**PREVALENCE OF HYPERTENSION AND RISKS FACTORS ASSOCIATED WITH IT AMONG 18-70 YEARS AGE GROUP OF RAJBANSHI COMMUNITY OF JHAPA RURAL MUNICIPALITY, JHAPA**



Name: Kalpana Rajbanshi

Adress: Jhapa Rural Municipality-6, Jhapa

Email : kalpu.raj982@gmail.com

Mobile no: 9824025609

Faculty: BSC. Food Nutrition & Dietetics

Roll No- 12/070

**PREVALENCE OF HYPERTENSION AND RISKS FACTORS ASSOCIATED WITH IT AMONG 18-70 YEARS AGE GROUP OF RAJBANSHI COMMUNITY OF JHAPA RURAL MUNICIPALITY, JHAPA**

By

**Kalpana Rajbanshi**

**Department Of Nutrition & Dietetics**

**Central Campus Of Technology**

**Institute Of Science & Technology**

**Tribhuvan University, Nepal**

**2018**

**Prevalence of hypertension and risk factors associated with it among 18-70 years age group of Rajbanshi community of Jhapa Rural Municipality, Jhapa**

***A Dissertation submitted to the department of Nutrition And Dietetics, Central Campus Of Technology, Tribhuvan University in the partial fulfillment of the requirements for the degree in B.S.C Nutrition And Dietetics.***

By

**kalpana Rajbanshi**

**Symbol no. 80087**

**Reg. No. 5-2-8-62-2013**

**Department Of Nutrition & Dietetics**

**Central Campus Of Technology**

**Institute Of Science & Technology**

**Tribhuvan University**

**Dharan, Hattisar, Nepal**

**2018**

**Tribhuvan University**

**Institute of Science & Technology**

**Department of Nutrition & Dietetics**

**Central Campus Of Technology, Dharan**

# Approval Letter

**This *dissertation* entitled *Prevalence of hypertension and risk factors associated with* *it among 18-70 years age group of Rajbanshi Community of Jhapa Rural Municipality, Jhapa* presented by *Kalpana Rajbanshi* has been accepted as the partial fulfillment of the requirements for the Bachelor degree in Nutrition and Dietetics.**

**Dissertation Committee**

1. **Head of Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**(Mr. Dambar Bahadur Khadka)**

1. **External Examiner \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**(Mr. Pramod Koirala)**

1. **Supervisor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**(Mr. Kalyan Rai, Teaching Asst.)**

1. **Internal examiner \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**( Mr. Man Kr. Tamang )**

***Date-June, 2018***

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(Kalpana Rajbanshi)

# Abstract

Background: Hypertension is one of the leading risk factors for CVD and the prevalence of hypertension has been increasing in the South Asian region including Nepal. Hypertension is a prevalent risk factor for cardiovascular and chronic kidney disease as well as premature disability and death.It is important to detect and manage prehypertension and hypertension to reduce the risk of correlated complications especially cardiovascular diseases. However inadequate community based data exist on prevalence of hypertension and its associated-factors.

Objective: To assess the prevalence of hypertension and risk factors associated with it among 18-70 years age group of Rajbanshi community of Jhapa Rural Municipality, Jhapa.

Method: An analytical cross-section study was conducted on a sample of 168 adults (95-females, 73-males) in Rajbanshi community of Jhapa Rural municipality.The information was obtained using pre-tested questionnaire which included socio- demographic information, dietary intake of individuals and other risk factors like alcohol and tobacco use, physical activity etc.  Blood pressure measurements and anthropometric measurements were taken to identify the risk factors, BMI, WHR, WC etc. Stastical Package for the Social Science (SPSS) version 20 and Microsoft Excel 2010 were used for analyzing the data. Chi square test and descriptive analysis were used to identify the prevalence of hypertension and risk factors associated with it.

Results: Overall prevalence of hypertension was found to be 25.6% and gender-wise prevalence was found to be 34.2%(male) and 19%(female). Age (p=0.001), sex (p=0.024), smoking(p=0.008), physical activity(p=0.01), family history(p=0.00), diabetes diagnoised(p=0.003) and consumption of GLV(p=0.023) were found to be significantly associated with prevalence of hypertension in Rajbanshi community of Jhapa Rural municipality, Jhapa.

Conclusion and Recommendaton: The prevalence of hypertension among adults of Rajbanshi community was high. Effective community based approaches should focus for reduction of prevalence of hypertension and its risk factors.

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# List of Abbreviations

|  |  |
| --- | --- |
| Abbreviations | Full form |
| ADA | American Diabetic Association |
| AHA | American Heart Association |
| BMI | Body Mass Index |
| BP | Blood Pressure |
| CBS | Central Bureau of Statistics |
| CKD | Chronic Kidney Diseases |
| DBP | Diastolic Blood Pressure |
| GLV | Green Leafy Vegetables |
| HC | Hip Circumference |
| HTN | Hypertension |
| IPAQ | International Physical Activity Questionnaire |
| JNC | Jet Navigation Chart |
| MSMT | Mrigendra Samjhana Medical Trust |
| NCD | Non communicable Diseases |
| NHRC | Nepal Health Research Council |
| RAAS | Renin Angiotensinogen Aldosterone System |
| RDA | Recommended Daily Allowances |
| SBP | Systolic Blood Pressure |
| SPSS | Statistical Package of Social Sciences |
| UNICEF | United Nations International Children’s Education Fund |
| VDC | Village Development Committee |
| VTM | Vegetarian Times Magazine |
| WC | Waist Circumference |
| WHO | World Health Organization |
| WHR | Waist Hip Ratio |

**Part-I**

# Introduction

## 1.1 Background

Hypertension cases have their historical origins as early as 2600B.C when the ancient Chinese could only suspect hypertension by the quality of one’s pulse. Despite these early origins it took centuries before hypertension was declared a chronic disease([Mueke, 2012](#_ENREF_53)). Hypertension is the global public health issue with 1/4 adults worldwide estimated to have high blood pressure. Overall 26.4% (972 million) of the adult world population was estimated to have hypertension in the year 2000; 333 million in economically developed countries and 639 million in economically developing countries, a figure that is projected to increase to 29.2% (1.56 billion) by the year 2025([Kearney *et al.*, 2005](#_ENREF_37)). High blood pressure is one of the most important causes of premature death worldwide killing nearly 9.4 million people every year globally, and the problem is growing([WHO, 2013c](#_ENREF_94)) . It is a leading cause of cardiovascular disease ([WHO, 2011](#_ENREF_89)) accounting for 45% of deaths due to heart disease and 51% due to stroke globally . Hypertension is also a major cause of disability, causing an estimated 13% of all deaths in the world ([Organization, 2009](#_ENREF_58)). Hypertension affects around 22% of people aged 18 years and over and is responsible for an estimated 9.4 million deaths per year globally. It contributes to at least 45% of deaths due to heart disease and 51% of deaths as a result of stroke ([Lim *et al.*, 2012](#_ENREF_45)).

Worldwide, 7.6 million premature deaths (about 13.5% of the global total) were attributed to high blood pressure. About 54% of stroke and 47% of ischemic heart disease worldwide were attributable to high blood pressure ([Lawes *et al.*, 2008](#_ENREF_42)). Across the WHO regions, the prevalence of raised blood pressure was highest in Africa, where it was 46% for both sexes combined. Both men and women have high rates of raised blood pressure in the Africa region, with prevalence rates over 40%. The lowest prevalence of raised blood pressure was in the WHO Region of the Americas at 35% for both sexes([W.H.O](#_ENREF_82)).

The prevalence of hypertension has risen rapidly in South East Asia. The prevalence of hypertension in adults (15 years or older) was estimated to be 23% in urban and 18% in rural Pakistan([Jafar *et al.*, 2003](#_ENREF_33)). In Sri Lanka, it was estimated to be 17.2% in urban and 16.7% in rural areas among 35 years or above age group ([Mendis and Ekanayake, 1994](#_ENREF_50)). Several studies from India have reported 20 to 40% prevalence in urban and 12-17% prevalence in rural areas ([Singh *et al.*, 1998](#_ENREF_71)).

Studies done in Nepal have reported the prevalence of hypertension ranging from 18.8% to 41.8%([Dhital and Karki, 2013](#_ENREF_17)). The first scientific HTN survey in Nepal was done in 1981 by Mrigendra Samjhana Medical Trust ([Nepal, 1987](#_ENREF_56)). The prevalence of HTN according to 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 ([Pandey MR *et al.*, 1983](#_ENREF_59)). After 25 years, repeat scientific survey was done by Nepal Hypertension Society in collaboration with MSMT in 2007 ([Vaidhya *et al.*, 2012](#_ENREF_79)). A cross-sectional study done in rural Kathmandu areas (Bhadrabas) showed that there were three fold increments in the 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%) ([Vaidhya *et al.*, 2012](#_ENREF_79)). In low-income settings like Nepal, there are few epidemiological studies assessing hypertension burden. Thus, the purpose was to determine prevalence, awareness, treatment, and control of hypertension in Nepal ([Neupane *et al.*, 2017](#_ENREF_57)). 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 ([Vaidya *et al.*, 2007](#_ENREF_80)) . A cross-sectional study on Hypertension in adults of 18 years above in Central Development Region found a prevalence of hypertension 22.4%(males:32.7% and female:15.3%) as per JNC VII criteria([Chataut J *et al.*, 2011](#_ENREF_14)).

## 1.2 Problem statement and justification

Hypertension (HTN) is an important public health problem in both economically developed and developing nations ([Kishore *et al.*, 2016](#_ENREF_39)). Hypertension is a leading risk factor for coronary, cerebral, and renal disease. While the prevalence of hypertension in developed countries has been established, little data are available in developing countries. In developing countries, the economic growth and associated socio-demographic changes have brought a significant change that may be associated with increased prevalence of non-communicable diseases such as hypertension([Esteghamati *et al.*, 2008](#_ENREF_22)). High blood pressure can't usually felt or noticed. In fact, the British Heart Foundation estimates that around seven million people with high blood pressure are undiagnosed ([Foundation.](#_ENREF_25)) .This is because high blood pressure very rarely causes any obvious symptoms. Hypertension is highly prevalent worldwide and the leading preventable cause of cardio vascular disease (CVD). Control of hypertension is very important in preventing incident CVD([Kearney *et al.*, 2005](#_ENREF_37)).The World Health Organization has estimated (2003) that high blood pressure cause one in every 8 deaths worldwide, making hypertension the third leading killer in the world.

Hypertension impairs pumping function of the heart and if untreated damages the heart, brain and kidneys. Stroke occurs more often in patients with high blood pressure([Srilakshmi, 2014](#_ENREF_73)). Uncontrolled blood pressure affects patients mental, physical and social well-being increasing the health care expenditure of the country. Hypertension rarely causes symptoms in the early stages and many people go undiagnosed. Those who are diagnosed may not have access to treatment and may not be able to successfully control their illness over the long term([WHO, 2013b](#_ENREF_93)).

Hypertension is one of the leading risk factors for CVD and the prevalence of hypertension has been increasing in the South Asian region including Nepal. Despite rapid urbanization, about 83% of Nepal’s inhabitants live in rural areas. Few studies have attempted to describe the burden and determinants for hypertension in rural Nepal and such data are limited in the South Asian context. Exploration of such data in rural Nepal will help to understand the etiology of CVD in a population at the cusp of the epidemiologic and nutrition transition, with findings that may be generalizable to other parts of rural South Asia ([Khan *et al.*, 2013](#_ENREF_38)).

