CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

To Study the Prevalence of Hypertension and Determination of Risk Factors and Associated Practices in the Valley of Hunza

by

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A thesis submitted in partial fulfillment for the degree of Master of Science

in the

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Dedicated to my father late Nahid Ullah Baig who was a source of inspiration and encouragement for me & Dedicated to my teachers. Thank you all for your affection and guidance.

CERTIFICATE OF APPROVAL

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Abstract

Hypertension is a growing health problem in many countries including Pakistan and is increasing day by day. There is very little community based data available in Pakistan therefore, information regarding occurrence of hypertension in the general population of the people of North of Pakistan is desirable. There are many causes of hypertension but it is greatly influenced by demographic characteristics such as gender, age, family history, alcohol, stress and many other diseases. It is one of the most preventable risk factor for CVD, as we can detect it easily and dietary and life style changes can be helpful to decrease the risk of associated health complications. Although some studies are conducted in some districts of North of Pakistan, but less updated data available. I studied the prevalence of hypertension, its risk factors and practices among the residents in the mountainous rural villages of Hunza district which is located in the North of Pakistan. This area is well known for its natural beauty and longevity in the world. The main objective of this study was to investigate association between blood pressure and the factors which are known to contribute in hypertension and to estimate the magnitude and prevalence of hypertension and its level of awareness and control measures among the residents of Hunza. A community based cross-sectional study was applied in 5 different villages in Hunza. In a particular study, a well prepared questionnaire was used which consist of three parts. These parts were related to socio demographic characteristics, knowledge of hypertension among the participants and the last part was covering the association between hypertension and its risk factors. For the study some critical measurements were also observed as BP, weight and height. A total of 425 individuals were participated in the survey of which 37.65% were men and 62.35% were women. The overall prevalence of hypertension was 33.88% (male 36.11%) and female (63.89%). While 58.3% of the hypertensive subjects were using anti-hypertensive medicine. Out of all subjects 39.29% had the history of hypertension. Significant association was found between positive history of hypertension and prevalence of hypertension (p= 0.00). If we consider the frequency of eating processed meat its prevalence is much in subjects eating much meat. This association was also statistically significant (p= 0.044).

The prevalence is also higher in subjects with diabetes as compared to non diabetic (p= 0.002). This study concluded that there was increase in prevalence of hypertension in Hunza, a valley north of Pakistan. The prevalence was 33.88% which was alarming in Pakistan with its associated risk factors.

Contents

List of Figures

List of Tables

Abbreviations

BMI	Body Mass Index
BP	Blood Pressure
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
HBP	High Blood Pressure
HTN	Hypertension
NCD	Non-Communicable Disease
SBP	Systolic Blood Pressure
WHO	World Health Organization

Chapter 1

Introduction

1.1 Background

Hypertension is increasing health problem in the most developing countries. It is also called as silent killer because it has not any particular sign and symptoms. The only way to control the prevalence of hypertension is the knowledge, practices, awareness and attaitude which will play key role to improve prevention of cardiovascular disease. The reason to select this study in north of Pakistan is that because being living there for long time, i observed increase in occurance of hypertension.

Hypertension is also called as high or increased blood pressure which is one of the global public health challenge. "Hypertension is a chronic medical condition in which the BP in the arteries is elevated. The higher the pressure in the blood vessels, the harder the heart has to work, in order to pump blood, thus making the heart to work too hard" [44]. It is a severe medical state that significantly increase the risk of heart, brain, kidney and other diseases. It is also called "Silent Killer" because in the initial stag it has not only specific sign and symptoms.What is the most effective approach to control hypertension in a certain population ? Dietary and life style modifications and management and hypertension awarness are the most effective ways to control hypertension. This can only be prevented by creating awarness, hence due to this its becoming the world's most preventable

health condition. Therefore to promote health and preventing diseases greatly lies on the individual , community and organization. Life style changes is very important for prevention and management of hypertension [39].

Although much research work is done in this field, but there are certain gaps specially in lower and middle income countries as lack of awarness to general population and lack of access to implimentable hypertension guidelines,and modifications in life style.I selected the topic of hypertension for my research because living in Hunza for long time, i observed the rise in cases of hypertension from some years.This may be due to too much use of salt in their diet, which will be the main factor contributing in increased blood pressure. "Conversely, reduction in sodium intake not only decrease blood pressure levels and hypertension incidence, but is also associated with a reduction in cardiiovascular morbidity and mortality" [38]. Being cold area the staple food is fatty meat products,butter, milk dairy products and salted snakes. Some other factors as diet high in saturated fats, physical inactivity, mental stress, obesity and use of tobacco are in practice.

The frequency of hypertension is increasing in developing countries due to exposure to risk factors (e,g obesity, stress). Hypertension leads to the burden of different health conditions, such as heart diseases, stroke and kideny failure. The prevalence of rate of hypertension in Hunza increased within few years. This may be due to factors like change in life style, environment, much consumption of salt, stress, dietary risk factors, lack of knowledge and awareness towards this serious health problem. The people are not much aware of these factors, which is resulting in serious heart diseases.

"The new epidemic of hypertension and cardiovascular diseases is not only an important public health problem, but it will also have a big economic, as a significant proportion of the productive population become chronically ill or die leaving their families in poverty" [9].

The risk factors that can not be changed include family history of hypertension, age over 65 years, diabetes, kideny diseases, mental stress. This is an important public health problem in both economically developed and developing nations. " The increasing prevalence of hypertension in develpping countirs is of great

concern. Globally nearly one billion people have hypertension of these two third are in developing countries" [43].

Studies suggest that there is lack of awareness and lack of understanding among participants in the etiology of high blood pressure so that the basic focus should be public education in considerate high blood pressure which helps to overcome it [9]. "Dietary and life style changes can improve blood pressure control and decrease the risk of associated health complications, althougth drug treatment may prove necessary in patient for whom life style changes prove ineffective of insufficient" [30]. Moreover, hypertension related attitude and practice plays major role to manage HBP and prevent its long term complications. There msut be need of devise possible health related educationl program to help in control and awrareness about HBP.

"Despite its magnitude, hypertension is one of the most preventable risk factor for CVD. It

can be easily be detected and it can be effectively treated with low cost drugs. Unfortunatly, hypertension awarness, treatment and control are unacceptably low in many countries, particularly in developing countries" [1]. In addition, the need to understand the disease process and control using preventive measures is the key to control hypertension.

Hypertension is significant risk factor for cardiovascular diseases, so it is most important to create awareness and hypertension related knowledge practice to control HBP which can only prevent from complications. Also to generate useful data which can help to prevent this health problem and to design feasible health program to control of HBP.

Life style factors plays significant role in hypertension as dietry and other factors, so the purpose of my research work is to assess the relationship between life style facts and hypertension and to achieve better control of BP through knowledge, awareness and attitude.

As Hypertension is important health problem and it can be considered one of the leading factor for cardiovascular mortality, so its prevalence and associated factors

are to be considered vital focus to control cardiovascular diseases. It is found that there is heavy load of hypertension in rural areas of Pakistan. It can only be prevented and treated by effective management and practices towards improved life style modifications. Consumption of less salt, use of less fats in diet, proper and regular exercise and avoid using tobacco and alcohol etc. The conclusion of this study will be helpful to raise understanding among people of residents of Hunza at long and will find out the gaps of knowledge and practices regarding the subject which helps in modification of prevalence strategies to aware their risk factors.

1.2 Problem Statement

The national health survey of Pakistan predicted that hypertension affects 18% of adults and 33% of adults above 45 years old. Therefore, that requires to present updated data on prevalence, awareness, treatment and control of hypertension in Pakistan. There is not any data available on current burden of disease. In another remote study conducted in the rural parts in Northern Areas of Pakistan. The dominance of hypertension was found to be 14%. 34.

Although research had been done on the prevalence of hypertension in Northern Areas of Pakistan but there is not much work done recently and some research gaps are still there. What is the most effective appraoch to control hypertension in a certain population? Dietry and life style modifications and management and hypertension awareness is the most effective ways to control hypertension. As hypertension is directly related to cardiovascular diseases, so its very important to study the prevalence and the factors which contributes in HBP.

1.3 Significance

As hypertension is significant risk factor for cardiovascular diseases, so it is most important to create awarness and hypertension related knowledge and practices to control HBP which can only prevented from complication. The study helps

to understand the changing prevalence of hypertension over the years in different villages in Hunza. Its important to study the hypertension and its related practices because HBP increase the risk for heart diseases and stroke. Its study is also important to generate useful data which can help to prevent this health problem and to design feasible health program to control HBP.

