



Risk factors of Hypertension: Logistic regression analysis

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Abstract:

Hypertension affects one billion people and it is estimated that high blood pressure kills nine million people worldwide. Prevalence of high blood pressure in adult aged 25years and above in Nepal is 36% male and 26.2% female. The objective of the study is to find out the risk factors of hypertension by applying logistic regression analysis. A descriptive cross-sectional study was conducted in Medical OPD of College of Medical Sciences, Bharatpur in February 2014 and random sampling technique was used to select hypertensive patients. 94.2% patients were hypertensive by both systolic and diastolic blood pressure. The maximum patients (33.3% in diastolic and 39.1% in systolic) were in stage I hypertension. From logistic regression analysis, the variables age, smoking, alcohol consumption and family history of hypertension were found to be significant at 5 percent level of significance. Lifestyle modification reduces blood pressure

which prevents or delay the incidence of hypertension. Hence hypertension can be controlled and prevented by modifying the lifestyle. The present study found the significant risk factors of hypertension were age, obesity, smoking, consumption of alcohol and family history of hypertension. People should advice to avoid risk factors of hypertension like smoking, consumption of alcohol and physical inactivity by health promotion program.

Keywords: Alcohol, Body mass index, Family history, Logistic regression analysis and Smoking.

Introduction

The health of a person is changed by ageing, rapid urbanization and globalization of unhealthy lifestyles. Non communicable diseases such as cardiovascular disease, cancer, diabetes and chronic lung disease have overtaken infectious disease as leading causes of mortality. One of the main risk factor for cardiovascular disease is hypertension. Hypertension is defined as persistence elevation of systolic blood pressure equal to or above 140 mm of Hg or diastolic blood pressure equal to or above 90 mm of Hg¹. The blood pressure is considered normal if systolic blood pressure of 90 - 119 mm of Hg and diastolic of 60 - 69 mm of Hg, pre-hypertension stage with systolic BP of 120-139mm of Hg and diastolic BP of 80-89 mm of Hg, stage I Hypertension with systolic BP of 140-159 mm of Hg and diastolic BP of 90-99mm of Hg , stage II Hypertension with systolic BP of 160- 179 mm of Hg and diastolic BP of 100-109 mm of Hg and Hypertensive emergency with systolic BP of ≥ 180 mm of Hg and diastolic BP of ≥ 110 mm of Hg^{2&3}

About 95% of the cases are primary hypertension where the blood pressure is high without identified cause and the remaining 5% accounts for the secondary hypertension in which high blood pressure is related to identify cause, which include kidney disease like nephritis, diabetes mellitus, adrenal gland disease, thyroid disease, Cushing's syndrome etc.

Hypertension affects one billion people worldwide, leading to heart attack and strokes. It is estimated that high blood pressure currently kills nine million people worldwide⁴. Hypertension is a global health problem which affects one in three adults worldwide but remains largely hidden.

Hypertension is sometimes called the “silent killer” because people who have it are often symptom free. Worldwide, high blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths. Globally, the prevalence of high blood pressure in adults aged 25 and over was around 40% in 2008. In South East-Asian region 1 out of 3 adults have high blood pressure; it is leading risk factor of death causing 1.5million death each year. Males have slightly higher prevalence than female in most of countries of Southeast-Asian region. Prevalence of high blood pressure in adult aged 25years and above in Nepal is 36% male and 26.2% female⁵. In Nepal 1 in 4 men and women have hypertension. 1 in 10 individual aged between 20 and 30 years has hypertension. With age, risk increase, 5 in 10 people aged 50 and above have heart disease. It shows that hypertension increasingly affecting the working age group of people.⁶

Methodology:

A descriptive cross-sectional study was conducted in Medical OPD of College of Medical Sciences-Teaching Hospital (CMS-TH), Bharatpur, in the month of February 2014. Study populations are the patients aged twenty years and above attending the Medical OPD of CMS-TH who are available at the time of data collection. Random sampling technique was used to select 69 hypertensive patients and same number of non-hypertensive patients to apply logistic regression analysis and find out the risk factors of the hypertension. The pretested and predesigned questionnaire was used to collect information from the patients. Their diastolic and systolic blood pressures were measured in sitting position, height and weight were also measured. Body mass index was computed and classified obesity having BMI more than 25 kg/m². Chi-square test, Odds ratio, Confidence interval were calculated for hypertension for each independent variables and logistic regression analysis was used to find out the significant risk factors of hypertension. The collected data were entered and analyze by using statistical package for social science (SPSS) version 18.0.

Result:

Mean age of hypertensive study patient is 57.29 years with standard deviation of 13.93 years. The majorities (47.8%) of hypertensive patient were belong to the age group 60 years and above

followed by 27.5% and 14.5% in the age groups 50 to 59 years and 40 to 49 years respectively. The mean diastolic and systolic blood pressures were 89.06 mm of Hg and 150.93 mm of Hg with standard deviation of 11.92 mm of Hg and 19.52 mm of Hg respectively.

Table 1: Distribution of hypertensive patients by systolic and diastolic blood pressure

Diastolic BP	Systolic BP				Total
	Pre-hypertension	Stage I Hypertension	Stage II Hypertension	Hypertensive emergency	
Normal	3	0	1	0	4
Pre-hypertension	13	5	3	1	22
Stage I Hypertension	3	11	8	5	27
Stage II Hypertension	0	6	3	1	10
Hypertensive emergency	0	1	2	3	6
Total	19	23	17	10	69
Chi-square = 32.38 P-value = 0.001					

Among the total hypertensive patients 94.2% patients were hypertensive by both systolic and diastolic blood pressure. 5.8% patients were hypertensive only by systolic blood pressure and they have normal diastolic blood pressure. The maximum patients (33.3% in diastolic and 39.1% in systolic) were in stage I hypertension. Other patients (27.5% in diastolic and 31.9% in systolic) were in pre-hypertension followed by 14.5% in diastolic and 24.6 in systolic were in stage II hypertension and 8.7% in diastolic and 14.5% in systolic were in emergency hypertension. (Table 1)

Table 2: Relation of Hypertension with independent variables

Variable	Chi-square	P- value	Odds Ratio	95% Confidence Interval	
				Lower	Upper
Age	23.35	0.000	-	-	-
Sex (Male)	1.862	0.172	1.626	0.807	3.276
Religion (<i>Hindu</i>)	4.379	0.036	0.260	0.068	0.991

Variable	Chi-square	P- value	Odds Ratio	95% Confidence Interval	
				Lower	Upper
Education status	7.910	0.095	-	-	-
Occupation	10.158	0.038	-	-	-
BMI(>25kg/m ³)	4.37	0.027	2.120	1.022	4.411
Smoking	7.094	0.008	2.707	1.287	5.694
Alcohol	8.380	0.004	3.047	1.411	6.579
Exercise	1.575	0.210	1.786	0.716	4.452
Family history of hypertension	6.737	0.009	2.547	1.247	5.200

The univariate analysis was performed to identify the individual association of hypertension with independent variables, with the objective of testing and fitting the best model. Variable, age, religion, occupation, body mass index, smoking, alcohol consumption and family history of hypertension were found to be significant difference with hypertension where as sex, education status and exercise were found to be insignificant .The significance of variables were also shown significant by the 95 percent confidence interval. The odds ratio of all significant variables were greater than one which mean that there was positive association with hypertension except religion Age, education status and occupation whose odds ratio were not calculated. Higher the odds ratio there was more chances developing hypertension. The person will have more chances developing hypertension who drink alcohol, smoke cigarette and have family history of hypertension.(Table 2)