Nepal's current health care system is not adequately equipped to deal with the challenges brought on by the increased prevalence of hypertension and CVD. These challenges exist at several levels. Risk factors that contribute to CVD such as unhealthy eating habits, obesity and, physical inactivity have increased, posing a major health problem. Facilities that are capable of assessing and managing risk factors and measuring blood pressure are limited in number and not easily accessible to all communities in Nepal ([Dhital and Karki, 2013](#_ENREF_17)).

The reasons for choosing Rajbanshi community are as follows

1. No any studies has been conducted in this community.
2. They are indigeneous group and are backward in terms of education andother facilities.
3. Being myself Rajbanshi, I want to know the health and nutrition status of my community.

## 1.3 Conceptual Framework of hypertension

Socio-economic status

Food consumption

(24hr recall)

Hypertension Lifestyle diseases

Diabetes

Attitude

Dietary habits & practices(FFQ)

obesity

Knowledge & awareness

Physical activity

([Ndungi, 2012](#_ENREF_55))

**Figure 1.1** Conceptual framework for hypertension

## 1.4 Objectives of the study

### 1.4.1 General objectives

1. To assess the prevalence of hypertension and risk factors associated with it among 18-70 years age group of Rajbanshi community of Jhapa Rural Municipality, Jhapa.

### 1.4.2 Specific Objectives

1. To carryout anthropometric measurements of 18-70 years of Rajbanshi people to assess the nutritional status.
2. To find out blood pressure using sphygmomanometer and stethoscope.
3. To conduct survey to find out socio-economic status, dietary intake, physical activity level, family history, behavioral factors and health factors with the help of semistructured questionnaire.
4. To find out some associated risk factors that contribute to hypertension.

## 1.5 Research Questions

The study has investigated the following research questions:

1. How much prevalence of hypertension is there among Rajbanshi people aged 18-70 years in Jhapa Rural Municipality, Jhapa?
2. What are the factors associated with hypertension among Rajbanshi people of 18 to 70 years of age in Jhapa Rural municipality, Jhapa?

## 1.6 Significance of the study

The findings of my study will have following implications.

1. Important to detect and manage prehypertension and hypertension to reduce the risk of correlated complications especially cardiovascular diseases.
2. Provide relevant knowledge regarding the nutritional status and dietary pattern of particular age group of population of Rajbanshi community.
3. Useful in informing the health sector and the public health planners in the mobilization and allocation of resources for the control and prevention of hypertension.
4. Could form the basis for the formulation of guidelines and messages which could be used for counselling of people of Rajbanshi community .
5. Provides the academic knowledge regarding food, nutrition and health.

## 1.7 Limitations

1. The design of study was cross-sectional; so cause-effect relationship could not be drawn.
2. Salt intake through different packaged foods was not calculated.
3. Non-quantitative food frequency questionnaire was used.

.

**Part-II**

# Literature Review

## 2.1 Hypertension

Every individual has blood pressure which is necessary to move blood through arteries and to provide oxygen to the tissue of the body. Blood pressure is the pressure of circulating blood on the blood vessels. Hypertension is an elevated blood pressure ([Srilakshmi, 2014](#_ENREF_73)). High blood pressure also called hypertension is a serious medical condition. It happens when the force of the blood pumping through arteries is too strong.

Hypertension is a chronic systemic disease characterized by an abnormally high blood pressure. The blood pressure is measured with the peak and lowest pressure in the cardiovascular system corresponds with systolic and diastolic blood pressure respectively. The normal blood pressure is less than 120/80 mmHg. Systolic pressure is the pressure in the arteries i.e. (blood vessels carrying oxygenated blood) when the heart contracts it is always higher than the diastolic. On the other hand when the heart contraction is over and the heart is relaxing the pressure in the arteries then is referred to as diastolic pressure and is always lower than the systolic pressure ([Mueke, 2012](#_ENREF_53)). Hypertension was defined as systolic BP of at least 140 mm Hg and diastolic BP of at least 90 mm Hg, self-reported use of antihypertensive medications, or both ([Egan *et al.*, 2010](#_ENREF_20)).Medical guidelines define hypertension as a blood pressure higher than [130 over 80](http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/KnowYourNumbers/Understanding-Blood-Pressure-Readings_UCM_301764_Article.jsp#.WV4hdtPyvMI) millimeters of mercury (mmHg), according to guidelines issued by the American Heart Association (AHA) in November 2017([Macgill, 2017](#_ENREF_48)). Hypertension was defined as mean systolic BP ≥140 and/or mean diastolic BP ≥90 mmHg.

The hypertension working group of American society of hypertension defines hypertension as a progressive cardiovascular syndrome arising from complex interrelated etiologies. Early markers of the syndrome are often present before blood pressure evaluation is observed. Therefore hypertension cannot be classified solely by discrete blood pressure thresholds. Its progression is strongly associated with functional and structural cardiac and muscular abnormalities that damage the heart, kidneys, brain and other organs and lead to premature morbidity and death ([Giles *et al.*, 2005](#_ENREF_28)).

According to the updated classification of high blood pressure in adults by AHA &ASA is given in Table 2.1.

**Table 2.1** 2017 Updated classification of Blood pressure

|  |  |
| --- | --- |
| **Category** | **SBP and DBP** |
| Normal | SBP <120 mmHg and DBP < 80 mmHg |
| Elevated | SBP 120-129 mmHg and DBP < 80 mmHg |
| Stage 1 hypertension | SBP 130-139 or DBP 80-89mmHg |
| stage 2 hypertension | SBP ≥ 140 mmHg or DBP ≥90 mmHg |

([American Heart Association and Association., 2017](#_ENREF_2))

Isolated Systolic hypertension is defined as an elevated blood pressure of > 130 mm Hg with a normal (<80 mm Hg) diastolic pressure. It is related to atherosclerosis (hardening of the arteries). It is the most common type of hypertension in people older than age 65 ([Sheps, 2018](#_ENREF_69)).

Especially severe cases of hypertension or hypertension crises are defined as a BP of more than 180/120 mmHg and may be further categorized as hypertensive emergencies or urgencies. Hypertension emergencies are by evidence of impending or progressive target organ dysfunction whereas hypertensive urgencies are those situations without progressive target organ dysfunction. These persons need intensification of their antihypertensive drug therapy ([Aronow, 2017](#_ENREF_3)).

## 2.2 Hypertension in context of Nepal

High blood pressure is now growing as a major public health challenge around the globe.  One in every three individuals worldwide is hypertensive ([Organization., 2013](#_ENREF_61)). Previously it was supposed to be the problem of elite, old and western people. Now, astonishingly almost double the numbers of hypertensive people live in developing countries like Nepal than those live in developed countries ([Anonymous, 2013](#_ENREF_3)).Nepal is now passing through an epidemiological transition with non-communicable diseases. Control of blood pressure in Nepalese hypertensive patients were very poor ranging in between 6% to 9.5% ([Shrestha and Dhungel, 2012](#_ENREF_72)). The prevalence of hypertension done in Nepal is shown in Table 2.2.

**Table**.2.2 Prevalence of hypertension in Nepal

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Investigators | Year | Location (urban or rural) | Sample size (*N*) | Age (years) | Prevalence (%) |
| WHO STEPs surveillance | 2003 | Kathmandu (urban) | 2, 030 | 25–64 | 18.8 |
| Vaidya et al. | 2004–2005 | Eastern Nepal (urban and rural) | 1 ,000 (males only) | ≥35 | 34.4 |
| WHO STEPs surveillance | 2004–2005 | Lalitpur, Tanahun and Kathmandu districts (urban and rural) | 3, 254 | 15–64 | 41.8 |
| Sharma et al. | 2005 | Kathmandu (urban) | 1 ,114 | ≥18 | 19.7 |
| Shrestha et al. | 2006 | Urban Nepal | 1, 012 | ≥40 | 22.7 |
| Vaidya et al. | 2006 | Kathmandu (urban) | 1 ,218 | ≥21 | 33.8 |
| WHO STEPs surveillance | 2007 | Rural and urban Nepal | 1, 016 | 15–64 | 31.3 |
| Chataut et al. | 2011 | Central Nepal (urban and rural) | 527 | ≥18 | 22.4 |
| Sharma et al. | 2011 | Eastern Nepal (urban and rural) | 14 ,425 | ≥20 | 33.9 |

([Dhital and Karki, 2013](#_ENREF_17))

According to NDHS 2016, the prevalence of hypertension was 17% (females)and 23%(males) in Nepal ([NDHS, 2016](#_ENREF_54)).

## 2.3 Causes of hypertension

For the majority of patients with high blood pressure, the cause is unknown. This is classified as primary or essential hypertension. A small portion of patients have a specific cause of their high blood pressure, which is classified as secondary hypertension ([Saseen and MacLaughlin](#_ENREF_66)). Over 90% of patients with high blood pressure have primary hypertension. Primary Hypertension can’t be cured but it can be controlled with appropriate therapy (including lifestyle modification and medication). Genetic factor may play important role in the development of primary hypertension. This form of high blood pressure tends to develop gradually over many years. Less than 10% of patients with high blood pressure have secondary hypertension. Secondary hypertension results from the interplay of several patho physiological mechanisms regulating plasma volume, peripheral vascular resistance and cardiac output all of which may be increased ([Ltd, 1995-2017](#_ENREF_47)). The most underlying cause of secondary hypertension is medical condition or medication. Controlling the underlying medical condition or removing the causative medication will result in decrease of result of blood pressure thereby resolving secondary hypertension. The most common cause of secondary hypertension is associated with kidney impairment such as chronic kidney disease (CKD) or renovascular disease. This form of blood pressure tends to appear suddenly and cause higher blood pressure than essential hypertension ([Bell *et al.*, 2015](#_ENREF_8)).

## 2.4 Pathophysiology of hypertension

Multiple factors that control blood pressure contribute to developing primary hypertension. The two primary factors include problem in either hormonal [natriuretic hormone or rennin angiotensin aldosterone system, (RAAS)] mechanisms or disturbances in electrolytes such as (sodium potassium and chloride). Natriuretic hormones causes increase in sodium concentration in cells leading to an increase in blood pressure. The RAAS regulates sodium, potassium and blood volume which will ultimately regulate blood pressure in the arteries (blood vessels that carries blood away from heart). Two hormones involved in the RAAS system include angiotensin II and aldosterone. Angiotensin II cause narrowing of the blood vessels, increases release of chemicals that elevate blood pressure, and increase aldosterone production. The constriction of blood vessels increases blood pressure(less space same amount of blood), which also places pressure on the heart. Aldosterone causes sodium and water to stay in the blood, which will increase pressure on the heart and elevate blood pressure ([Bell *et al.*, 2015](#_ENREF_8)).

## 2.5 Risk Factors associated with hypertension

There are several risk factors for developing high blood pressure. Family history of high blood pressure, advancing age and gender are some predetermined unalterable predisposing factors for high blood pressure. If parents have high blood pressure, their offspring are also genetically susceptible to it. Similarly, men are at more risk for suffering from high blood pressure until 45 years of age. However, the main concerning culprits for developing high blood pressure are some modifiable risk factors like lack of physical activity, overweight, poor diet with excessive salt intake, harmful use of alcohol, tobacco consumption and stressful life ([Dhungana, 2017](#_ENREF_18)). This may due to the increasing pace of urbanization and industrialization. Besides lack of knowledge of the people on their food habit has also led to the rise of the disease ([WHO, 2013b](#_ENREF_93)).