Life style factors plays significant role in hypertension as dietary and other factors. So the purpose of my research work is to assess the relationship between life style factors and hypertension and to achieve better control of BP through knowledge, awareness and attitude.

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It can only be prevented and treated by effective management and practices towards improved life style modifications. Consumption of less salt, use of less fats in diet, proper and regular exercise and avoid using tobacco and alcohol etc. The results of this study will be helpful to increase understanding between people of residents of Hunza at long and will find out gaps of knowledge and practices regarding the subject which helps in modification of prevalence strategies to aware their risk factors.

1.4 Aims and Objectives

1. To describe the prevalence of hypertension and its related factors.
2. To study the life style modifications and practices in hypertension respondents.
3. To study the risk factors and their role in hypertension patients.
4. To determine age specific prevalence of hypertension and blood pressure (BP) levels in relation to diet and life style factors in the valley of Hunza.

1.5 Statement of Hypothesis

"Hypertension is an important health problem due to its high prevalence, and temporal relationship exists between hypertension and related risk factors. It can be prevented by practices as change in dietry habits and behavioral changes".

Hypertension prevalence rises more rapidly with age. It has been hypothesize that there is a relationship between age, obesity, race, ethenicity and socio economic status with hypertensive dieases.

Researchers found that there is a greater prevalence of hypertension in low income and rural areas, although significantly less treated.

Researchers also hypothesized that the occurrence, prevalence and adulthood rates of hypertension can be described by a secular trend of hypertesive diease control.

1.6 Limitations

Although hypertensin is the most preventable cardiovascular risk factor, but there are certain limitations during its study as!

- The first major limitation deficit of specific data on the occurrence of hypertension in the remote areas of Pakistan. This part of the country is ignored regarding the scientific studies.
- During 2020, the epidemic of Corona Virus (COV-19) is the most challanging situation for research. So during my studies i also faced certain problems during survey.
- The other limitation of this study was conducting the survey in some of the villages of Hunza which might show our results promising. I recommended to other researchers to conduct large surveys and to suggest possible ways to generate recent scientific data.
- Absence of particular data in stress level is also one of the limitation of the study.

- As my research suggests the existance of greater awareness about HBP among the residents, but there is room for improvement, so oppertunities exists for improving the information.

Chapter 2

Literature Review

2.1 Definition of Hypertension

Hypertension is a term use to explain high blood pressure. Defining hypertension is difficult as there are different definitions found in different literature.

According to Evans and Rose defined it as, " that level of blood pressure at which detection and treatment do more good than harm" [42].

Hypertension is best defined for operational purposes irrespective of age as, " the level of blood pressure at which the benefits (minus the risk and costs) of actions exceeds the risk and costs (minus the benefits) of inaction" [8].

The current difinaition of hypertension of WHO (1993) is therefore " a level of systolic blood pressure of 140mm Hg or above, or a level of diastolic blood pressure of 90 mm Hg or above"[46].

Similar definitions habe been given by Joint National Committee and European working group on hypertension as well. "So based on diastolic or systolic blood pressure; high daistolic blood pressure has commonly been used to define hypertension" [22].

According to American Heart Association, high blood pressure (HBP or Hypertension) is "when your blood pressure, the force of your blood pushing against the walls of your blood vessels is consistently too high".

2.2 General Introduction of Hypertension

"Hypertension is a chronic medical condition in which the BP in the artries is elevated. The higher the pressure in blood vessels, the harder heart has to work in order to pump blood, thus making the heart to work too hard" [45].

"Hypertension cuts across every social class. Both lower income groups and higher income groups may be at increased level of developing hypertension. Aside genetic factors, several behavioral and socioeconomic factors can put an individual at risk" [32].

These studies suggests that hypertension is an alarming health condition across the globe and even economically developed countries are at risk so its an important public health concern.

"The high blood pressure is one of the leading attributable risk factors for mortality in south Asia. The latest prevalence of HBP was found to be in Bangladesh 17.9%, Bhuttan 23.9%, India 31.4%, Maldives 31.5%, Nepal 33.8%, Pakistan 25% and Srilanka 28.9%" [31].

According to WHO (2017), "the leading to the development of NCD (HBP) are high salt intake, inadequate intake of fruits and vegetables, overweight and obesity, lack of physical activity, tobacco, high stress and high cholestrol".

These findings are evidence of risk factors for hypertension but there is gap in the research as although much studies were done regarding hypertension but knowledge and practice gaps are still there.

According to Chobanian AV et al, (2003). "Life style modifications are important determinent of our physical health and effective tool for successful treatment and control of HBP. Further improvement in imparting HBP related knowledge is needed for better and improved sustainable healthcare" [10]. "Greater awareness and educational interventions are required, since research has found significant increase about hypertension awareness among the interventional group following completion of intervention"[35]. These studies confirm that life style modification and knowledge about hypertension can be helpful to control and manage HBP.

2.3 Types of Hypertension

Hypertension is categorized into two main categories as primary (essential) hypertension and secondary hypertension.

2.3.1 Primary (Essential) Hypertension

Primary hypertension is also as essential hypertension and this affect ninety-five percent of people suffered from the disease. The main causes of hypertension are still not known, however, factors as age, high intake of salt, low potassium diet, sedentary life style, stress and Geans which have been found as leading factors of hypertension.

In the lines of Beilin, "It is not longer revelant to define essential hypertension as arising blood pressure without any cause, Since a number of causes can be clearly identified in most of the cases of socalled "essential hypertension"[4]. "There is a clear evidence that changes in life style including dietry cahnges, that reduce body weight, fat, and alcohol intake and increase potassium and calcium inake, as well as exercise" [2].

2.3.2 Secondary Hypertension

High blood pressure occuring as a result of a conseqence of another disorder or a side effect of medication is referred to as secondary high blood pressure. Such disorder may include renal failure or renovascular diseases. This type of blood pressure is evident in about five to 10% of cases [14].

According to Kaplan, 2005, the incidence of secondary hypertension is estimated between 5-10% which is directly linked to disease of kidneys, endocine system, vascular system, lungs and central Nervous system.

It has been reported that it is higher in the speciality clinics, compared to the primary care clinics. According to studies the exact prevalence of secondary HTN is unknown and the diagnosis is mostly missed in the majority of patients [15].

2.4 The Prevalence of Hypertension

According to SMA Shah et.al 2001, the occurance of hypertension in the district Ghizer of Northern Area which is adjacent to Hunza district was about 14% [37].

In a study comparing the prevalence of hypertension in six European countries, Canada and United States, it was found that prevalence of hypertension was highest in Germany as (55%), Finland (49%), Spain (47%), England (42%), Sweden and Italy (38%) while in contrast, the rates were 28% in US and 27% in Cananda [47].

2.5 Prevalence of Determination of Risk Factors

Jugal Kishore et al, (2016) conducted a study on prevalence of hypertension and determination of risk factors in rural Delhi. "It was a community based cross-sectional study, which found that the prevalence of hypertension was 14.1% among study objects.

It was higher in individuals with age above 35, and much prevalence in subjects taking alcohol, raised cholestrol level"[21]. Furthermore, as the world's population grows and ages, the number of individuals with untreated hypertension rises. Thus we can predict that chances of hypertension rises with age and cholestrol and alcohol are some of risk factors.

JM Van Rooyan et al, (2000) studied "The hypertension and its determination in the population of transition, which is an area of South Africa. This study was conducted in the urban area and black subjects were included in the study.

It was found that there was significant rise in BP with increase in age. The author also concluded that the rural area people might be stressed by experimental procedure so possible high blood pressure during the process" [20].

In my point of view, as there is not any complicated process of measuring BP and other protocols, so less chances of rise in BP during the process.

2.6 Risk Factors Associated with Hypertension

The prevalence and related complications of HBP are multifactorial like having positive family history, presence of much obesity, misdiagnosis, and not revelant or insufficient therapy. "The HBP is also influenced by rapid, urbanization, change in socioeconomic conditions, such as sedentary life, alcohol consumption, excessive salt intake and increase stress and this burden is likely to grow in the coming decades" [14].

Epidemiologically , "HBP is wide and increasing globally, even in the economically developed nations such as united states where it was second most important cause of death after tobacco"[29]. Hypertension is not only major health problem in developing countries like Pakistan but studies show that it is also leading cause of death in developed countries like America.

