overall prevalence of hypertension in India was 29.8%. Significant differences were also observed between rural (27.6%) and urban (33.8%) India. [4] Fourth National Family Health Survey (NFHS-4) evaluated hypertension in a large population-based sample and

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reported hypertension in 13.8% men vs. 8.8% women (overall 11.3%) aged 15–49 and 15–54 respectively. Fourth District Level Household Survey (DLHS-4) also reported hypertension in 25.3% with greater prevalence in men (27.4%) than women (20.0%). This indicates that 207 million persons (men 112 million, women 95 million) with hypertension in India. [5]

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) published in 2003 classified hypertension based on the average of two or more properly measurements in four stages as Normal SBP<120 mmHg or DBP<80 mmHg, Pre hypertensive SBP (120-139) mmHg or DBP (80-89) mmHg, Stage1 hypertension SBP (140-159) mmHg or DBP (90-99) mmHg, Stage 2 hypertension SBP(160-179) mmHg or DBP≥(100-109) mmHg, Stage 3 hypertension SBP≥180mmHg or DBP≥110mmHg, while European Society of Hypertension Guidelines, 2007 and British Hypertension Society (BHS) IV, 2004 use optimal, normal and high normal categories to subdivide pressures below 140 mmHg systolic and 90 mmHg diastolic.[6]

Increase in blood pressure is the highly responsible to the global burden of disease and world-wide mortality. Hypertensive cases and the prevalence of high blood pressure worldwide are expected to increase over the next decade. Therefore, preventive strategies are urgently needed, especially in developing and less developed countries. Also, necessary action should be taken to reduce the different risk factors in the form of trail-based drug therapy. Three-drug combinations can control hypertension in about 90% of patients but only if resources allow identification of patients and drug delivery is affordable. [7] Increased awareness, treatment, and control of high blood pressure are critical for the reduction of mortality and morbidity. It is suggested that community screening programs combined with simplified diagnostic evaluation and intense patient education and follow-up may greatly increase the success rate. Policy related, health system related, as well as individual factors are the determinants and barriers for the poor-quality of hypertension management.

Present study comprehensively covered various behavioural risk factors and socio demographic variables associated with hypertension in eastern region (Varanasi) of Uttar Pradesh to explore magnitude and outcomes of non-communicable diseases so that effective prevention and planning strategies can be framed to prevent both mortality and disability among sufferers.

Aims & Objectives

1. To assess the prevalence of hypertension in rural India.

2. To identify the strength of association between lifestyle risk factors and hypertension.

MATERIALS AND METHODS

A community based cross sectional study was conducted of Varanasi district of Uttar Pradesh, India. According to Census (2011), the total population 40 year and above was approximately 27.4%. In this area about 30% of the population aged 40 year and above is in any of the risk category (mild to severe) of MI and Stroke. Among five major risk factors (age, sex, obesity, diabetes and smoking) of Hypertension, considering minimum prevalence of diabetes 12.7% with 1.5 times design effect and 10% non-response rate the sample size was calculated 2000. Out of eight blocks two blocks were selected randomly as primary sampling unit (PSU) namely Cholapur and Sewapuri. From each selected block three Gram Panchayats were also selected randomly as secondary sampling unit (SSU). Finally, probability proportional to size sampling (PPS) procedure was adopted to select participants from each selected gram panchayat. In which all selected gram panchayats were completely enumerated till the required sample size obtained, following inclusion and exclusion criteria and written consent.

Omron digital arm blood pressure monitor hbp-1100 was used in left arm in sitting position. Three measurements were taken and the mean value of the 2nd and 3rd measurements was used for the analysis. 144 respondents were excluded from study because they deny for fasting blood sugar test thus remaining 1856 participant's data were used in analysis. For an accurate diagnosis of hypertension to be made, it is essential for proper blood pressure measurement technique to be used. Improper measurement of blood pressure is common and can change the blood pressure reading by up to 10 mmHg, which can lead to misdiagnosis and misclassification of hypertension. Correct blood pressure measurement technique involves several steps. Proper blood pressure measurement requires the person whose blood pressure is being measured to sit quietly for at least five minutes which is then followed by application of a properly fitted blood pressure cuff to a bare upper arm. The person should be seated with their back supported, feet flat on the floor, and with their legs uncrossed. The person whose blood pressure is being measured should avoid talking or moving during this process. The arm being measured should be supported on a flat surface at the level of the heart.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) was used for the data entry and analysis. Univariate analysis described the Lifestyle and demographic factors influence on hypertension. Chi-square was used as bivariate analysis to determine the association between two variables. Logistic regression as the multivariate analysis was used to determine a depth relationship between dependent variable hypertension and all selected demographic and lifestyle related variables. Logistic regression is typically used in situation where the response is dichotomous variable that means our dependent variable is binary variable. In all dichotomous dependent situations, the variable y is given a value of 1 for a positive response or 0 for a negative response, and nothing in between. The probability of a positive response is P (y = 1) and is denoted by π for population, estimated by proportion in the sample and denoted by p as usual. Since probability has to be between 0 and 1. If the probability increases with the value of a regressor, the relationship generally takes the form of an S-shaped curve called sigmoid. This shape is natural because of the restriction of (0, 1) on π.