### 2.5.1 Age

Age is unavoidable, it increases with the time. Ageing is a normal biological process which begins at conception and ends only with death. The process of ageing brings about physiological, psychological and immunological changes which influences the nutritional status([Srilakshmi, 2014](#_ENREF_73)). In men and women, the incidence of hypertension increased with increasing age ([Thawornchaisit *et al.*, 2013](#_ENREF_77)). Ageing is not only a risk factor to develop hypertension but also a risk factor to cause many diseases ([Kaori, 2004](#_ENREF_36)). The prevalence of hypertension increases with age consistently in all regions of the world ([Ezzati *et al.*, 2002](#_ENREF_23)). The risk associated with elevated blood pressures (BP) may be affected by age.The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) uses systolic BP and diastolic BP to categorize normal, prehypertension, and hypertension in all adults older than age 18 years ([Bowman *et al.*, 2006 ,](#_ENREF_10)).

### 2.5.2 Gender

There is a little evidence of a difference in blood pressure between the genders. However men tend to show a higher average level at the beginning of adolescent. Later in the life the difference narrows and the pattern may even be reversed ([Kaori, 2004](#_ENREF_36)).  Men are at more risk for suffering from high blood pressure until 45 years of age ([Dhungana, 2017](#_ENREF_18)). Using data from a Health and Demographic Surveillance site of West Bengal, India, the study on “Sex differences in the risk profile of hypertension” assesses the sex differences in hypertension. While past studies on sex differences in the prevalence of hypertension in India have been inconclusive, this study reveals a higher likelihood of hypertension among men compared to women ([S. Ghosh *et al.*, 2016](#_ENREF_27)). Studies are in progress to evaluate whether estrogen supplementation protects against the late relative rise of blood pressure in women ([WHO, 1996](#_ENREF_85)).

### 2.5.3 Education

Education is more strongly associated with CVD risk factors than material status in the elderly([Stelmach *et al.*, 2004](#_ENREF_75)). Education background is a predictor to judge socio-economic status as well as occupation. Higher education level is generally regarded as higher socio-economic status. Several studies show that the prevalence of hypertension is higher as the level of education increases. This may be due to the sedentary life style and increase in table works ([Kaori, 2004](#_ENREF_36)).

### 2.5.4 Income

Studies have shown that in developed countries lower socio-economic status was associated with higher level of blood pressure and the association was stronger and consistent in women than in men ([Sabri *et al.*, 2005](#_ENREF_64)) while in developing or developed countries higher prevalence of blood pressure was noted in upper socio-economic group ([Kaori, 2004](#_ENREF_36)).

### 2.5.5 Anthropometric Indices

Along with the prevalence of obesity, high blood pressure is a common health issue in both women and men worldwide and has become a major disease in Korea. Obesity is related to serious health problems such as hypertension, ischemic stroke, cardiovascular disease, type 2 diabetes, metabolic syndrome, sleep apnea and dyslipidemia. Anthropometry is an easy, economical, effective, and reliable method that is useful as an initial screening tool for hypertension. Various anthropometric indices that describe obesity and body fat distribution have been developed; these include the body mass index (BMI), waist circumference ([Mozaffarian *et al.*, 2011](#_ENREF_52)) and the waist-to-hip ratio (WHR) ([B. J. Lee and Kim, 2014](#_ENREF_43)). Waist circumference above or equal to 80 cm and 90 cm for females and males respectively is known as abdominal obesity ([Brussels, 2006](#_ENREF_12)). Abdominal obesity is defined as WHR greater than 0.9 for male and WHR greater than 0.85 for female. The hip circumference is measured at a level parallel to the floor, at the largest circumference of the buttocks ([WHO, 2008](#_ENREF_88)).

Obesity is one of the most significant risk factors for hypertension. However, there is controversy regarding which measure is the best predictor of hypertension risk. Body mass index (BMI), waist circumference ([Mozaffarian *et al.*](#_ENREF_52)) and waist-to-hip ratio (WHR) in subjects were compared as predictive indicators for development of hypertension ([J. W. Lee *et al.*, 2015](#_ENREF_44)).

**Table 2.3** Classification of obesity according to ‘Asian Criteria’ value of BMI

|  |  |
| --- | --- |
| **Class** | **“Asian criteria” BMI cut- off** |
| Underweight | <18.5 |
| Normal | 18.5-23 |
| Overweight | 23-27.5 |
| Obese | ≥27.5 |

Source:([WHO, 2004](#_ENREF_87))

### 2.5.6 Dietary Habit

The vegan or total vegetarian diet includes only food from plants like fruits, vegetables, legumes (dried beans and peas), grains, seeds and nuts while non-vegetarian diet include meat and meat products. There are different types of vegetarian such as:

* Lacto-ovo-vegetarians: Eating both dairy products and eggs. This is the most common type of vegetarian diet.
* Lacto-vegetarians: Eating dairy products but avoid eggs.
* Ovo-vegetarian: Eating eggs but not dairy products.
* Vegans do not eat dairy products, eggs, or any other products which are derived from animals ([Society](#_ENREF_72)).

Most vegetarian diets are low or devoid of animal products. They are also lower in total fats, saturated fats cholesterol and high in fibers and other minerals, phyto-chemicals ([Association, 2015](#_ENREF_5)). India is the only country in the world with highest number of vegetarian people i.e. 20%-40% of its total population ([VTM, 2008](#_ENREF_81)). Though the actual population of vegetarian is not known in Nepal there are some ethnic groups, religions etc that avoid non-vegetarian diets.

Studies have suggested an association between vegetarian diet and lower blood pressure but the relationship is not well established. More likely, the change in blood pressure is due to the lower blood viscosity that follows a reduction in dietary fat. The results confirm findings by Sacks et al. (1974) of lower blood pressure in vegetarians. The analysis of vegetarian sub-groups showed that strict avoidance of animal products was indeed associated with lower blood pressure and lower cholesterol levels as well as with higher blood fluidity ([Ernst *et al.*, 1986](#_ENREF_21)).Those who followed vegetarian diets also had lower blood pressure on average than people who ate different diets. Plant-based diets often contain more fiber and less fat and therefore fewer calories, which may explain why vegetarians are generally slimmer than meat-eaters. A healthy weight helps to keep blood pressure in check. Also, fruits and vegetables are low in sodium but rich in potassium, characteristics that help lower blood pressure ([Harvard Health Publishing, 2014](#_ENREF_30)).

A meta-analysis conducted in 2010 showed that consumption of vegetarian diet is associated with lower blood pressure. It also suggests that such diet could be a useful non-pharmacologic means of reducing blood pressure ([Yokoyama *et al.*, 2014](#_ENREF_97)). The Dietary Approaches to Stop Hypertension ([Prasad *et al.*](#_ENREF_60)) study showed that a diet rich in vegetables and fruits reduced systolic BP by 5.5 mmHg (*P*<0.001) and diastolic BP by 3 mmHg (*P*<0.001).The DASH study was partly based on the observation that vegetarian diets are associated with a significantly reduced risk of hypertension ([Yokoyama *et al.*, 2016](#_ENREF_98)).

### 2.5.7 Physical activity

Regular physical activities can reduce the risk of high blood pressure Being physically active is one of the most important things to prevent or control high blood pressure. It doesn’t take a lot of effort to become physically active. All we need is 30 minutes of moderate-level physical activity on most days of the week. Examples of such activities are brisk walking, bicycling, raking leaves, and gardening ([SERVICES *et al.*, 2003](#_ENREF_68)). Just brisk walking or jogging for half an hour on five days of week can be helpful for preventing it. Such physical activities will also be beneficial for lowering down the systolic blood pressure by 4 to 9 mm of Hg in hypertensive people. Moreover, cycling, hiking, swimming and aerobics are also equally supportive for burning out the calories and getting rid of obesity, a precursor to high blood pressure and diabetes like chronic disorders. However, sedentary lifestyle, lack of interest in outdoor activities, use of passive mode of transportation and increased urbanization have played a substantial role for reducing the physical activity level in people. More than 14 percent of Nepalese are now living the insufficiently physically active life. In last three decades, Nepalese mean body mass index is also gradually shifting upward with proportional increment in non-communicable diseases ([Chataut J *et al.*, 2011](#_ENREF_14)).

In a prospective study of type 2 diabetics who attended a diabetes center in a Saudi Arabia, it was found that those who regularly exercise had a 62% lower risk of developing hypertension compared to individuals who did not exercise ([Salman and Al-Rubeaan, 2009](#_ENREF_65)).

### 2.5.8 Marital Status

Marriage or having a partner increased the risk of hypertension in women([Thawornchaisit *et al.*, 2013](#_ENREF_77)). Marital status in men had no influence on hypertension, which supports the results from more economically developed countries, the USA and Korea([Jo *et al.*, 2001](#_ENREF_34)).However, in middle-income countries, the results diverged: married men, when compared with their unmarried counterparts, had a higher risk of hypertension in Barbados and a lower risk in Poland ([Lipowicz and Lopuszanska, 2005](#_ENREF_46)) . Very few studies considered the effects of marital relationship on cardiovascular risk and disease ([Wang, 2005](#_ENREF_83)). Most of those studies have examined the effect of marital status on mortality, health status, or psychological well-being but only few studies have investigated the relationship between marital transition and cardiovascular health i.e. hypertension ([Wang, 2005](#_ENREF_83)).

### 2.5.9 Alcohol consumption

Epidemiologic evidence suggests that heavy alcohol consumption is strongly associated with increased risk of hypertension.However, the effects of light to moderate alcohol intake on blood pressure (BP) remain unclear and controversial. Some previous studies have reported a linear association between alcohol intake and BP among men,while others have reported a threshold only above which there is an association in both men and women([Briasoulis *et al.*, 2012](#_ENREF_11)). Heavy and regular drinking of alcohol not only increases the blood pressure, also contributes for high triglycerides, obesity and other cardiovascular diseases. Available evidence suggests the limitation of alcohol consumption will substantially reduce blood pressure. Nonetheless, high numbers of Nepalese are indulgent to alcohol ([Dhungana, 2017](#_ENREF_18)).

### 2.5.10 Tobacco Consumption (Chewing and Smoking)

Tobacco consumption continuous to be a major health hazard and it contributes significantly to cardiovascular morbidity and mortality. According to the Journal of the American College of Cardiology the exact toxic component of cigarette smoke and the mechanism involved in the cigarette smoking cardiovascular dysfunction is largely unknown ([Primatesta *et al.*, 2001](#_ENREF_61))Smoking causes an immediate spike in blood pressure and can raise systolic blood pressure levels by as much as 4 mmHg. The nicotine in tobacco products spur the nervous system to release chemicals that can constrict blood vessels and contribute to high blood pressure ([Rodriguez, 2009](#_ENREF_63)). Although smoking increases the risk of vascular complications in people who already have hypertension, it is not associated with the increase in the development of hypertension ([Ambrose and Barua, 2004](#_ENREF_1)). According to a report published by American Heart Association in 2010 no any significant association between smokeless tobacco and hypertension but showed higher risk of other heart diseases. In a meta-analysis done by Westman EC showed weak association with chronic hypertension ([Westman, 1995](#_ENREF_84)).