The use of fat was related with hypertension in rular areas. The use of saturated fats (butter, meat, lard fat or margarine, whole milk etc) is common in rural areas. Animal fat specially from pork and denatured oils from fries and reused for cooking of food in house holds. A study in rural Malavi, Tanzania, and Rwanda.

(De Remirez SS et al, 2010) reported similar findings about fat consumption [13]. Similar to these African areas there is much consumption of animal fat and products in hunza valley. So it can be assumed that fat can increase the risk of occurance of hypertension.

Socio Economic Status: According to (WHO, 1996), "In countries that are in post-transitional stage of economic and epidemiological change, consistently higher levels of blood pressure and high prevalence of HTN have been found in lower socio-economic groups.

How ever, in societies that are transitional or pre-transitional, higher levels of blood pressure and a higher prevalence of HTN have been noted in upper socio-economic groups" [42].

There are many studies conducted in India, in which most of the studies have indictaed a higher prevalence HTN in higher socio-economic groups as compared to low socio-economic groups.

"There was study conducted on HTN which focused on socio-economic status in a rural South-Indian community. This showed that the prevalence of HTN in highest socio-economic group (22.5%) was more than twice that in the lowest socio-economic group (88%). This shows that there are much life style modifications in the upper socio-economic group than the lower socio-economic group ones" [16].

"But a study in a Mumbai, found that no any specific difference between high and low socio-economic groups" [12]. Salt intake among the people of most of the countries is found between 9 and 12 g/d, but the current WHO suggested for salt intake is 5g/d or less. The UK and US suggested are 6g/d or less. There was a study as, "How far should salt intake be reduced?".

"Which was a meta-analysis of randomized long term salt reduction trials, said that the current public health recommendation to reduce salt intake from 9-12 g/d to 5-6 g/d will have a major effect on BP but by no means is ideal and a further reduction to 3g of salt per day will have a much greater effect on blood pressure" [62].

2.7 Role of Genetics/ Heredity

According to (Pickering 1968) essential hypertension is now believed to be a distinct genetic trait.

A family history of HBP is considered to be one of the strongest risk factors for future development of HTN in individuals.

The BP of first order adult relatives (parents, siblings), corrected for age and sex, have been shown to aggregate at all levels of BP, with a regression co-efficient of 0.2- 0.3 [34].

There was a study conducted among the residents in Pune, Deswal BS, found that the relative risk of developing hypertension in individuals who have positive family history among their first degree relatives, was 84- 86 times more as compared to those who have not any family history of hypertension [60].

2.8 Prevention and Management of Hypertension

"However the use of preventive measures present positive activities that stops behaviour that causes diseases as high blood pressure. It is the cheapest and most effective way of controlling high blood pressure. Primary prevention has been proposed as the most effective approach to the emerging epidemic" [25]. According to the above research we can prevent HBP through Primary prevention , which is caused due to age, high salt intake, sedentary life style, stress, etc. This can easily be prevented through awarness and knowledge.

2.9 Hypertension Associated Knowledge, Attitude, and Practices at Community Level

"Beside lack of health related knowledge, the individual attitude, and other cultural factors affect health care seeking behaviour" [18]."Moreover, hypertension associated knowledge and practices plays an important role in controlling HBP and controlling its long term complications and co- morbidity" [26]. These studies proved that we can easily control HBP through possible ways as knowledge, attitude, and practices.For this awarness among population is the key factor for proper control of hypertension.

Chapter 3

Materials and Methods

3.1 Study Design

This was a cross sectional, descriptive,questionnaire based survey conducted in 5 villages of Hunza. Systemic random sampling method was used to select the study subjects in particular areas. Selection of household units were based on sex and age. Diagnostic criteria: Based on WHO criteria, a person was considered hypertensive if :

1. SBP>140mmHg and /or DBP>90mmHg.
2. Persons already on anti- hypertensive treatment.

3.2 Study Settings

The research was conducted in the valley of Hunza located in north of Pakistan. The majority of population lives in rular areas on agriculture and livestock, in this mountaineous valley.

Sample size: The study was conducted in 5 villages of Hunza, all the persons above 30 years were taken for the study. Among 500 adults 425 were examined and remaining 75 were excluded because of not availibility even after repeated visits.

3.3 Study Population

The study participants are permanent residents of Hunza, who had been living there from atleast 10 years. The subject composed of adults of both sexes aged 25 and above. Total 425 subjects were included in this study.

In this study a well prepared questionnaire was used, which is pretested WHO-STEP structural questionnaire. It has three parts.

3.3.1 Part 1

Measuring the socio demographic characteristics of participants.

3.3.2 Part 2

Consists of knowledge and practices of hypertension among the participants.

3.3.3 Part 2

The last part was focus on the possible risk factors, as physical activity, salt intake, diet etc.

The research was consist of three steps;

3.3.4 Step 1

Information of sociademographic variables as age,gender, education,occupation were obtained and behavioural factors which are risky can be calculated, that is use of tobacco, alcohol use and related factors using questionnaire.

3.3.5 Step 2

Experimental measurements including height, weight and blood pressure were observed using standard protocols and instruments. Blood pressure was measured

using a digital measuring device with participants sitting after resting for at least 5 minutes.

The measurment were taken with each subject sitting on a chair and supported hand. Blood pressure was recorded three times. The standard protocol had been followed and result of last two readings would be used in analysis.

"Hypertension subjects were defined as those with systolic blood pressure (SBP) equal to or more than 140mm Hg or diastolic blood pressure (DBP) equal to or less than 90mm Hg or those being treated for hypertension" [48].

3.3.6 Step 3

Ethical Issues! Each subject that has been selected gives explanation about the procedure and objectives of study. Subjects participated in the study under voluntary basis. Personal information of the subjects was kept confidential.

3.4 Method of Collection of Data

3.4.1 Duration of the Study

The study was carried out for the period of 3 months from september 2020 to november 2020.

3.4.2 Collection of Data

All the subjects were personaly contacted in their houses, examined and interviewed using the pre- tested questionnaire using modified WHO STEPS Protocol.

3.4.3 Incusion Criteria

All subjects age 30 years and above.

3.4.4 Exclusion Criteria

Persons less than 25 years. Subjects with physical deformity, pregnant women and other chronic illness will be excluded from the study.

3.5 Instruments Used for Collecting Data

3.5.1 Mercury Sphygmomanometer

This was used to measure BP which was checked regurly against a similar istrument and regularly standardized throughout the period of data collection.

3.5.2 Weighing Machine

The weight was taken on a portable weighing machine with acalibrated scale of 0.5kg marked from 0 to 13 kgs and the machine was frequently checked against standard weights.

3.5.3 Measuring Tape

Height was measured with a calibrated measuring tapmarked in centimeters. The measurement was taken in errect standing position.

3.5.4 Stethoscope

A standard stethoscope was used to measure the blood pressure.

3.5.5 Age

The age was recorded as stated by the subject to the nearest completed year.

TABLE 3.1: Study Variables

Concept	**Variables**
Independent Variable Blood Pressure	Diastolic Blood Pressure(DBP) and systolic Blood Pressure(SBP)
Dependent Variables Socio-demographic Characteristics	Age, sex, marital status, level of education, occupation
Family Related Life Style related factors	History of Hypertension, history of Diabetes
	Salt intake, tobacco smoking, Fruit and vegetable consumption, Physical activity. Obesity, Diabetes.
Co-mobidity Drugs and treatment	Hypertension drugs, adherence to treatment.
Anthropometric Measurements	Weight, Height.

3.5.6 Family History

Family history of hyprtension, diabetes militus, were taken in the first degree relatives, which includes parents,brothers and sisters.

3.5.7 Salt Intake

Extra salt was defined as at least one tea spoon full of salt every day. (2.300 mg sodium). Consumption of salt was assessed by asking survey participatnts

the frequency, qualty and type of salt used in their house hould, as well as their cooking habits and their attitude towards their dietary salt.

3.5.8 Education

Formal education recorded as stated by the subject as Primary, Secondary and Tertiary.

3.5.9 Occupation

Was recorded as employed, selfemployed and unemployed.

3.5.10 Physical Activity and Weight Control

Physical activity was assessed by asking questions regarding knowledge and practices and impotrance of exercise and weight lose towards control of hypertension.

3.5.11 Stress

Stress defines for participants as feeling of short-tempered, anxiety or suffering from insomia as a result workload at home, work or within previous year. The psychological stress was assessed with simple question as, “Have you been under stress?” etc. For each question participants have four choices as most of the time, same time, often and never.