The transformation

removes the (0, 1) restriction since can now be between ∞ for π = 0 and +∞ for π = 1. This is called the logit (logistic integral transformation) of π.

and known as logistic regression equation and Computer programs easily provide the values of b0, b1, b2, ..., bk, which are the

the odds for a positive response which is a useful statistical quantity. Also, in last p value of <0.05 was considered to be significant.

RESULTS

shows the frequency of hypertensive population corresponding to risk factors like Age group, Gender, Marital Status, Smoking, Alcohol intake, physical activity, BMI, diabetic confirmation and dietary practices like Fruits in week, Salt intake are shown in table. The overall prevalence of hypertension was found 29.1% as shown in given table. The normal and prehypertensive were 31.7% and 39.2% respectively. Out of total hypertensive population 66.4%, 23.4%, 10.2% were stage1, stage2, satge3 hypertensive respectively. Age distribution of hypertensive population also showed the increasing trend as age increases. Hypertensive population in age group (40-49), (50-59), (60-69), (70& above) were 15.4%, 30.6%, 38.6% and 44.0% respectively. Study showed strong association of obesity, diabetes with hypertension. 38.5% of obese and 45.6% of diabetic population was also hypertensive. Males were more likely to have hypertension than females, 30.1% and 28.4% respectively mentioned in.

P value based on 2 was also calculated for each of the risk factors as shown in. Age, physical activity, BMI and diabetes were highly significant with hypertension (P value<0.05). Logistic regression analysis is used in which effects of confounders are eliminated and further findings are discussed. Adjusted odds ratio is calculated for each subgroup of different risk factors responsible for the hypertension. Compared to age group (40-49) years, others groups (50-59), (60-69), (70& above) were 2.44, 3.67, 5.33 times (AOR=2.44, 3.67, 5.33) more likely to have hypertensive population. Hypertension occurs nearly equal in both male and female (AOR=1.007; 95%CI: 0.77-1.32). In case of marital status others (single, widowhood, divorced, separated) were1.28 times more likely to have hypertension than married population (AOR=1.279; 95%CI: 0.95-1.72). Smokers have 1.38 times more chance to become hypertensive (AOR=1.380; 95%CI: 1.01-1.88) than non-smokers while in alcoholic and non-alcoholic population have equal chance (AOR=1.009; 95%CI=0.74-1.37) to become hypertensive. In dietary practices peoples who take more than 5gm salt have less chance (AOR=0.86; 95%CI: 0.56-1.12) than who take more than 5gm salt in a day, because of more diabetic confirmed participants in less than 5gm of salt in day than others, also persons who take fruits in a week were equally likely to have hypertension than others (AOR=1.008; 95% CI: 0.87-1.35). Person who do not perform hard physical activity 1.10 times more (AOR; 1.10; 95%CI: 0.85-1.41) likely to have hypertension than others. Obesity is highly significant with hypertension (p value =0.000), obese population are 2.70 times more (AOR=2.70; 95%: 2.10-3.47) likely to have hypertension than normal and underweight persons. Again, diabetic confirmation is also highly significant with hypertension (p value=0.000), persons with diabetic 1.68 times more likely (AOR=1.68; 95%CI: 1.11-2.53) to have hypertension than non-diabetic. For more details of adjusted odds ratio and their confidence interval one may also see and forest plot as shown in .