### 2.5.11 Salt consumption

High salt consumption was associated with increased risk of developing hypertension in a longitudinal study in Taiwanand in cross-sectional studies in China while other reports revealed that salt restriction reduced blood pressure ([Chien *et al.*, 2008](#_ENREF_16)). Owing to the overwhelming capacity of the kidney to excrete excessive salt consumption, high plasma sodium leads to excessive intravascular volume and high blood pressure ([Thawornchaisit *et al.*, 2013](#_ENREF_77)). Average salt intake is between 9 grams (g) and 12 g per day in most countries around the world.The WHO recommends reducing intake to under 5 g a day, to help decrease the risk of hypertension and related health problems.This can benefit people both with and without hypertension, but those with high blood pressure will benefit the most ([Macgill, 2017](#_ENREF_48)).

### 2.5.12 Potassium

Potassium is a key mineral that the body relies on heavily to function properly. It helps to lower blood pressure by balancing out the negative effects of salt ([UK, 2008](#_ENREF_78)). Potassium is the principal positively charged ion inside the cell membrane. Potassium concentrations are about 30 times higher inside than outside the cells. A diet that includes natural sources of potassium is important in controlling blood pressure because potassium lessens the effect of sodium. The level of potassium intake can affect the blood pressure.  Potassium concentration is higher in fruits and vegetables than in cereals and meat. Salting foods and discarding the liquid induces sodium (Na+) for potassium (K+) exchange and reduces the potassium content of foods. Blood pressure is currently the primary criterion for determining potassium requirements, with blacks being more vulnerable to hypertension and more responsive to potassium supplementation than whites, hypertensive individuals more responsive to increasing potassium intakes than normotensive individuals, and potassium having a greater benefit for those consuming a high salt diet ([Stone *et al.*, 2016](#_ENREF_76)).

### 2.5.13 Stress

Human body produces a surge of hormones when in a stressful situation. These hormones temporarily increase blood pressure by causing heart to beat faster and blood vessels to narrow. There's no proof that stress by itself causes long-term high blood pressure. It may be that other behaviors linked to stress such as overeating, drinking alcohol and poor sleeping habits cause high blood pressure. However, short-term stress-related spikes in blood pressure added up over time may put at risk of developing long-term high blood pressure. Exercising three to five times a week for 30 minutes can reduce your stress level

([staff, 2015](#_ENREF_74)).

Stress can cause hypertension through repetition of blood pressure elevation as well as it stimulates the nervous system to produce large amount of vasoconstriction hormones that increases the blood pressure. Emotional stress, job strain, social environment may be the factors associated with the blood pressure. Furthermore when one risk factor is associated with other stress producing factor, the effect on blood pressure is multiplied. Overall studies shows that stress does not directly causes hypertension (stressful situations can raise blood pressure temporarily) but it can have effect on the development of hypertension ([Kulkarni *et al.*, 1998](#_ENREF_40)). Avoiding stress, or developing strategies for managing unavoidable stress, can help with blood pressure control([Macgill, 2017](#_ENREF_48)).

### 2.5.14 Diabetes

High blood pressure, or hypertension, is a condition that’s often present in people with type 2 diabetes. It’s unknown why there’s such a significant correlation between the two diseases. It’s believed that obesity, a diet high in fat and sodium, and inactivity contribute to both conditions. A 2013 survey by the American Diabetes Association (ADA) found that fewer than half of people at risk for [heart disease](https://www.healthline.com/health/heart-disease) or [type 2 diabetes](https://www.healthline.com/health/type-2-diabetes) reported discussing biomarkers, including blood pressure, with their care providers ([Jovinelly, 2017](#_ENREF_35)). An estimated 3 million Americans have both diabetes and hypertension. The prevalence of coexisting hypertension and diabetes appears to be increasing in industrialized nations because populations are aging and both hypertension and NIDDM incidence increases with age ([Re, 1994](#_ENREF_62)).

Patients with both diabetes mellitus and hypertension are vulnerable to cardiovascular and renal complications ([Kaori, 2004](#_ENREF_36)). In the US population, hypertension occur in the approximately 30% of the patients with type 1 diabetes and 50-80% of the patients with type 2 diabetes mellitus([Landsberg and Molitch, 2004](#_ENREF_41)). A prospective cohort study in US reported that type 2 diabetes mellitus was almost 2.5 times likely to develop in subjects with hypertension as compared to subjects with normal blood pressure ([Gress *et al.*, 2000](#_ENREF_29)). Hypertension is common among patients with diabetes ([Boer *et al.*, 2017](#_ENREF_9)). When hypertension and diabetes co-exist, the effects of one disease tend to make the other worse. This makes for a deadly combination. Uncontrolled diabetes is not the only risk factor for hypertension. The chances of having a heart attack or stroke are further multiplied if other risk factors exist, in addition to diabetes ([Barhum, 2017](#_ENREF_7)).

**Part-III**

# Material and Methods

## 3.1 Research Design

A community based cross-sectional survey was conducted from 29th October to 5th of November, 2017 in Jhapa Rural Municipality to assess prevalence of hypertension and risk factors associated with it in 18-70 years age group of Rajbanshi community of Jhapa Rural Municipality, Jhapa using semi- structured questionnaire on formal interview basis. Measurement of Blood Pressure, height, weight, waist circumference and hip circumference were taken.

## 3.2 Study Site

This study was conducted in Jhapa Rural Municipality of Jhapa district. It comprises of 3 VDCs i.e. Sharnamati, Kumorkhodh and Tanghandubba. According to National Population and Housing census 2011, Sharnamati VDC constituted of 115 households with 580 total populations, Kumorkhodh constituted of 322 households with 1709 total populations and Tanghandubba constituted of 151 households with 731 total populations. Thus newly formed Jhapa Rural Municipality altogether comprises of 588 households with 3374 total populations.

## 3.3 Materials

The materials required for the survey are as follows:

* Blood pressure measuring devices: Stethoscope and Sphygmomanometer were used for blood pressure measurement.
* Weighing machine: A weighing scale with capacity of 100 kg were used.
* Stadiometer: A stadiometer with capacity of measuring 6 ft was used.
* Measuring tape :A non stretchable measuring tape was used to measure waist and hip circumference.
* Measuring utensils: Standardised utensils were used for taking 24 hour dietary recall.
* Questionnaire:A well designed, semi structured and pretested set of questionnaire was used to collect information on socio-demographic and economic data such as age, sex, ethnicity, marital status, education, income, education, caste, religion.

## Research variables

### 3.4.1 Dependent Variables

#### 3.4.1.1 Blood pressure

According to updted 2017 ACC/AHA guidelines of hypertension, blood pressure measurements less than 120/80 mmHg were considered normal,120-129/80 mmHg were considered elevated level, 130-139/80-89 mmHg were considerd as Stage 1 Hypertension and greater than 140/90 mmHg were considered as stage 2 Hypertension.

**3.4.2 Independent variables**

The independent variables under this study were defined as :

#### 3.4.2.1 Body mass index

People with a BMI of 18.5-22.9 were classified as normal , with BMI of 23.0 to 27.5 kg/m² were classified as overweight; while those with a BMI greater or equal to 27.5 kg/m² were classified as obese based on WHO standards of classification for Asians([WHO, 2004](#_ENREF_87)).

#### 3.4.2.2 Waist circumference in cm

Men and women with waist circumference above 90 cm and 80 cm respectively were identified as being abdominally obese ([IDF, 2006](#_ENREF_31)).

#### Waist to Hip ratio

Men and women with waist to hip ratio greater than 0.90 and 0.85 were considered as abdominally obese respectively ([WHO, 2011](#_ENREF_89)).

#### 3.4.2.4 Socio-economic and demographic variables

Age, caste, religion, marital status, income, occupation, education, parity, family size

## 3.5 Target Population

The target populations of this study were the people aged 18-70 years of Rajbanshi community of Jhapa Rural Municipality, Jhapa.

### 3.5.1 Inclusion criteria

* People aged 18-70 years from Rajbanshi community of Jhapa Rural Municipality.

### 3.5.2 Exclusion Criteria

* people who were below 18 and above 70 years of age.
* Women who were pregnant and people having serious illness.
* People who were not available at house at the time of survey.
* Participants who did not consent to participate in the study.
* People who were not from the Jhapa Rural Municipality.

## 3.6 Sampling Technique

Sample size of the study was calculated by using formula from creative research system. There are altogether seven wards in Jhapa Rural Municipality. All seven wards were chosen for sample selection and equal numbers of samples were taken from each ward using simple random sampling. The total sample size was 168.

## 3.7 Sample size

The sample size was determined using Sample size formula from creative research system, *N=Z2P(1-P)/d2,* by assuming 23% of prevalence of hypertension in Jhapa Rural Municipality of Jhapa district, 95% confidence interval, 7% desired precision, some people may refuse or are unavailable so 10% non-response rate was added to the total sample size and again for precision further 20 samples were added. A Z-value 1.96 is used at 95% CI and d of 7%. (N= sample size, P= prevalence, d= margin of error).

N = Z2 P (1-P)/d2

= (1.96)2\*0.23\*0.77/ (0.07)2

= 3.8416\*0.1771/ (0.0049)

=138.8

= 139 (minimum sample size)

From the office of sharnamati VDC, Kumorkhodh VDC and Tangandubba VDC, we found that the total number of Rajbanshi population was 3374.Thus we applied finite population sample formula to obtain new sample size to conduct survey in this particular village.

Therefore,

New SS = n0 / [1+ {(n0-1) / POP}]

Where,

New SS = New sample size for finite population

n0 = Sample size in infinite population

POP = Total number of population

New sample size obtain as

= n0 / [1+ {(n0-1) / POP}]

= 139/ [1+ {(139-1) / 3374}]

= 133.65

i.e., 134

Thus calculated sample size was adjusted for non-response. Considering non-response rate as 10%, the adjusted sample size was calculated to be 148. Extra 20 participants were added to increase the precision. Thus the total number of sample size was 168.

## 3.8 Pretesting

Pretesting was done in 10 people for the feasibility and practicability of the tool. The questionnaire was prepared in English and reviewed by supervisor and co-guide of this study. The prepared sets of questionnaire, anthropometric instruments and BP apparatus were pre-tested among few people who were from study site. Pre-testing of the questionnaire was performed to gather information about understanding ability, time required for each person, acceptability and to check the interpretation of the variables. After pre- testing all the ambiguous, misleading and wrongly interpreted questions were omitted and questionnaires were revised in accordance with the findings of pre-testing.

## 3.9 Validity and reliability

To ascertain the degree to which the data collection instruments will measure what they purposed to measure, the instruments were validated by comparing with standard known measurements. Reliability refers to quality control measure of data collected. Validity of instrument was ascertained by comparing the data provided by our weighing balance with standard weights. Likewise validity of stadiometer was ascertained by comparing the measurement from our stadiometre and UNICEF stadiometre. Measuring tape was calibrated against standard stadiometre. Validity of sphygmomanometer was ascertained by comparing readings with the readings calculated from standard mercury sphygmomanometer. For 24 hours recall, different foods were standardized in utensils for data collection. The instruments were checked and reset daily to validate the data. The questionnaire was validated by reviewing different literature designed to assess the dietary habit, physical activity and other behavioral factors of adults of Rajbansi community.The questionnaire was also pre-tested prior to data collection to ascertain content and face validity. Questionnaire was checked for completeness, consistency and clarity. Validity and reliability of the study was ensured by pre-testing of the tools, using standardized instruments. The test re-test method was used to test consistency in producing the same results.