3.6 Statistical Analysis

Analysis of data was performed by using SPSS version 20. The results obtained were explain in simple proportions. The variation among graphs were assess using Chi square test for statistical significance. Logistic regression analysis calculated odds. The level of significance was considered as P value less than 0.05.

1. First i explored freqency distributors of sociodemographic and behavioural characteristic of subjects.

2. Described statistic had been use to summerize and present information in the form of mean, median, percentages and tables. 95% confidence intervals for prevalence estimates.

3. Binary logistic regression models would be use to examined factors related with hypertension among adults.

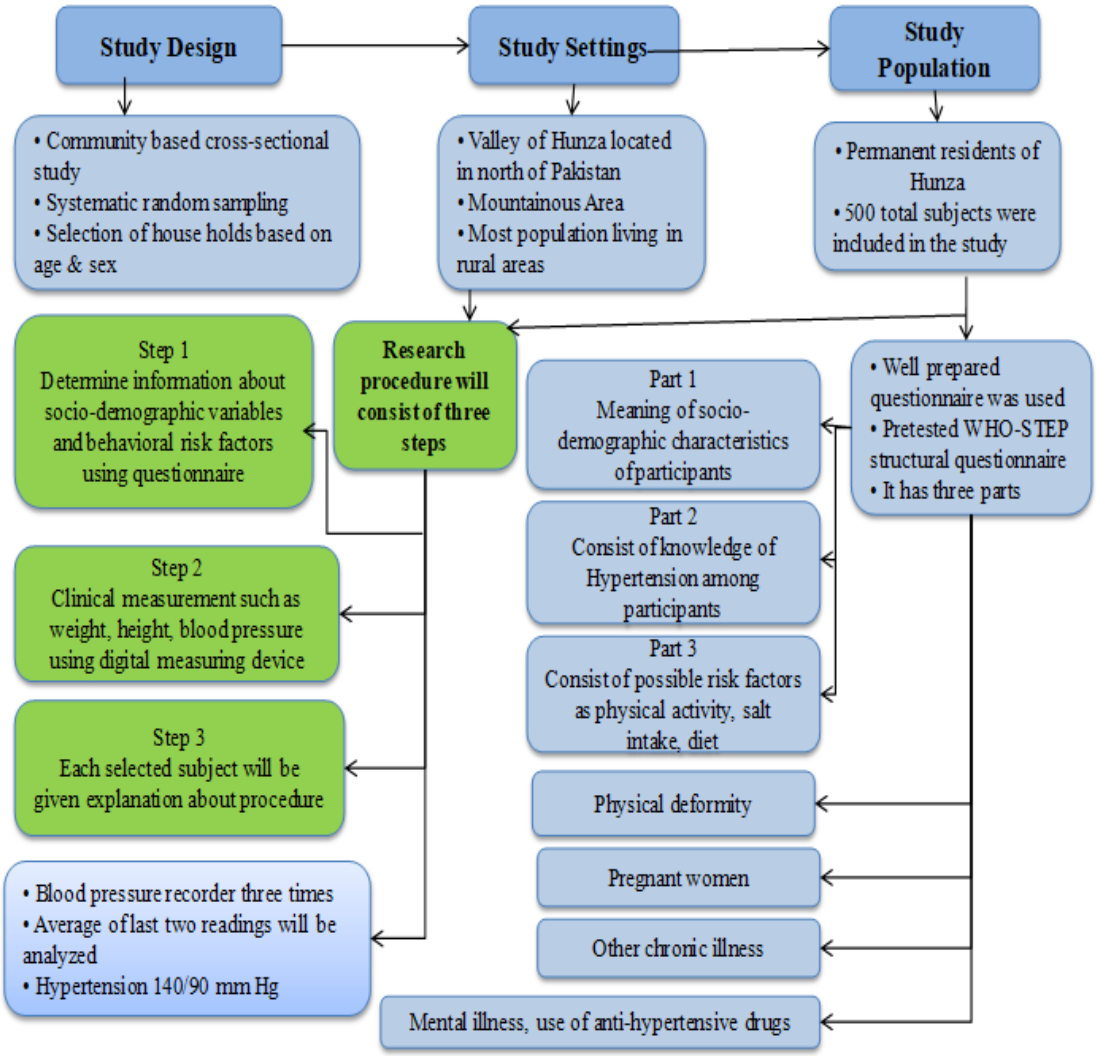

FIGURE 3.1: Flow Chart Showing Methodology of Study Design

Chapter 4

Results and Discussion

4.1 Results

I studied 425 subjects (160 male and 265 female) between age 25 – 80 years inclusive from Hunza. After review of the data sheet, subjects with complete data were found 425/500 individuals those who respond include less than 90%, 62.35 % women and 37.6 % men.

More than 24.24 % of the subjects were with secondary education, 45.18 % with primary education and 22.59 % were graduated from universities respectively. Mostly respondents were unemployed during survey and more than 27.53 % were employed. Among 425 subjects 39.29 % had history of hypertension while the remaining 60.7 % mention that they did not have any hypertension history.

Blood pressure measurments was done in all participants to check hypertension. The mean of systolic and diastolic BP results were 120.8 mm Hg and 79.6 mm Hg. Among all repsondents, 33.88 % were identified as hypertensive and 66.12 % were non hypertensive.

Among hypertensive, there were 58.3% subjects who were using anti hypertensive medication during data collection period. 41.41 % has noraml BP on measurements. During this study I observed an age wise dependent raise the prevalence of hypertension in both male and female as with the minor prevalence in younger agewise groups and major in high age groups.

TABLE 4.1: Socio-Demographic Characteristics of Study Participants in Hunza 2020

Characteristics	**Frequency (n)**	**Percentage (%)**
Sex		
Male	160	37.65
Female	265	62.35
Age (years)		
25 – 34	79	18.59
35 – 44	91	21.41
45 – 54	76	17.88
55 – 64	69	16.24
65 – 74	55	12.94
75 years & above	55	12.94
Duration of Stay in Community		
$\geq$ 10 years	23	5.41
11 - 29 years	104	24.47
30 - 49 years	86	20.24
$\leq$ 50 years	212	49.88
Marital Status		
Married	373	87.76
Unmarried	47	11.06
Divorced	5	1.18
Education		
Uneducated	34	8
Primary	192	45.18
Secondary	103	24.24
Tertiary	96	22.59
Job Status		
Employed	117	27.53
Self employed	134	31.53
Unemployed	174	40.94

Table 4.1 shows the sociodemographic characteristics of respondents such as age, sex of hypertensive (n=144) and non-hypertensive (n=281) groups. The hypertension prevalence was significantly higher in individuals more than 45 years than those less than 45 years. There was significant difference in the two groups with respect to age. It also showed the significant difference in hypertension prevalence in different education classes. There was also the difference in hypertension

prevalence in different occupational catagories.

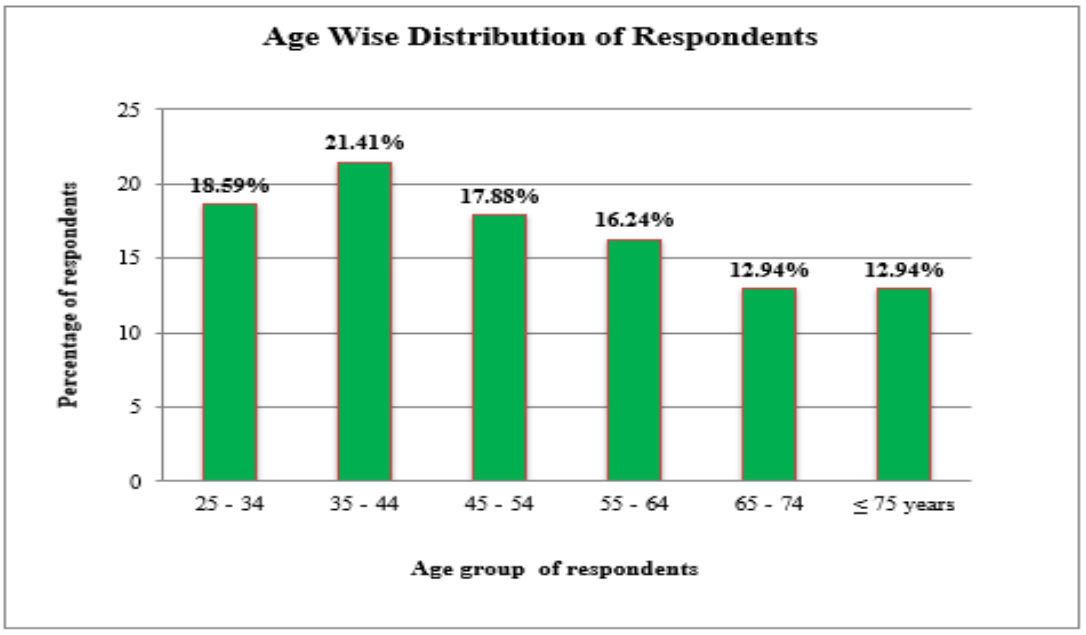

FIGURE 4.1

The graph recorded in **figure 4.1** represents the age wise distribution of respondents. This showed that 18.59% were in age group of 25-34, 21.41% were in age group of 45-54, 16.24% were in age group of 55-64, 12.94% were in the age group of 65-74 and 12.94% were in the age of 75 years and above.