DISCUSSION

Recent world bank report shows that more than 1.5 billion people (with more than 1.3 billion in India alone) lives in Indian subcontinent region including India, Nepal, Bangladesh, Pakistan, Srilanka, Bhutan and the Maldives. It contributes nearly one fifth of the world's total population. 65% of this population is mainly young and below age 35 years. There are many diversities with wide variations in race, ethnicity, socioeconomic status, religion, language and cultural practices across the region is found. Improving socio-economic status, changing lifestyles, increasing life expectancy and increasing urbanisation results increase in incidence of chronic diseases such as diabetes, hypertension and cardiovascular diseases. The prevalence of hypertension is much higher and currently is around 33% for the whole of south Asia, and specifically around 33% in urban India and 25% in rural India. [8] Present study also shows the same result as prevalence of hypertension in study population is 29.1%. A research study on the "Prevalence of hypertension in rural populations from Ibero-America and the Caribbean" by Díaz et al also revealed that crude hypertension prevalence among rural Ibero-America was 32.6% (95% CI: 31.4-32.5%). Study also showed that most significant risk factors were overweight (39%) and abdominal obesity (39%). [9] The present study also shows that 30.9% of overweight and 38.5% of obese population are also hypertensive. The reasons for this increase are multifactorial. Changing lifestyles leading to a more sedentary behaviour could be a major risk factor for hypertension. .

The Framingham Heart Study and the epidemiology of cardiovascular disease: a historical perspective by Mahmood et al showed most of cardiovascular risk factors are positively associated with hypertension. [10] Our study also shows the same result as behavioural risk factors like smoking, alcohol intake are strongly associated with hypertension. Study also shows that BMI, Hard physical activity are also associated with hypertension. In our present study prevalence of hypertension are 15.4%, 30.6%, 38.6%, 44.0% corresponding to different age group (40-49), (50-59), (60-69) and (70 &above). Thus, here a continuous increase in hypertensive population corresponding to increase in age group. The Framingham study also showed the same result in which systolic blood pressure(SBP) shows a continuous increase between 30 and 84 years or over. Another study on Asian Indian living in urban Singapore and rural India also showed increasing age, overweight/obese and diabetes history had positive association and never drinking alcohol showed a protective association with hypertension after adjusting the potential confounders. [12] NFHS4 was done in a large population-based sample and reported hypertension overall 11.3% also 13.8% in men and 8.8% for women with age group (15–49) years and (15–54) years respectively. Similarly, DLHS4 reported prevalence of hypertension 25.3% with greater prevalence in male 27.4% than female 20.0%. In other words, nearly 207 million persons (male 112 million, female 95 million) were hypertensive in India. [5] Our study also shows same result as prevalence of hypertension is higher in men 30.1% than females 28.4%. .

Sathish et al found that nearly 23.6% of the sample population developed hypertension over a 7 years follow-up, also age ≥35 years (RR=4, 95%CI: 2.37-6.03), current smoking (RR=1.99, 95% CI: 1.14-2.97) and obesity (RR=2.45, 95% CI: 1.45-3.70) were significantly associated with incidence of hypertension. Overall currently smoking, obesity, and increased age contributed 70.1% of the all new cases of hypertension among sample from rural Kerala, India. [16] While in our study age group (60-69) years, (70& above) years are 3.67, 5.33 times more like to have hypertension compare to age group (40-49) years. Also, currently smoking have 1.38 times more risk of hypertension than non-smokers, and obese population are 2.70 times more likely to have hypertension than normal BMI. .

CONCLUSION

Summing up, Population strategies are required to reduce the consequences of high blood pressure and reduce the need for antihypertensive medications. Lifestyle changes are recommended to lower blood pressure, before starting medications. Effective lifestyle modification may lower blood pressure as much as an individual antihypertensive medication. Combination of two or more life style modifications can give even better results. Therefore, preventive strategies are urgently needed, especially in rural population and management of hypertension must be optimised.

RECOMMENDATION

Promotion of healthy dietary habits, physical activity, tobacco cessation, avoid excessive intake of alcohol, avoid stress some are basic life style modification which can play major role in prevention of new hypertensive cases. Majority of the rural population have high risk of cardiovascular diseases. It is important to emphasize the importance of BP measurement to health workers as well as each individual to diagnose hypertension.

LIMITATION OF THE STUDY

Since, study based on totally rural setting of Varanasi, selected individuals were not from urban areas; hence findings prevalence of hypertension and associated risk factors are not equally true for urban population.

RELEVANCE OF THE STUDY

Since this study highlights the current scenario of hypertension especially among rural area in eastern UP, and no such study was carried out for this population before. Hence it is helpful in planning of other interventional studies with follow-up to estimate and reduction in cardiovascular diseases in future and obviously for the benefit of every individual especially in rural India.

AUTHORS CONTRIBUTION

Both authors have contributed equally in this research work.

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