## 3.10 Data collection techniques

Data were collected in three phases viz, initial direct contact with participants and filling structured questionnaires, secondly blood pressure measurement and at last anthropometric measurements of participants.

### 3.10.1 Data collection for dependent variable

#### 3.10.1.1 Blood pressure measurement

The Bravo Aneroid sphygmomanometer (regularly inspected and validated) was used. Two separate measurements were obtained on the left arm of the seated subject using a cuff of an appropriate size and the average BP reading was recorded. Systolic Blood Pressure is the point at which the first of two or more korotkoff sounds is heard (onset of phase 1) and the disappearance of korotkoff sound (onset of phase 5) is used to define Diastolic Blood Pressure. The average of the readings of SBP and DBP was taken as the blood pressure of the participant. Both the blood pressure measurements were obtained after the subject had rested for at least five minutes in a seated position. It was made sure that the subjects had not consumed any hot beverages, such as tea or coffee or smoked/chewed tobacco or undertaken vigorous physical activity within the 30 min preceding the interview. If they had, then the measurements postponed by 30 min.

### 3.10.2 Data collection for independent variables-

#### 3.10.2.1 Anthropometric measurement

Anthropometric measurements were taken by measuring height with standiometre, weight with digital weighing balance and waist circumference and hip circumference by non-stretching tape.

1. Weight: Weight was measured to the nearest 100 grams (0.1kg) using a weighing scale, after calibrating it to zero, and after removal of shoes and excess clothing. Both weight and height were taken twice. In order to ensure quality data, the weighing scale was calibrated before measuring of weight every day and after every five measurements during the data collection time ([CDC, 2007](#_ENREF_13)).
2. Height: Height was measured using stadiometre to the nearest 0.1cm. The subject was told to stand (without shoes) on a horizontal platform with his heels together and with the Frankfurter plain horizontal. The subject draws himself to full height without raising the shoulders with arms and hands relaxed and with the feet flat on the ground ([CDC, 2007](#_ENREF_13)).
3. Body mass index (BMI): BMI was calculated using the formula weight in kilograms divided by the square of the height in meters weight (kg)/ height (m2).
4. Waist circumference: It was measured at the mid-point between the lower border of the rib cage and the iliac crest. Waist circumference was measured using a non-stretchable tape halfway between the lower border of ribs and the iliac crest on a horizontal plane, while ensuring that the tape was level around the body and parallel to the floor. The tape was tightened around the body without depressing the skin ([CDC, 2007](#_ENREF_13)). Two measurements to the nearest 0.1cm were taken and the mean recorded.
5. Hip circumference:It was measured around the highest point of hip. Hip circumference was measured using a non-stretchable tape ([CDC, 2007](#_ENREF_13)). Two measurements to the nearest 0.1cm were taken and the mean was recorded.

#### 3.10.2.2 Dietary Intake

Food frequency questionnaire and 24 Hour dietary recall were used for the assessment of dietary intake. The food frequency questionnaire was used to obtain information on the type of foods consumed by the respondents in the preceding days and the frequency of consumption of those foods. All the types of foods listed were read out and asked the participants to point out the foods they eat and the frequency of consumption of those foods within a week or fortnightly.

For 24 hour dietary recall, the respondents were asked to recall the foods they had taken in past 24 hour. Respondents were also asked about the left overs of the food items they had

taken. Prompts were given to make them easy to remember the time and amount of the food item they had eaten. Portion size of the food was estimated as per the utensils that were calibrated prior to the study. A record form was created and all the information was recorded in the form for further analysis.

With the help of information obtained from dietary assessment nutrients like fat, energy, calorie, carbohydrates were calculated. Nutrients like fat, protein, carbohydrate, potassium as well as total calorie were calculated and classified according to WHO recommendations. It is recommended that 15-30 % of total calories should be included from fat ([WHO, 2017b](#_ENREF_96)). Similarly, it is recommended that 55-75% of total calories should be included from carbohydrate ([Mann *et al.*, 2007](#_ENREF_49)). Protein intake should be 0.83gm/kg ([WHO, 2002](#_ENREF_86)) Recommendation for total calories is based on the energy requirement of an individual. Total energy requirement is calculated as follows:

Recommended energy for women

18 to 30 years= (14.818×weight+486.6)× PA factor

30 to 60 years= (8.126×weight+845)× PA factor

≥60 years= (9.082×weight + 658.5 )× PA factor

Recommended energy for men

18 to 30 years= (15.057 ×weight + 692.2)× PA factor

30 to 60 years= (11.472×weight + 873.1) × PA factor

≥60 years= (11.711×weight + 587.7 ) × PA factor

([FAO, 2011](#_ENREF_24))

**Table 3.1** Physical activity factor to calculate total energy

|  |  |
| --- | --- |
| Physical activity level | Factors |
| Low | 1.53 |
| Moderate | 1.76 |
| Heavy | 2.25 |

([FAO, 2011](#_ENREF_24))

#### 3.10.2.3 Physical Activity

Short IPAQ (International Physical Activity Questionnaire) was used for classifying physical activity of study participants. Physical activity part was used to collect data on type, frequency, duration and intensity of physical activity during work, transportation and leisure time in a typical week. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

Physical activity was categorized as low, moderate and high according to the score of each individual calculated following the short IPAQ questionnaire. For this total MET-minutes/week was calculated and physical activity level was determined as shown below:

Total MET-minutes/week = Walk (METs×min×days) + Moderate (METs×min×days) + vigorous (METs×min×days).

Where, MET factors for walk, moderate activity and vigorous activity are 3.3, 4 and 8 respectively.

IPAQ categorical score is as follows:

1. Low : No physical activity is performed or physical activity with MET values less than 600 MET per week activity ([IPAQ, 2002](#_ENREF_32)).
2. Moderate: Physical activity with MET value 600 or greater than 600 per week or 3 or more day of vigorous activity of at least 20 minutes per day activity ([IPAQ, 2002](#_ENREF_32)).
3. Vigorous: Vigorous-intensity activity on at least 3 days and accumulating at least 1500 or 7 or more days more days of any combination of walking, moderate or vigorous intensity activities accumulating at least 3000 MET-minutes/week activity ([IPAQ, 2002](#_ENREF_32)).

Adequacy of physical activity for each individual was also determined according to WHO recommendation. WHO has recommended that adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity ([WHO, 2017a](#_ENREF_95))

Data collection regarding other variables such as age, gender, marital status, family type, family size, income, education level, occupation, history of disease etc were done using structured questionnaire.

## 3.11 Data Analysis

The collected data were checked and rechecked for completeness and consistency at the end of each day of data collection. The collected data were first edited, organized, categorized and entered into Microsoft Excel 2010 and then into statistical package of social science (SPSS) version 20.0.

The collected data were analyzed by using descriptive statistics. Descriptive analysis was used to describe the percentages and number distributions of the respondents by socio-demographic characteristics and other relevant variables such as physical activity, dietary patterns, medical characteristics and behavioral characteristics in the study. Likewise, qualitative data were transcribed and coded by assigning labels to various categories. Verified test parameters were used to establish the relationships between the variables and indicators of hypertension.

## 3.12 Logistic and ethical consideration

Prior to survey, ethical clearance was obtained from Nepal Health Research Council (NHRC) asshown in Appendix C. Permission to conduct survey was obtained from Nutrition and Dietetics Department, Central Campus of Technology. Also permission to conduct survey in Jhapa Rural Municipality was obtained from Jhapa Rural Municipality office. An informed written and verbal consent was obtained from the respondents at the time of survey. The objective of the survey was explained clearly in simple language. Privacy and confidentiality of collected information was ensured at all levels.

**Part IV**

# Result and Discussion

A cross-sectional study to assess the prevalence of hypertension and associated risk factors was conducted in 168 adult people (females-95, males-73) of Rajbanshi community of Jhapa rural municipality. The results obtained from this study are explained in the following headings.

## 4.1 Demographic and socioeconomic characteristics

The information’s on demographic and socioeconomic characteristics are given below.

### 4.1.1 Age distribution of the study population

There were relatively more people of age group 30-39 i.e. 27.4%(46).The age group ≥60 consisted 14.9% of total people i.e. 25. Age distribution of the study population is shown in table 4.1The distribution of surveyed population is shown in Table no. 4.1.

**Table 4.1** Distribution of age of surveyed population (n=168)

|  |  |  |
| --- | --- | --- |
| **Age** | **Frequency** | **Percent** |
| 18-29 | 34 | 20.2 |
| 30-39 | 46 | 27.4 |
| 40-49 | 34 | 20.2 |
| 50-59 | 29 | 17.3 |
| ≥60 | 25 | 14.9 |
| Total | 168 | 100 |

### 4.1.2 Gender wise distribution of study population

Among 168 participants, 56.5% (95) were females and 43.5% (73) were males. There were more female participants involved in this study because in many families male were found to go abroad for employment.

**Table 4.2** Distribution of study population according to gender (n=168)

|  |  |  |
| --- | --- | --- |
| Gender | Frequency | Percent |
| Male | 73 | 43.5 |
| Female | 95 | 56.5 |
| Total | 168 | 100 |

### 4.1.3 Marital status of the study population

Majority of the study population were married 90.5% (152) and only 9.5% (16) were unmarried.The distribution of mariatal status of participants is shown in Table no. 4.3.

**Table 4.3** Distribution of marital status (n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| Married | 152 | 90.5 |
| Unmarried | 16 | 9.5 |
| Total | 168 | 100 |

### 4.1.4 Socioeconomic factors

Socioeconomic factors include education level, occupation and income level of family.SES can be assessed by measuring these factors.Modified Kuppuswamy scale is used for assessing the SES of family in Nepal ([A. Ghosh and Ghosh, 2009](#_ENREF_26)). Here, in this study, this kuppuswamy scale was used for assessing socioeconomic status of family as many study had found SES as a risk factor for hypertension.

#### 4.1.4.1 Distribution of occupation

The study showed that 54(32.1%) participants(family heads) were semiskilled who were mostly involved in foreign employment. A least percent i.e. 4.2% were unemployed, 23.8% were skilled, 20.2% were farmer, clerks or shop owners and 19.6 % were reported to be unskilled. The distribution of occupation of family heads is shown in Table no. 4.4.

**Table 4.4** Distribution of occupation (n=168)

|  |  |  |
| --- | --- | --- |
| **occupation** | **Frequency** | **Percent** |
| Skilled | 40 | 23.8 |
| Semiskilled | 54 | 32.1 |
| Clerical/ shop-owner/farmer | 34 | 20.2 |
| Unskilled | 33 | 19.6 |
| Unemployed | 7 | 4.2 |
| Total | 168 | 100 |

#### 4.1.4.2 Education level

More than half i.e. 56.5 %(95) of participants (family heads) had education level up to middle school, 10.1% were illiterate , 10.1% were graduated/ post graduated and 10.1 % were high school graduated. Very few 3.6% (6) had education level of primary level and remaining 9.5 % had completed intermediate or diploma.The distribution of education level of family heads is shown in Table 4.5.

**Table.4.5** Distribution of education level(n=168)

|  |  |  |
| --- | --- | --- |
| **Education level** | **Frequency** | **Percent** |
| Graduate or post graduate | 17 | 10.1 |
| Intermediate or diploma | 16 | 9.5 |
| High school graduate | 17 | 10.1 |
| Middle school | 95 | 56.5 |
| Primary school | 6 | 3.6 |
| Illiterate | 17 | 10.1 |
| Total | 168 | 100 |

#### 4.1.4.3 Family income per month (Rs)

The study showed that 29(17.3%) participants had monthly income greater than Rs.42,876.Similarly, 41(24.4%) participants had monthly income between Rs.(16,000 -21,000), 2.4% of participants had monthly income less than Rs.2,100.The distribution of monthly income is showed in Table no 4.6.