Logistic regression analysis for hypertension was carried out by taking variables age, religion occupation, body mass index, smoking, alcohol consumption, family history of hypertension which were found significant by univariate analysis. From logistic regression analysis, the variables age, smoking, alcohol consumption and family history of hypertension were found to be significant at 5 percent level of significance and religion and occupation were found insignificant. From the analysis of odds ratio of above variables at 95 percent confidence interval found significant difference since the lower and upper limit did not include one. (Table 3)

Table 3: Logistic regression analysis of hypertension with other study variables (by Enter Method)

Variable	B	S.E.	Wald	Df	P value	Odds Ratio	95% C.I. for Odds Ratio	
							Lower	Upper
Age	-0.059	0.015	14.885	1	0.000	0.943	0.915	0.971
Religion	-1.214	0.751	2.615	1	0.106	0.297	0.068	1.294
Occupation	0.163	0.127	1.644	1	0.200	1.177	0.917	1.511
BMI (>25kg/m ²)	0.756	0.213	12.550	1	0.000	2.130	1.402	3.236
Alcohol consumption	0.654	0.249	6.905	1	0.009	1.923	1.181	3.131
Smoke	0.876	0.246	12.684	1	0.000	2.401	1.483	3.889
Family history of hypertension	1.005	0.426	5.574	1	0.018	2.733	1.186	6.297
Constant	0.657	1.510	0.189	1	0.664	1.929	-	-

Discussion:

Hypertension is an important public health challenge because of its high prevalence and increase in risk of cardiovascular and renal disease. Many people are unaware and remain undiagnosed. Even the majority of those who are diagnosed do not get treated and change their lifestyle to control their blood pressure. This increasing prevalence of hypertension is attributed to population growth, aging and behavioral risk factors such as unhealthy diet, unhealthy lifestyle, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress. Correlation coefficient between systolic BP and diastolic BP was 0,785. This result was consistent with the result of Gavish B, et al⁷ where it was 0.74.

A studies conducted in Taiwan shown that hypertension is more prevalent in female compared to male.⁸ In the present study showed that the hypertension is more in female but the difference between male and female was not statistically significant since the p-value is more than .005(0.172).

In many studies it was reported that age is strongly associated with hypertension⁸⁻⁹. In the present study showed the prevalence of hypertension was highly statistically significant difference as the increased in age of the persons since the p-value was 0.000.

Occupation was found insignificant in the study conducted by S Ganesh Kumar in India¹⁰ which was similar to the present study result where religion and occupation of the study population were found insignificant from logistic regression analysis.

This study revealed that the obesity was significantly associated with hypertension since the p-value was less than 0.05. This result was consistent with results of Manandhar K¹¹, Vaidya A¹², Sanjeev Kumar¹³ and Sonmez HM¹⁴. they also found hypertension was significant difference with obesity.

In many studies it was found that smoking was significant risk factor for hypertension. The present study was also revealed that smoking was significant risk factor for hypertension since p-value was 0.008.

Alcohol was found significant risk factor for hypertension in the present study. This result was similar to result of Manandhar K, S Ganesh Kumar and Vaidya A, these studies also found increase in alcohol intake aggravate the hypertension.

In the present study, family history of hypertension was significantly associated with hypertension. This result was supported by the study of Sanjeev Kumar.

A study conducted in China by Zheng¹⁵ found the variables age and smoking were significant factors for hypertension by logistic regression analysis which was consistent with the present study.

Conclusion:

The undiagnosed and uncontrolled blood pressure leads to heart attack, stroke as well as kidney and eye damage. Early death, disability, loss of income and medical care expenditure due to hypertension all have effect on families, communities and national budgets. The loss of family income from death or disability can be devastating spending on health care which often long term or life long in case of complication of hypertension including costly intervention like cardiac

bypass surgery, carotid artery surgery, dialysis etc. draining individual and government budget and pushing millions of people in poverty.