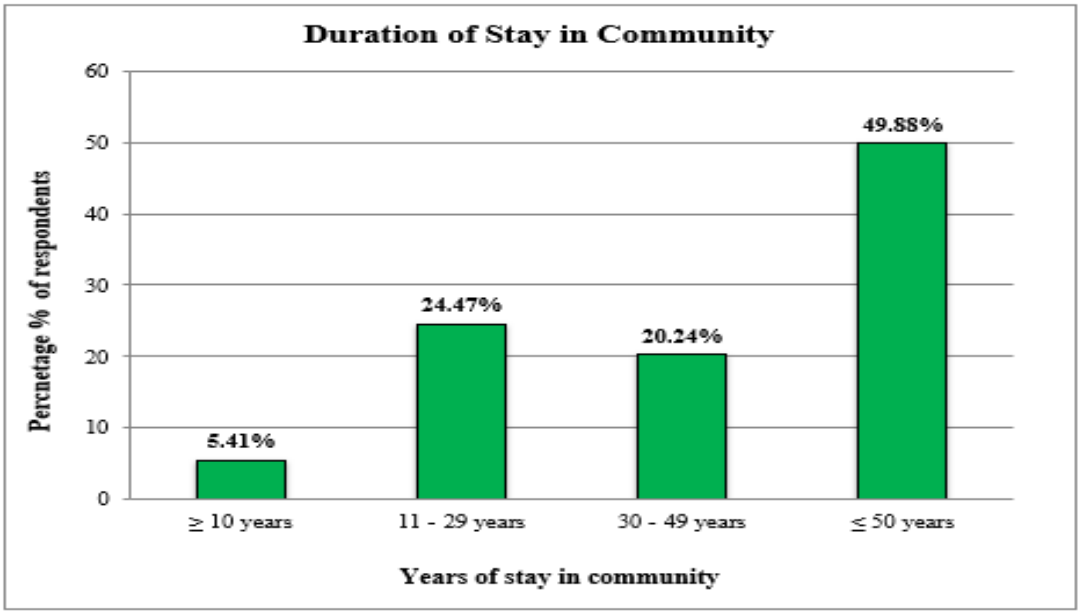

FIGURE 4.2: The duration of stay in community of the respondents in hypertension study

The graph recorded in **figure 4.2** presented the duration of saty in the community. This showed that 5.41% of the subjects were living for ≥ 10 years in the community. 24.47% were living for 11-29 years, 20.24 % were living for 30-49 years and 49.88% were living for more than 50 years.

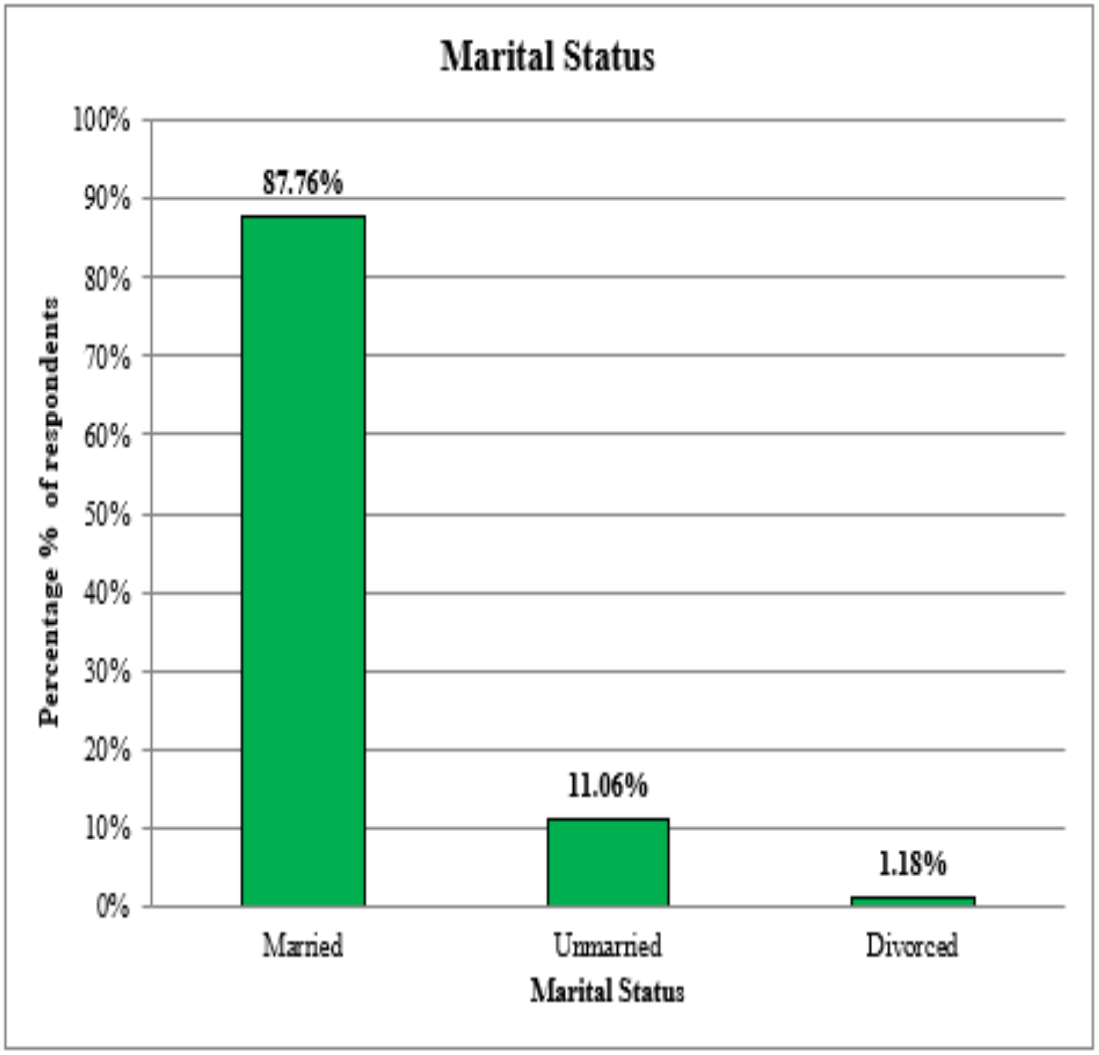

FIGURE 4.3: Marital status of the respondents in hypertension study

The graph recorded in figure 4.3 represents the marital status of the respondents. This graph showed that 87.76% of the subjects are married, 11.06% are unmarried and 1.18% are divorced.

The graph recorded in **figure 4.4** represents the educational status of the respondents. This showed that 8% of the subjects were uneducated, 45.18% were primary level, 24.21% were econdary level and 22.59% got tertiary level of education.