**Table 4.6** Distribution of monthly income (n=168)

|  |  |  |
| --- | --- | --- |
| **Income** | **Frequency** | **Percent** |
| ≥42,876 | 29 | 17.3 |
| 21,438-42,875 | 39 | 23.2 |
| 16,078-21,437 | 41 | 24.4 |
| 10,719-16,077 | 26 | 15.5 |
| 6,431-10,718 | 27 | 16.1 |
| 2,165-6,430 | 2 | 1.2 |
| ≤2,164 | 4 | 2.4 |
| Total | 168 | 100 |

#### 4.1.4.4 Socioeconomic status

After assessing all the SES factors, socioeconomic status score had been calculated where only 1.2% (2) belonged to upper class, 51.2%(86) belonged to upper middle class, 27.4 % (46) belonged to lower middle class, 18.5% (31) belonged to upper lower class and 1.8%(3) belonged to lower class. The distribution of SES score is shown in Table no. 4.7

**Table 4.7** Distribution of socio-economic status(n=168)

|  |  |  |
| --- | --- | --- |
| **Socio-economic status** | **Frequency** | **Percent** |
| upperclass | 2 | 1.2 |
| upper middle class | 86 | 51.2 |
| lower middle class | 46 | 27.4 |
| upper lower class | 31 | 18.5 |
| lower class | 3 | 1.8 |
| Total | 168 | 100 |

### 4.1.5 Type of Family

The study showed that 66.7% (112) of the participants were from single family and rest of 33.3%(56) were from joint family.The study also showed that 66.7 %(112) of familes had family size greater than 5 and rest 33.3%(56) of familes had size smaller than 5.The distribution of size and type of family is shown in Table no 4.8.

**Table 4.8** Distribution of family type and size (n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| **Family Type** |  |  |
| Single | 112 | 66.7 |
| Joint | 56 | 33.3 |
| Total | 168 | 100 |
| **Family Size** |  |  |
| <5 | 56 | 33.3 |
| ≥5 | 112 | 66.7 |
| Total | 168 | 100 |

## 4.2 Anthropometric indices

### 4.2.1 BMI

The study showed that 14.9%(25) participants were underweight, followed by normal- 44.6%(75), overweight-38.7(65) and only few 1.8%(3) were found as obese.

**Table 4.9** Distribution of participants ( Asian BMI criteria)(n=168)

|  |  |  |
| --- | --- | --- |
| **category** | **Frequency** | **Percent** |
| underweight | 25 | 14.9 |
| normal | 75 | 44.6 |
| overweight | 65 | 38.7 |
| obese | 3 | 1.8 |
| Total | 168 | 100 |

### 4.2.2 WC and WHR

According to WC, 88.7%(149) were found to be normal and remaining 11.3%(19) were found to be abdominal obese and according to WHR, 23.2%(39) were normal and 76.8%(129) were abdominal obese, which is shown in Table 4.10.

**Table 4.10** Distribution of participants (WC and WHR)(n=168)

|  |  |  |
| --- | --- | --- |
| **Category** | **Frequency** | **Percent** |
| **Waist circumference(WC)** |  |  |
| Normal | 149 | 88.7 |
| Abdominal obese | 19 | 11.3 |
| Total | 168 | 100 |
| **WHR** |  |  |
| Normal or underweight | 39 | 23.2 |
| Abdominal obese | 129 | 76.8 |
| Total | 168 | 100.0 |

## 4.3 Behavioral characteristics

From the study, very few percent of participants were found to take psychological stress on daily basis.64.3 % of people were found to have stress 2-3 times a week. According to the participants, 32.7 % were free of stress. They never took stress. They took everything lightly. More than half of the participants (58.9%) used to sleep between 7-8 hours daily, 8.3% of participants were found to sleep less than 7 hours daily and nearly one third i.e. 32.7 % were reported to sleep more than 9 hours daily.The distribution of behavioral characteristics is shown in Table no. 4.11.

**Table 4.11** Distribution of behavioral characteristics(n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| **Stress** |  |  |
| Daily | 5 | 3 |
| 2-3 times a week | 108 | 64.3 |
| Never | 55 | 32.7 |
| Total | 168 | 100 |
| **Sleeping Hours** |  |  |
| <7 hrs | 14 | 8.3 |
| 7-8 hrs | 99 | 58.9 |
| ≥9 hrs | 55 | 32.7 |
| Total | 168 | 100 |

## 4.4 Physical activities

Short IPAQ questionnaire was used in order to assess the physical activity level. Subjects were categorized to do low, moderate and vigorous physical activity. Most of the participants were found to do high physical activity i.e. 65.5% (110). As study participants were from rural area, most of participants were found to be involved in plaughing fields,, cattle rearing, walking, cycling, cooking, cleaning, firewood collecting etc, daily for several hours, they were tend to do high physical activity. Only 7.1% (12) participants were found to do low physical activity. 27.4 % of participants were found involving in moderate physical activities in my survey area. Similarly it was found that 82.7% (139) had adequate physical activity (≥1500mins/week) while only 17.3% (29) performed inadequate physical activity (< 1500mins/week). The distribution of physical activities is shown in Table no.4.12.

**Table 4.12** Distribution of physical activities (n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| **Physical activity** |  |  |
| High | 110 | 65.5 |
| Moderate | 46 | 27.4 |
| Low | 12 | 7.1 |
| Total | 168 | 100 |
| **Physical activity** |  |  |
| Adequate | 139 | 82.7 |
| Inadequate | 29 | 17.3 |
| Total | 168 | 100 |

## 4.5 History of Hypertension and Diabetes diagnosed

Majority 110(65.5%) participants were reported to have no any history of hypertension and 34.5 % of participants were reported to have history of hypertension in their families. Only 3(1.8%) participants were reported to have diabetes and rest 165(98.2%) participants were not diagnosed with diabetes.The distribution of history of hypertension and diabetes is shown in Table no 4.13.

**Table 4.13** Distribution of history of hypertension and diabetes(n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| **Family member(Hypertensive)** |  |  |
| Yes | 58 | 34.5 |
| No | 110 | 65.5 |
| Total | 168 | 100 |
| **Diabetes diagnosed** |  |  |
| Yes | 3 | 1.8 |
| No | 165 | 98.2 |
| Total | 168 | 100 |

## 4.6 Dietary intake

### 4.6.1 Dietary intake in a preceding day

It was found that majority of participants 90.5%(152) consumed inadequate calories and only 9.5%(16) participants consumed adequate calories in their diet. The mean calorie intake was (2016.75±533)kcal , mean carbohydrate intake was found to be 368±113.88 gm, mean carbohydrate consumption was (308.5±105.05)gm mean fat intake (42.29±13.83)gm, protein intake(47.96±14.88)gm. This study results can be compared with the study results of study done in Kathmandu and Chitwan district of Nepal. In the study done in Kathmandu, mean calorie consumption (1681.5±500)kcal, mean carbohydrate intake (308.5±105.05)gm, mean fat intake(24.1±9.6)gm, mean protein intake(40.25±14.4)gm were found ([Ohno *et al.*, 2005](#_ENREF_56)). Similarly in the study done in Chitwan district, mean calorie (2137±532)kcal, mean carbohydrate intake(404±100)gm, mean fat intake(32.4±21.7) and mean protein intake(49.6±1)gm were found ([Ohno](#_ENREF_57" \o "Ohno, 1997 #115) *[et al.](#_ENREF_57" \o "Ohno, 1997 #115)*[, 1997](#_ENREF_57" \o "Ohno, 1997 #115)).

More than half of the participants.53%(89) were found to consume low carbohydrate, 29.2%(49) were found to consume adequate carbohydrate and 17.9%(30) were found to consume high carbohydrate. Likewise for fat consumption, majority of participants i.e 109(64.9%) were reported to consume low fat followed by normal fat and high fat. Majority of the participants i.e 101 (60.1%) had adequate protein and 67(39.9%) participants were found to consume inadequate protein.

All study participants were found to consume potassium in much lesser amount than the recommended level. This might be because of poor consumption of green leafy vegetables, fruits and other vegetables in a daily diet. The RDA of potassium is 3510mg per day ([WHO, 2012a](#_ENREF_90)) but the mean consumption was found to be (1730.45±548.03)mg.99.4 % of participants were reported to consume sodium more than the upper safe limit i.e. 2,000 mg ([WHO, 2012b](#_ENREF_91)).Similarly, the mean sodium intake was found to be (3724.91±1167.14)mg which was very much higher than the upper safe limit and this might be caused due to excess consumption of salt and sodium rich foods. Similarly, The distribution of nutrient intake is shown in Table no 4.14.

**Table 4.14** Distribution of nutrients intake (n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| **Calories** |  |  |
| Adequate | 16 | 9.5 |
| Inadequate | 152 | 90.5 |
| Total | 168 | 100 |
| **Carbohydrates** |  |  |
| Low | 89 | 53 |
| Adequate | 49 | 29.2 |
| High | 30 | 17.9 |
| Total | 168 | 100 |
| **Protein** |  |  |
| Adequate | 101 | 60.1 |
| Inadequate | 67 | 39.9 |
| Total | 168 | 100 |
| **Fat** |  |  |
| Normal | 56 | 33.3 |
| Low | 109 | 64.9 |
| High | 3 | 1.8 |
| Total | 168 | 100 |
| **Sodium** |  |  |
| <2000 mg | 1 | 0.6 |
| ≥2000 mg | 167 | 99.4 |
| Total | 168 | 100 |
| **Potassium** |  |  |
| <3510 mg | 168 | 100 |
| ≥3510 mg | 0 | 0 |
| Total | 168 | 100 |

### 4.6.2 Distribution of dietary factors

The study revealed that all the participants had salt intake greater than 5 gm daily. This might be because of lack of knowledge on appropriate use of salt. Majority of participants 146(86.9%) were found to be non-vegetarian, 7(4.2 %) pure vegeterian,14( 8.3% ) lacto vegetarian and only 0.6% lacto-ovo- vegetarian. More than half 114(67.9%) of study participants were found not to smoke, 7(4.2%) were past smokers and 47(28%) of participants were found to smoke. The study also revealed that 22(13.1%) participants used to drink alcohol and rest all 146(86.9%) participants did not use to drink alcohol.The distribution of dietary factors is shown in Table no 4.15.