Lifestyle modification has the central role in the health promotion, disease prevention and successful management of hypertension. There is growing evidence of hypertension due to demographic ageing, rapid urbanization and globalization of unhealthy lifestyles. Lifestyle modification reduces blood pressure, prevent or delay the incidence of hypertension, enhance antihypertensive drug efficacy and decrease the risk of cardiovascular disease. Thus hypertension can be controlled and prevented by modifying the lifestyle therefore decreasing mortality, morbidity, disabilities and socioeconomic burden due to hypertension. The present study found the significant risk factors of hypertension were age, obesity, smoking, consumption of alcohol and family history of hypertension. People should advice to avoid risk factors of hypertension like smoking, consumption of alcohol and physical inactivity by health promotion program of motivation to individual and mass strategy.

Acknowledgement:

Authors would like to thank Dr. B.S. Patowary, Professor of Medicine department for giving permission to carry out study in OPD of Medicine Department, College of Medical sciences, Bharatpur.

References:

- [1] The seventh Report of the Joint National Committee(JNCVII). (2006). On Prevention, Detection, Evaluation And Treatment of High Blood Pressure:the JNC 7report. Journal Of Medical Association, 289, 2560-2572.
- [2] Understanding blood pressure readings: American Heart Association. 11 January 2011. Retrieved 30 June 2014.
- [3] Low blood pressure (hypotension) - Causes: MayoClinic.com. Mayo Foundation for Medical Education and Research. 2009-05-23. Retrieved 2014-06-30.

- [4] World Health Organisation (WHO, 2013). WHO,Global Health Observatory. Geneva ,WHO. http://www.who.int/gho/ned/risk_factor/blood_pressure_prevalence/en/ Retrieved on May 15, 2013.
- [5] World Health Organisation (WHO, 2011). Noncommunicable disease in South East Asian region:situation and response,New Delhi. http://www.searo.who.int/entity/world_health_day/en/index.html. Retrieved on May 15, 2011.
- [6] Obesity: Result of sedentary lifestyle: Himalayan Times, Kathmandu, May 27, 2013
- [7] Gavish B, Ben-Dov IZ, and Bursztyn M.: Linear relationship between systolic and diastolic blood pressure monitored over 24 h: assessment and correlates. *Journal of Hypertension*.2008 Feb; 26 (2):199-209.
- [8] Tsai PS, Ke TL, Huang CJ: Prevalence and determinants of prehypertension status in the Taiwanese general population. *Journal of Hypertension*,2005: 23:1355-60.
- [9] Jenel Z, Pall D, Katona E: The epidemiology of hypertension and its associated risk factors in the city of Debrecen, Hungary: *Public Health*, 2002; 116: 138-44.
- [10] S Ganesh Kumar and N Deivanai Sundaram (2014): Prevalence and Risk Factors of Hypertension among Bank Employees in Urban Puducherry, India , *International Journal Occupation Environ Med*; **5**, **2**:94-100. April, 2014
- [11] Manandar, K., Koju, R., Sinha, N., & Humagain, S. (2012). Prevalence and associated risk factors of Hypertension among people aged 50 years and more in Banepa Municipality,Nepal. *Kathmandu University Medical Journal* , 10 (39), 35-38.
- [12] Vaidya, A., Pathak, R., & Pandey, M. (2012). Prevalence Of Hypertension In Nepalese Community Triples In 25 Years:a repeat cross-sectional study in rural Kathmandu. *Indian Heart Journal* , 64 (2), 128-131.
- [13] Sanjeev Kumar (2008): Risk factors of hypertension: A nested case and control study in a rural community, *Journal of College of Medical Sciences-Nepal*,. 5,.1, 59-62
- [14] Sonmez HM, Basak O, Camci C. The epidemiology of elevated blood pressure as an estimate for hypertension in Aydin, Turkey. *J Hum Hypertense* 1999; 13, 399-04
- [15] Zhuoyuan Zheng , Ye Li and Yunpeng Cai: The Logistic Regression Analysis on Risk Factors of Hypertension among Peasants in East China & Its Results Validating , *IJCSI International Journal of Computer Science Issues*, Vol. 10, Issue 2, No 1, March 2013