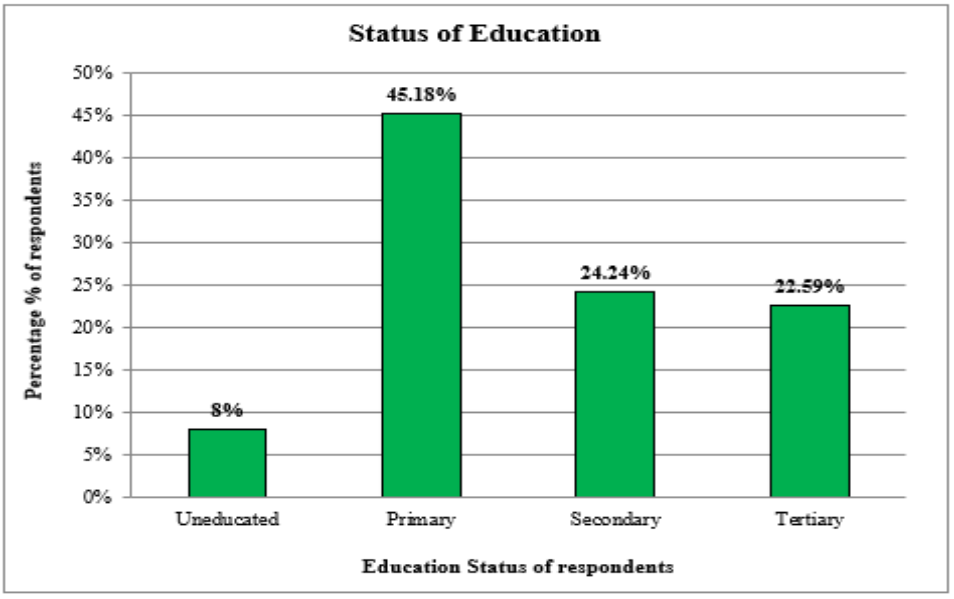

FIGURE 4.4: Education status of the respondents in hypertension study

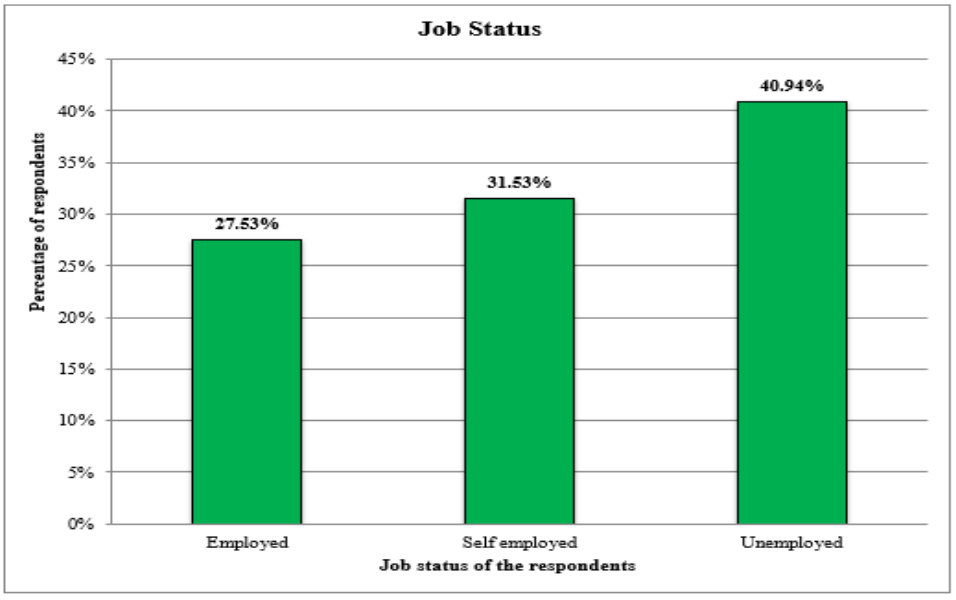

FIGURE 4.5: Job Status of the respondents in hypertension study

The graph recorded in **figure 4.5** represents the job status of the respondents. This showed that 27.53% were employed, 31.53% were self employed and 40.94% were unemployed during survey.

Table 4.2 shows the association between sociodemographic characteristics and hypertension, its prevalence with the age. It is statistically significant with hypertension ($p \leq 0.000$). The table also showed that sociodemographic characteristics as duration of stay in the community, marital status. Education and job status,

all are statistically significant with hypertension (p=0.000). The prevalence was higher in old age group, subject with primary education, living in the community for more than 50 years and unemployed subjects.

TABLE 4.2: Socio-Demographic Charactersitics of Hypertensive and Non-Hypertensive Group of Study Participants in Hunza 2020

Characteristics	**Hypertensive**		**Non Hypertensive**		**Chi square (X2)**	**p Value**
	n	**%**	**n**	**%**		
Sex						
Male	52	36.11	108	38.43	0.219	0.64
Female	92	63.89	173	61.57		
Age (years)						
25 – 34	9	6.25	70	24.91		
35 – 44	18	12.5	73	25.98	65.693	0
45 – 54	24	16.67	52	18.51		
55 – 64	26	18.06	43	15.3		
65 – 74	29	20.14	26	9.25		
75 years & above	38	26.39	17	6.05		
Duration of stay in the community						
≥10 years	2	1.39	21	7.47		
11 - 29 years	12	8.33	92	32.74	57.69	0
30 - 49 years	23	15.97	63	22.42		
≤ 50 years	107	74.31	105	37.37		
Marital Status						
Married	138	95.83	235	83.63		
Unmarried	5	3.47	42	14.95	13.381	0.001
Divorced	1	0.69	4	1.42		
Education						
Uneducated	29	20.14	5	1.78		
Primary	79	54.86	113	40.21	67.293	0
Secondary	21	14.58	82	29.18		
Tertiary	15	10.42	81	28.83		
Job Status						
Employed	24	16.67	93	33.1		
Self employed	41	28.47	93	33.1	20.289	0
Un employed	79	54.86	95	33.81		

Table 4.3: Predictors of Hypertension in Hunza 2020

Characteristics	**Subjects (n)**	**Hypertensive**		**OR**	**95% C.I**	**p Value**
		(n)	**(%)**			
Sex						
Male	160	54	33.8	0.905	0.567, 1.373	0.640
Female	265	92	34.7	1.0		
Physical activity						
Yes	365	126	34.5	1.201	0.663, 2.177	0.546
No	59	18	30.5	1.0		
Family history of Hypertension						
Yes	167	77	46.1	4.916	2.693, 8.974	0.000
No	258	67	26.0	1.0		
DM Status						
Diabetic	60	31	51.7	3.908	2.302, 6.617	0.002
Non diabetic	365	113	31.0	1.0		
Tobacco Consumption						
Yes	47	15	31.9	0.005	0.473, 1.732	0.763
No	378	129	34.1	1.0		
Fruit & Vegetable Consumption						
Yes	369	133	36.0	2.305	1.153, 4.609	0.016
No	56	11	19.6	1.0		

Table 4.3 shows the predictors of hypertension. The odds of developing hypertension was 4 times more among respondents who were having family history of hypertension compared to those who were having not any family history of hypertension.

[OR] : 4.916, 95% confidence interval [CI] :(2.693, 8.974). The table also shows that its also 3 times more among respondents who are diabetic as compared to non diabetic odd ratio [OR] : 3.908, 95% confidence interval [CI] : (2.302, 6.617).

The table also shows that there is less chances of developing hypertension among subjects who use much fruits and vegetables and do some physical activity. This table shows that there is significant association between "high blood pressure" and having "family history of Hypertension".

There were 146 subjects who were hypertensive and among those 77 respondents said that they have family history of hypertension.

It is also statistically significant as p value is (0.00). It was also found in this table that there is also association between "DM status" and hypertension as a person having diabetes have more chances of having high blood pressure as compared to normal person.

Studies showed that there is significant association between high blood pressure and the use of tobacco.

The results of my studies showed not any proper association between tobacco consumption and hypertension. This might be due to less use of tobacco among the residents of Hunza.

This table also showed that there is less chances of HBP in the subjects who use fruits and vegetables frequently and doing physical activity regularly.

This valley is well known for some popular fruits as apple, cherry, grapes, apricots, pears etc. people mostly consume these fruits and mostly use vegetables for cooking.

This was also statistically significant as p value = (0.016). This table showed that mostly subjects were doing some physical activity as out of 146 hypertensive subjects 126 were doing physical activity.