**Table 4.15** Distribution of dietary factors(n=168)

|  |  |  |
| --- | --- | --- |
| **Factors** | **Frequency** | **Percent** |
| **salt consumption per day** |  |  |
| <5 gm/day | 0 | 0 |
| ≥5 gm/day | 168 | 100 |
| Total | 168 | 100 |
| **Vegetarianism** |  |  |
| Vegan | 7 | 4.2 |
| Lacto vegetarian | 14 | 8.3 |
| Lacto- ovo vegetarian | 1 | 0.6 |
| Non-vegetarian | 146 | 86.9 |
| Total | 168 | 100 |
| **Smoking** |  |  |
| current smoker | 47 | 28 |
| Past smoker | 7 | 4.2 |
| No | 114 | 67.9 |
| Total | 168 | 100 |
| **Alcoholism** |  |  |
| Yes | 22 | 13.1 |
| No | 146 | 86.9 |
| Total | 168 | 100 |

### 4.6.3 Food frequency questionnaire

The foods were distributed into three groups of consumption: “frequent”, “regular” and “rare”. This categorization was based on recommendations of the Food Guide for the Brazilian Population ([Sato *et al.*, 2010](#_ENREF_67)). From the food frequency questionnaire, we came to know that all the 168 participants consumed cereals/cereal products frequently whereas only 40 participants consumed Pulaes/legumes frequently other 126 and 2 participants consumed on regular and rare basis respectively.Majority 100(59%) of participants consumed green leafy vegetables frequently, 62(36.9%) consumed regularly and only 6(3.6%) participants consumed rarely. Frequency of consumption of GLV was found to be higher because it was the time of growing green leafy vegetables. There were no any participants who did not use to eat potatoes. 78% of participants used to consume potatoes frequently and 37(22%) used to consume regularly. Very few participants 0.6% consumed banana frequently, 36.9 % consumed regularly and major participants 62.5% consumed on rare basis. Majority of participants 84.5% consumed red meat rarely, and other 15.5% consumed on regular basis. There were no participants consuming red meat and fish frequently. Majority of participants 70.8% (119) were reported to consume fish rarely and rest 29.2% were reported to consume fish on regular basis. Major percent 59.5% were reported to consume papad on regular basis, 16.1% consumed frequently and rest of 24.4 % consumed papad rarely. Very few participants 2.4% and 3% consumed pickles and noodles/chips respectively. More than half 57.7% and 63.7% consumed pickles and noodles/chips respectively on rare basis.39.9% consumed pickles and 33.3% consumed noodles/chips on regular basis. The distribution of foods intake is shown in Table 4.16.

**Table 4.16** Distribution of foods/food intake

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Frequency of consumption** | | | | | |
| **Foods** | **Number** | | | **Percentage** | | |
| **Frequent** | **Regular** | **Rare** | **Frequent** | **Regular** | **Rare** |
| Cereals | 168 | 0 | 0 | 100 | 0 | 0 |
| Pulses/legumes | 40 | 126 | 2 | 23.8 | 75 | 1.2 |
| Other vegetables | 158 | 10 | 0 | 94 | 6 | 0 |
| GLV | 100 | 62 | 6 | 59.5 | 36.9 | 3.6 |
| Potatoes | 131 | 37 | 0 | 78 | 22 | 0 |
| Banana | 1 | 62 | 105 | 0.6 | 36.9 | 62.5 |
| Red meat | 0 | 26 | 142 | 0 | 15.5 | 84.5 |
| Fish | 0 | 49 | 119 | 0 | 29.2 | 70.8 |
| Mil/milk products | 8 | 134 | 26 | 4.8 | 79.8 | 15.4 |
| Papad | 27 | 100 | 41 | 16.1 | 59.5 | 24.4 |
| Pickles | 4 | 67 | 97 | 2.4 | 39.9 | 57.7 |
| Noodles/Chips | 5 | 56 | 107 | 3 | 33.3 | 63.7 |

## 4.7 Prevalence of hypertension in Rajbanshi community

### 4.7.1 According to the guidelines given by AHA

In the current community based cross-sectional study on 168 subjects in 18 years and above of age, out of total more than half i.e 58.3%(98) were normal,16.1%(27) had elevated level of blood pressure, 4.8 %(8) were found to have stage 1 hypertension and 20.8%(35) were found to have stage 2 hypertension. The overall prevalence of hypertension was found to be 25.6%.The result as shown in figure could be compared with the study done among adults in Central Development Region where, prevalence of hypertension was found to be 22.4 % in 2011 which was lower than our study result ([Chataut *et al.*, 2011](#_ENREF_15)).The prevalence found in our study was lower than the prevalence i.e. 32.5% found from the community based cross-sectional study done in municipalities of Kathmandu in 2015 ([Dhungana *et al.*, 2016](#_ENREF_19)). This was because people in Rajbanshi community were physically active and very few people live idlely.The bargraph showing prevalence of hypertension is shown in Fig.4.1.

**Fig.4.1** Overall prevalence of hypertension among adults of Rajbanshi community according to AHA guidelines

### 4.7.2 Prevalence of hypertension(gender wise) according to AHA

In the current community based cross-sectional study on 168 subjects (73 males and 95 females) in 18 years and above of age, the prevalence of hypertension was found to be 34.2% and 19% for males and females respectively. Prevalence of hypertension for females was found to be much lower than the males. Our study findings could be compared with the study result found in study done in Central Development Region where prevalence of hypertension for males and females were 32.7% and 15.3% respectively. In that study too prevalence of hypertension for females was much lower than males. Our study findings could be compared with the study result found in study done in Municipalities of Kathmandu Nepal where prevalence of hypertension for males and females were 38.4 % and 28.4 % respectively. In that study too prevalence of hypertension for females was lower than males ([Dhungana *et al.*, 2016](#_ENREF_19)).The prevalence of hypertension among males (23%) which was also found higher than the females(17%) in Nepal ([NDHS, 2016](#_ENREF_54)). Out of total females, 66.3% were normal, 14.7 % had elevated level of blood pressure, only 3.2 % had stage 1 hypertension and 15.8 % had stage 2 hypertension. Similarly, out of total males, 47.9% of males were normal, 17.8% had elevated level of bloodpressure, 6.8% had stage 1 hypertension and 27.4 % had stage 2 hypertension.The bargraph showing prevalence of hypertension (genderwise) is shown in Fig.4.2.

**Fig.4.2** Prevalence of hypertension in Rajbanshi community people (gender-wise)

## 4.8 Factors associated with hypertension (WHO cut-off)

Age (P=0.001), sex(P=0.024), smoking(P=0.008), physical-activity(P=0.010), Family history(P=0.00), diabetes diagnosed(P=0.003) and GLV consumption(P=0.023) were found to be significantly associated with hypertension according to WHO cut offs as shown in table. WHR (P=0.095) and alcoholism (P=0.077) were found to have close relationship with hypertension. In the study done in Central development region of Nepal age, gender, smoking, alcohol consumption, physical inactivity, diabetes and family history were also found to have significant association with hypertension ([Dhungana *et al.*, 2016](#_ENREF_19))..In the study done in Bhadrabas village area of Kathmandu, smoking, physical inactivity were found to have significant association with hypertension ([Vaidhya *et al.*, 2012](#_ENREF_79)).Age, smoking, alcoholism were associated with hypertension ([Khan *et al.*, 2013](#_ENREF_38)). The factors associated with hypertension are shown in Table no. 4.17.

**Table 4.17** Factors associated with hypertension.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Factors** | **Category** | **Normal/Elevated** | **Hypertensive** | **Chi-square** | **P-value** |
| **Age** | 18-29 | 29(85.3) | 5(14.7) | 18.126 | 0.001\* |
| 30-39 | 39(84.8) | 7(15.2) |
| 40-49 | 28(82.4) | 6(17.6) |
| 50-59 | 15(51.7) | 14(48.3) |
| ≥60 | 14(56) | 11(44) |
| **Sex** | Male | 48(65.8) | 25(34.2) | 5.074 | 0.024\* |
| Female | 77(81.1) | 18(18.9) |
| **WHR** | Normal | 33(84.6) | 6(15.4) | 2.781 | 0.095 |
| Abdominal obese | 92(71.3) | 37(28.7) |
| **Alcoholism** | Yes | 13(59.1) | 9(40.9) | 3.117 | 0.077 |
| No | 112(76.7) | 34(23.3) |
| **Smoking** | Current user | 28(59.6) | 19(40.4) | 9.604 | 0.008\* |
| Past user | 4(57.1) | 3(42.9) |
| No | 93(81.6) | 21(18.4) |
| **Physical Activity** | High | 90(81.8) | 20(18.2) | 9.227 | 0.01\* |
| Moderate | 28(60.9) | 18(39.1) |
| Low | 7(58.3) | 5(41.7) |
| **Family History** | Yes | 26(44.8) | 32(55.2) | 40.69 | 0.00\* |
|  | No | 99(90) | 11(10 |
| **Diabetes Diagnoised** | Yes | 0(0) | 3(100) | 8.879 | 0.003\* |
| No | 125(75.8) | 40(24.2) |
| **GLV** | Frequent | 82(82) | 18(18) | 7.525 | 0.023\* |
| Regular | 39(62.9) | 23(37.1) |
| Rare | 4(66.7) | 2(33.3) |

**Part-V**

# Conclusion and Recommendations

## 5.1 Conclusion

In conclusion, the result of this study indicates the study community being one of the indigenous and backward community; hypertension is the major problem with the overall prevalence of 25.6%.The prevalence in males (34.2%) was found nearly double than females (19%) in our study. This confirmed that males were more affected from hypertension than females which were seen similar in other hypertension studies done in Nepal. There were not so many studies conducted to assess the risk factors of hypertension in specific communities, so this study should be understood clearly and thoroughly.

This study has assessed the nutritional status and prevalence of hypertension among adults of Rajbanshi community. The findings of this study confirmed that advancing age (p=0.001), gender(p=0.024), physical inactivity(p=0.01), smoking(p=0.008), diabetes diagnoised(p=0.003), family history(p=0.00) and consumption of green leafy vegetables(p=0.023) were significantly associated with hypertension. WHR (p=0.095) and alcohol consumption (p=0.077) were also found to have close relationship with hypertension. The study showed high consumption of salt and low consumption of potassium in diet as RDA recommended by WHO which could have increased the risk of hypertension of adults of Rajbanshi community.

## 5.2 Recommendations

The result of this study suggests the following recommendations;

1. Community based approaches for reduction of hypertension and its risk factors are essential.

2. Effective community based strategies might provide the best opportunities’ to avoid hypertension driven health and economic consequences in Nepal.

3. The need of the hour is to increase awareness regarding modifiable risk factors of hypertension.

4. Our study provides a background for a population based intervention in attempts to prevent rising problems of hypertension in the country.

5. Doctors and health workers should educate the patients and normal people about the HTN and how severe and dangerous it is if not controlled.

**Part VI**

# Summary

Hypertension is the commonest cardiovascular disorder and now regarded as major public health problem. It is a precursor to major diseases like myocardial infarction, stroke, renal failure etc. There are very less community based data on hypertension in Nepal, so information on the prevalence of hypertension is desirable.

A cross-sectional community based study was conducted in Jhapa Rural Municipality in Rajbanshi community, Jhapa. Equal numbers of participants were selected for study from all 7 wards of Jhapa rural municipality. The main objective of study was to assess the prevalence of hypertension among Rajbanshi adults of Jhapa Rural Municipality. Anthropometric and blood pressure measurements were taken and associated risk factors were assessed. The collected data regarding socio demographic, economic, dietary factors, behavioral factors and physical activity collected were analyzed using Microsoft excel and SPSS version 20.0. Chi-square test of significance was performed to find out the factors associated with hypertension with 95 % confidence interval.

Findings showed that overall prevalence of hypertension was 25.6%(male-34.2%, female-19%).Outcomes of our study showed that age (p=0.001), gender(p=0.024), physical activity(p=0.010), smoking(p=0.008), diabetes(p=0.003), family history(p=0.000), and consumption of green leafy vegetables(p=0.023) were significantly associated with hypertension. High salt consumption and low potassium intake in diet are main factors for causing hypertension. All study participants had consumed salt more than 5 gram daily and potassium intake less than 3510 mg, as RDA recommended by WHO. Therefore the study participants had a high risk of developing hypertension in near future. Keeping in mind, the severity and consequences of hypertension concerned authorities and agencies should actively take part to control the prevalence of hypertension and combat the factors associated with it.

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**Appendices**

**Appendix-A**

**Questionnaire**

****

**Nutritional assessment form**

**Department of nutrition and dietetics**

**Central campus of technology**

**Tribhuvan University**

**Dharan, Nepal**

**PREVALENCE OF HYPERTENSION AND RISK FACTORS ASSOCIATED WITH IT AMONG 18-70 YEARS AGE GROUP OF RAJBANSHI COMMUNITY OF JHAPA RURAL MUNICIPALITY, JHAPA**



Participant’s code Date of interview (B.S.):

dayy

Yr.

Mth.

1. **GENERAL INFORMATION**
2. Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_( male/ female)
3. Date of birth (B.S.):

Yr.

day

Mth.

1. Age: years
2. Religion:
3. Hindu
4. Christian
5. Buddhist
6. Muslim
7. Others\_\_\_\_\_\_\_\_

5.Marital status (married/ unmarried)

1. **ANTHROPOMETRIC INFORMATION**

**6.**

|  |  |
| --- | --- |
| **Measurement** | **Reading** |
| Weight (kg) |  |
| Height |  |
| Waist circumference |  |
| Hip circumference |  |

1. **BLOOD PRESSURE**

7.

|  |  |  |  |
| --- | --- | --- | --- |
| **Blood pressure** | **Reading A** | **Reading B** | **Mean reading** |
| Systolic blood pressure (mmHg) |  |  |  |
| Diastolic blood pressure (mmHg) |  |  |  |

1. **FAMILY INFORMATION**

8. Number of family members: \_\_\_\_\_\_\_

9. Number of female members:\_\_\_\_\_\_\_\_

1. Number of male members:\_\_\_\_\_\_\_\_\_
2. Type of family: (single/ joint)
3. Socioeconomic status (Kuppuswamy Scale)
4. Educational level:
   1. Profession or honor
   2. Graduate or post graduate
   3. Intermediate or diploma
   4. High school graduate
   5. Middle school
   6. Primary school
   7. Illiterate
5. Family monthly income level (Rs): (it has to be as follows)
   1. <2300
   2. 2301-6850
   3. 6851-11450
   4. 11451-17150
   5. 17151-22850
   6. 22851-45750
   7. >45751
6. Occupation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(specify)
   1. Employed
   2. semiskilled
   3. Skilled worker
   4. profession
   5. Semi-profession
   6. Unskilled
   7. Unemployed
7. Is anyone in your family suffering from hypertension?
   * 1. Yes b) No

13.1 If yes, his/her relation to you \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **PHYSICAL ACTIVITY QUESTIONNAIRE (Short IPAQ)**
2. During the last 7 days, on how many days did you do vigorous physical activities (heavy lifting, digging, aerobics, or fast bicycling for more than 10 minutes)?
3. \_\_\_\_\_Days per week
4. Don't Know/Not Sure
5. Refused
6. How much time did you usually spend doing vigorous physical activities on one of those days?
7. \_\_ \_\_ Hours per day \_\_ \_\_ \_\_ Minutes per day
8. Don't Know/Not Sure
9. Refused

OR

How much time in total would you spend over the last 7 days doing vigorous physical activities?”

1. \_\_ \_\_ Hours per week \_\_ \_\_ \_\_ \_\_Minutes per week
2. Don't Know/Not Sure
3. Refused
4. During the last 7 days, on how many days did you do moderate physical activities (carrying light loads, bicycling at a regular pace, or double tennis. NO walking)?
5. \_\_\_\_Days per week
6. Don't Know/Not Sure
7. Refused
8. How much time did you usually spend doing moderate physical activities on one of those days?
9. \_\_ \_\_Hours per day \_\_ \_\_ \_\_ Minutes per day
10. Don't Know/Not Sure
11. Refused

OR

What is the total amount of time you spent over the last 7 days doing moderate physical activities?”

1. \_\_ \_\_ \_\_ Hours per week \_\_ \_\_ \_\_ \_\_Minutes per week
2. Don't Know/Not Sure
3. Refused
4. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
5. \_\_\_\_Days per week
6. Don't Know/Not Sure
7. Refused
8. How much time did you usually spend walking on one of those days?
9. \_\_ \_\_ Hours per day \_\_ \_\_ \_\_ Minutes per day
10. Don't Know/Not Sure
11. Refused

OR

What is the total amount of time you spent walking over the last 7 days?

1. \_\_ \_\_ \_\_ Hours per week \_\_ \_\_ \_\_ \_\_Minutes per week
2. Don't Know/Not Sure
3. Refused
4. During the last 7 days, how much time did you usually spend sitting on a week day?
5. \_\_ \_\_ Hours per weekday \_\_ \_\_ \_\_ Minutes per weekday
6. Don't Know/Not Sure
7. Refused

OR

What is the total amount of time you spent sitting last Wednesday?

1. \_\_ \_\_ Hours on Wednesday \_\_ \_\_ \_\_ Minutes on Wednesday
2. Don't Know/Not Sure
3. Refused
4. **BEHAVIORAL FACTORS**
5. Do you smoke/ chew tobacco or not?
6. Current smoking (30days)/ chewing tobacco
7. Past user
8. No

22. On average how many cigarettes are you/have you been taking in a day?

1. 1-9 2. 10-19

3. 20 or >

23. Do you drink alcoholic beverages?

1. Yes 2. No
   1. .How frequently do you consume?
2. Daily
3. Weekly
4. Twice a week
5. Once a month
6. Twice a month
7. Other\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. How much do you drink at a time?
8. Half glass (Tea cup)
9. One glass
10. Two or more glass

24. How often do you consume fruits and vegetables of all kinds (fresh, canned, frozen, cooked, raw

and juices)?

1. <1time /day

2. 1 time/day

3. 2 times/day

4. >3times/day

25. How often do you have mental /psychological stress?

1. Daily
2. 2-3 times a week
3. Never

26. Do you use food as a stress relieving method?

1. Yes
2. No

27. If yes which type of food do you prefer?

1. Processed food
2. Fruits and vegetables
3. Cereal
4. On average, how many hours in night do you sleep? \_\_\_\_\_\_\_\_\_\_\_\_\_\_ hours

29.How often do you have disturbed sleep?

a) Never b) Daily c) weekly d) others specify

1. **History and Treatment of hypertension (only for those that are aware of their hypertension)**
2. How long have you been suffered from hypertension?

1.Recently diagnosed 2. Less than 1 year

3. 1 to 3 year 4. 3 to 5 year

5. 5 to 10 years 5. More than 10 years

1. Have you ever taken drug for high blood pressure?

1. Yes 2.No

* + - 1. **Complications of hypertension and co-morbidity**

1. Have you ever been diagnosed with diabetes? (Check medical records if available)
2. Yes

2.No

* + - 1. **DIETARY QUESTIONNAIRE**

1. What are you?
2. Vegan
3. Lacto ovo vegetarian
4. Lacto-vegetarian
5. Non-vegetarian
6. How much oil do you use monthly while cooking? \_\_\_\_\_\_\_\_\_\_Litres
7. Which cooking oil do you use for cooking?
8. Animal fat
9. Vegetable oil
10. Combination

36.How many packets of salt do you use monthly? \_\_\_\_\_\_\_\_\_

37.How often do you consume curd? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How often do you use butter/ghee?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**39.FOOD FREQUENCY QUESTIONNAIRE**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Types of Food** | **More than once a day** | **Daily** | **Thrice a week** | **Once a week** | **Once a fortnight** | **Once a month** | **Nev-er** | **Remarks** |
| **Cereals/cereal products** |  |  |  |  |  |  |  |  |
| **Pulses/legumes** |  |  |  |  |  |  |  |  |
| **GLV** |  |  |  |  |  |  |  |  |
| **Other vegetables** |  |  |  |  |  |  |  |  |
| **Fruits** |  |  |  |  |  |  |  |  |
| **Milk** |  |  |  |  |  |  |  |  |
| **Curd** |  |  |  |  |  |  |  |  |
| **Paneer** |  |  |  |  |  |  |  |  |
| **Ghee** |  |  |  |  |  |  |  |  |
| **White meat(chicken)** |  |  |  |  |  |  |  |  |
| **Red meat (mutton/goat/beef)** |  |  |  |  |  |  |  |  |
| **Fish** |  |  |  |  |  |  |  |  |
| **Egg** |  |  |  |  |  |  |  |  |
| **Pickles** |  |  |  |  |  |  |  |  |
| **Noodles/chips** |  |  |  |  |  |  |  |  |
| **Papad** |  |  |  |  |  |  |  |  |

1. **24 Hr Dietary recall**

|  |  |  |  |
| --- | --- | --- | --- |
| Timing | Description of food or drink | Serving | Amount |
| Breakfast( 6-9)am |  |  |  |
| Lunch(9-11)am |  |  |  |
| Snacks(1-5)pm |  |  |  |
| Dinner(9-11)pm |  |  |  |
| Bedtime |  |  |  |

**Appendix-B**

**Consent form**

Hello, I am Kalpana Rajbanshi, a student of BSc. Nutrition and Dietetics at Central Campus of Technology, Dharan. For the completion of this bachelor’s degree I need to carry out a dissertation.

The topic for the study is**” Prevalence of Hypertension and risk factors associated with it among 18-70 years age group of Rajbanshi community of Jhapa Rural Municipality, Jhapa’’.**

This is a survey to help understand the current situation and need of the community. There are no entitlements attached to participation in the survey. Participation is voluntary and you can decide not to answer some questions and stop the interview anytime .I guarantee confidentiality of data collected. It will take around 30 minutes of your time. Are you willing to take the interview?

I hereby give consent to participate in the above study. I am also aware that I can withdraw this consent at any later date, if I wish to. This consent form being signed voluntarily indicates participate in the study until I decide otherwise. I understand that I will receive a signed and dated copy of this form.

I have signed this consent forms before my participation in the study.

Signature of parent/guardian: \_\_\_\_\_\_\_\_\_\_\_ Sign of witness: \_\_\_\_\_\_\_\_\_\_\_

Date:

Place:

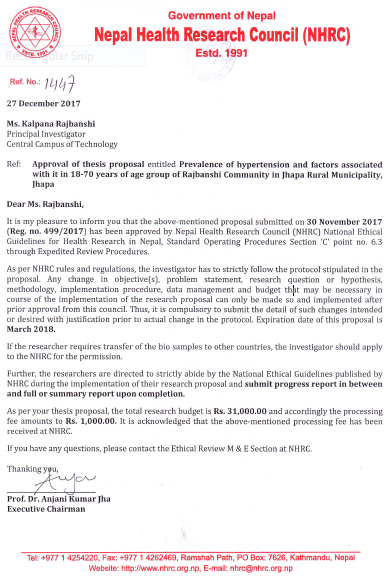
I hereby state the study procedures were explained in the detail and all questions were fully and clearly answered to the above mentioned participant /his/her relative.

Investigator’s sign:

Date:

**Appendix- C**

**Ethical Approval**



**Appendix- D**

**Color plates**

**  **

Fig.1 Measuring Blood pressure Fig.2.Measuring weight Fig.3 Measuring height



Fig.4 Measuring Waist circumference Fig.5. Measuring Hip circumference