TABLE 4.4: Hypertension Prevalence Across Behavioral and Dietry Characteristics of Respondents in Hunza 2020

Sr.#	Statement	Options	Hypertensive		Non Hypertensive	
			n	%	n	%
1	Positive family history of hypertension	Yes	77	53.5	90	32
		No	67	46.5	191	68
2	Positive family history of Diabetes Mellitus	Yes	39	27.1	60	21.4
		No	105	72.9	221	78.6
3	DM Status	Diabetic	31	21.5	29	10.3
		Non diabetic	113	78.5	252	89.7
4	Smoking	Yes	15	10.4	32	11.4
		No	129	89.6	249	88.6
5	Doing physical activity every day	Yes	126	87.5	239	85.1
		No	18	12.5	42	14.9
7	Frequency of eating oil and fatty food	Not frequently	41	28.5	101	35.9
		Frequently	92	63.9	157	55.9
		Much frequently	11	7.6	23	8.2
8	Frequency of eating deep fries	Not frequently	41	28.5	84	29.9
		Frequently	62	43.1	137	48.8
		Much frequently	41	28.5	60	21.4
		More than once a day	0	0	4	1.4
9	Frequency of eating processed meat	About once a day	3	2.1	19	6.8
		Once a week	89	61.8	179	63.7
		Not at all	52	36.1	79	28.1

Table 4.4 shows the result that there are 167 (39.29 %) of respondents having positive family history of hypertension and 99 (23.29 %) of subjects having positive history of DM.

There were 60 (14.11 %) known DM patients.If we look at the table, there were 47 (11.05 %) of people are smokers and 365 (85.88 %) are doing some physical activity.

4.1.1 Dietary Practice of Respondents

Approximately, 294 (69.17%) of the study participants eat processed meat at least once a weak.

While 92 % of the participants eat oil and fatty food frequently. Regarding to the ratio of eating much deep fries 199 (46.82 %) consume mostly (frequently), and 101 (23.76 %) on much frequent basis.

4.1.2 Eating Oily and Fatty food

This table shows that among 146 hypertensive subjects 92 said that they consume oily and fatty food frequently, and 11 said they consume oil much frequently. As Hunza is cold area so people living there mostly use oily and fatty food in winters.

If we consider the practices and level of awareness about the use of fat among respondents, mostly knew that they must lower the consumption of oily and fatty products. Their attitude towards the less use of fatty products was positive.

4.1.3 Eating Processed Meat and Meat products

This table shows that among 146 hypertensive subjects 89 subjects said that they were using processed meat once a week, and 52 subjects said that they were not using at all.

Like fatty food meat is also staple food of the people of Hunza especially in winters. There is much use of meat and meat products among adults. This table shows the significant association between hypertension and consumption of meat.

Table 4.5: Association between presence of risk factor and hypertension in Hunza 2020

Risk Factor	Hypertensive		Non Hypertensive		Total		df	Chi Square (X2)	p value
	n (144)	%	n (281)	%	n (425)	%			
Family History of hypertension									
Yes	77	53.47	90	32.03	167	39.29	1	18.354	0
No	67	46.53	191	67.97	258	60.71			
Fruits and Vegetables consumption									
Yes	133	92.36	236	83.99	369	86.82	1	5.838	0.016
No	11	7.64	45	16.01	56	13.18			
Physical Activity									
Yes	126	87.5	239	85.05	365	85.88	1	0.365	0.546
No	18	12.5	42	14.95	60	14.12			
Tobacco Consumption									
Yes	15	10.42	32	11.39	47	11.06	1	0.091	0.763
No	129	89.58	249	88.61	378	88.94			
DM Status									
Diabetic	31	21.53	29	10.32	60	14.12			
Non diabetic	113	78.47	252	89.68	365	85.88	1	9.863	0.002

Continued Table: 4.5 Association between presence of risk factor and hypertension in Hunza 2020

Frequency of eating oily & fatty food									
Frequent	41	28.47	101	35.94	142	33.41			
	92	63.89	157	55.87	249	58.59	2	2.67	0.263
Not frequent									
	11	7.64	23	8.19	34	8			
Much frequent									
Frequency of consumption of salt									
Frequent	59	40.97	125	44.48	184	43.29			
Not frequent	66	45.83	126	44.84	192	45.18	2	0.816	0.665
Much frequent	19	13.19	30	10.68	49	11.53			
Frequency of eating oily processed meat									
More than once a day	0	0	4	1.42	4	0.94			
About once a day	3	2.08	19	6.76	22	5.18	3	8.105	0.044
Once a week	89	61.81	179	63.7	268	63.06			
Not at all	52	36.11	79	28.11	131	30.82			

Table 4.5 shows assocaition between presence of risk factors and hypertension. The hypertension prevalence was much in subjects having positive history as compared to those who did not. This relationship between hypertension history and hypertension was found by using pearson chisquare and this association was statistically significant (p=0.00). Respondents who consume fruits and vegetables have less prevalence compared to those who did not (p=0.016). If we consider the frequency of eating processed meat its prevalence is much in subjects eating much meat. This association was also statistically significant (p= 0.044). The prevalence is also higher in subjects with diabetes as compared to non diabetic (p= 0.002).

TABLE 4.6: BMI Category of Hypertensive and Non Hypertensive Respondents of Hunza 2020

BMI	**Male (n=160)**				**Female (n=265)**			
Category	**Hypertensive**		**Non Hypertensive**		**Hypertensive**		**Non Hypertensive**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Underweight	9	5.63	23	14.38	11	4.15	52	19.62
Normal	24	15	51	31.88	33	12.45	73	27.55
Overweight	13	8.13	26	16.25	36	13.58	27	10.19
Obese	6	3.75	8	5	12	4.53	21	7.92
Total	52	32.5	108	67.5	92	34.72	173	65.28

Table 4.6 shows BMI category of hypertensive and non hypertensive respondents of Hunza. The results found that there is much prevalence as (8.13%) of hypertensive male respondnets are over weight of total (32.5%). While (3.75%) are obese of total (32.50%). The results also showed that (13.58%) of hypertensive female respondents are over weight out of (34.72%). And 4.53% have obesity as out of (34.72%).

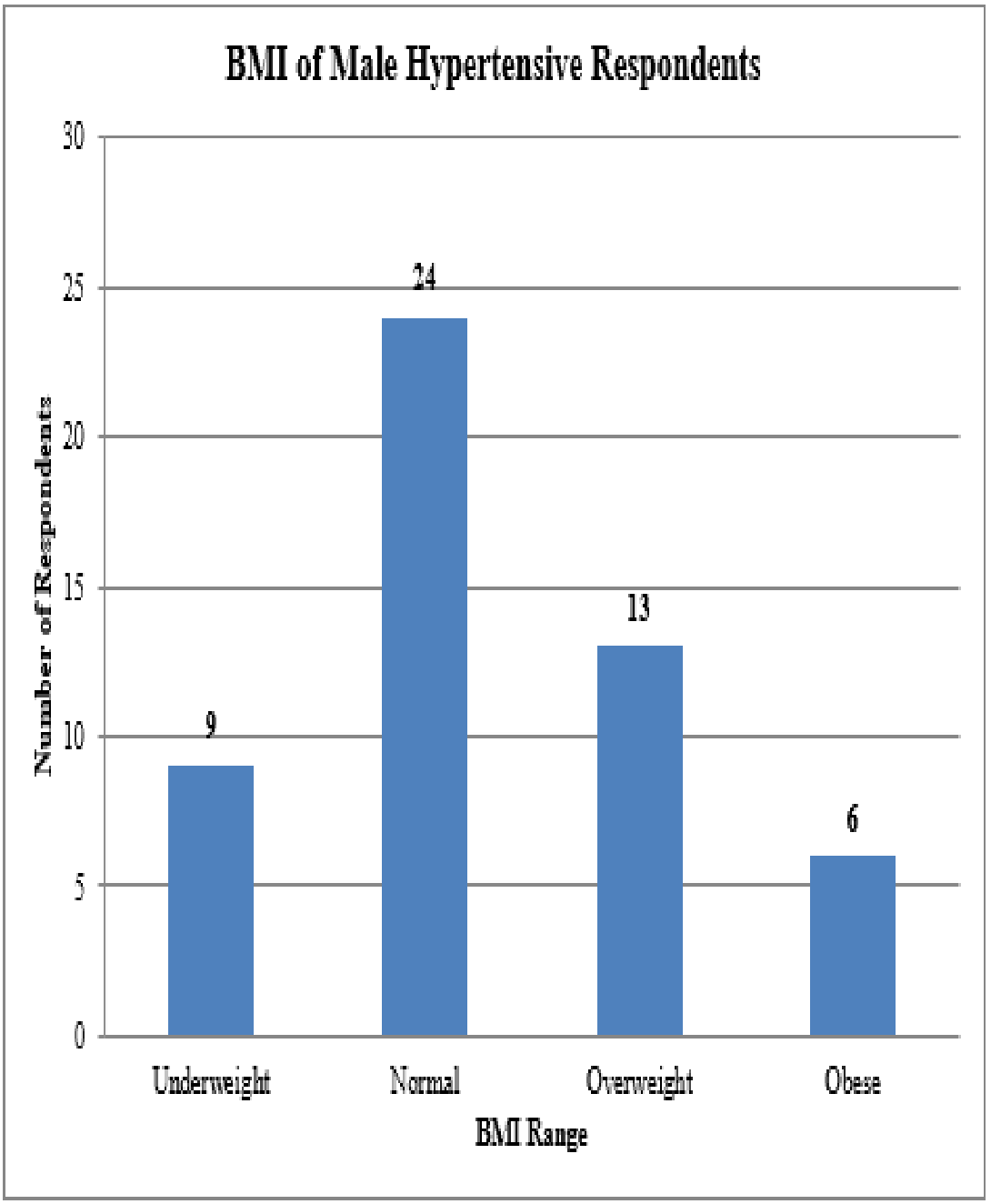

FIGURE 4.6: Graph Showing BMI of Male Hypertensive Respondents

The graph recorded in **Figure 4.6** represents the BMI of the male hypertensive respondents. This showed that 9 hypertensive male respondents were under weight out of total 52 male hypertensive respondents, similarly 24 male hypertensive respondents were normal, 13 hypertensive male respondents were over weight and 6 hypertensive respondents were obese out of total 52 hypertensive male respondents.

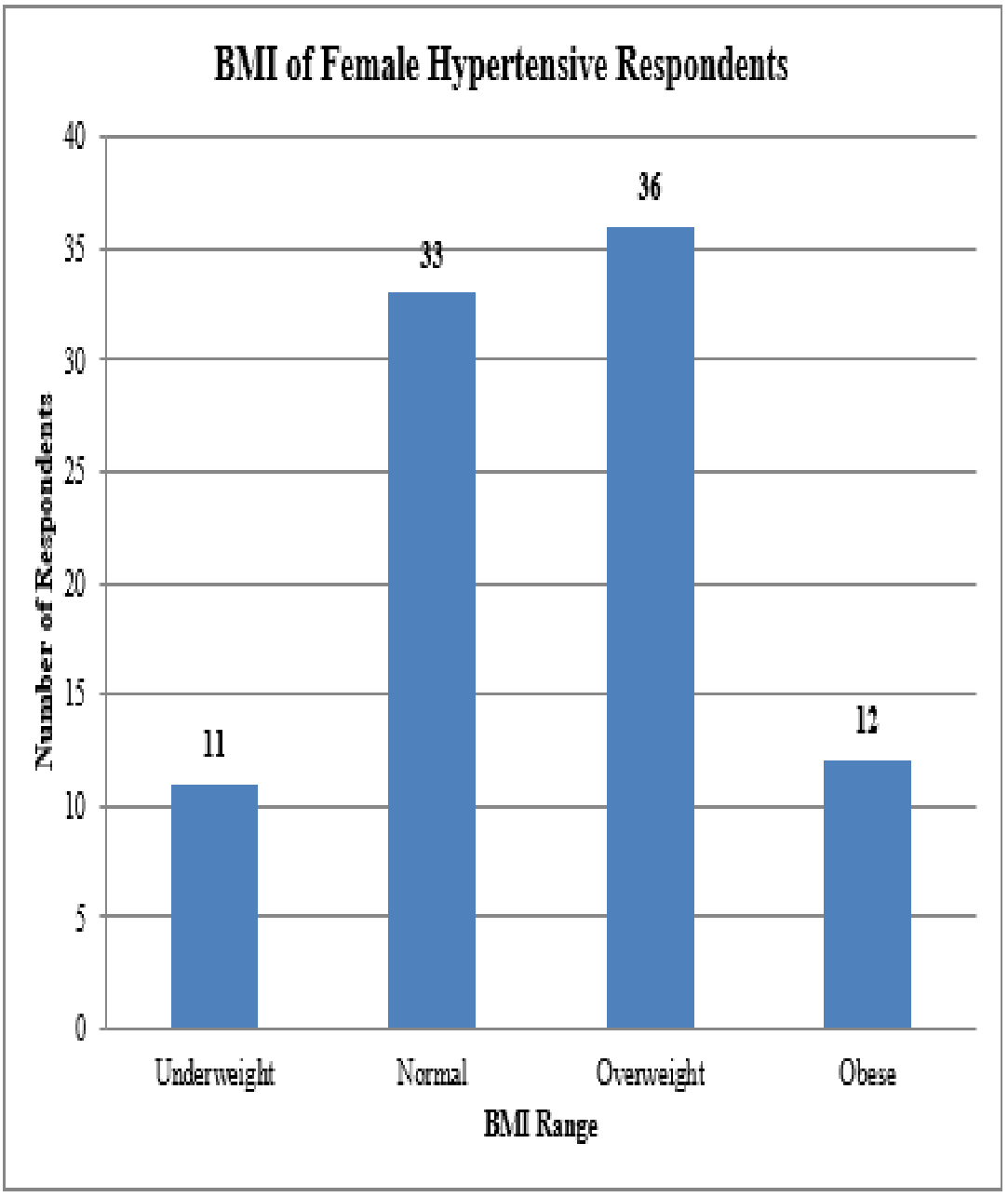

FIGURE 4.7: Graph Showing BMI of Female Hypertensive Respondents

The graph recorded in **figure 4.7** represents the BMI of the female hypertensive respondents. This showed that 11 hypertensive female respondents were under weight out of total 92 female hypertensive respondents, similarly 33 female hypertensive respondents were normal, 36 hypertensive female respondents were over weight and 12 hypertensive respondents were obese out of total 92 hypertensive female respondents.

Table 4.7: Knowledge of High Blood Pressure in the Respondents of Hunza 2020

Sr.#	Statement	Options	Hypertensive n=144	%	Non Hypertensive n=281	%
1	What do you think consumption of too much fat elevate your cholesterol level?	Yes	112	77.78	209	74.38
		No	32	22.22	72	25.62
2	Have you been told by a doctor or other health care provider that you were suffering from high blood pressure?	Yes	118	81.94	87	30.96
		No	26	18.06	194	69.04
3	What do you think are the causes of hypertension?	Fats in body	7	4.86	32	11.39
		High Cholesterol	18	12.5	47	16.73
		High intake of salt	117	81.25	194	69.04
		Sugar	2	1.39	8	2.85

Table 4.7 shows the knowledge of hypertension among respondents to know about the causes of hypertension participants were allowed to select an option among four options as 1) Fats in body 2) High cholestrol level 3) High intake of salt 4) Sugar, and mostly selected the option high intake of salt, during interview.

For example out of 425 subjects 311 select high intake of salt as the cause of hypertension.

Most of the hypertensive respondents said no to the question asked as, " have you ever been told by doctor that you have high blood pressure?". There was positive response by subjects for the question about the role of fats in increasing BP.

This table shows that among 146 hypertensive subjects 112 subjects said, "Yes" in response to question, "What do you think consumption of too much fat elevate your cholesterol level?"

Likewise 118 hypertensive subjects said "Yes" in response to the question, "Have you been told by a doctor or other healthcare provider that you were suffering from high blood pressure?"

There were 117 subjects who knew that high intake of salt is the main cause of HBP and 26 subjects said that fats in body are the main cause of hypertension.

This table found that there was positive attitude of respondents towards the prediction of HBP. Mostly participants agreed that much consumption of fat, oil and salt are the factor for HBP.

This attitude will help them to control high blood pressure and related cardiovascular disorders. In this study there were some respondents who were hypertensive but never went to doctor to examine blood pressure, and there were some who were above 100 years but not have any HBP. This might be due to their proper diet and regular exercise.

If we consider the attitude towards high blood pressure, this study found that mostly respondents as both non hypertensive and hypertensive. Moreover, this showed positive attitude toawards predictions of HBP. All the participants agreed that intake of vegetables and fruits, regular checkup of blood pressure and discussion with physician can help in controlling HBP.

Table 4.8: Attitude Towards Prediction of Hypertension among Repondents in Hunza 2020

Sr.#	Statement	Options	Hypertensive		Non Hypertensive	
			n	%	n	%
1	Should we reduce salt to prevent hypertension?	Yes	130	90.28	214	76.16
		No	4	2.78	41	14.59
		Don't Know	10	6.94	26	9.25
2	What do you think we lose our weight	Yes	100	69.44	196	69.75
		No	14	9.72	46	16.37
		Don't Know	30	20.83	39	13.88
3	Can being overweight or obese put you risk for developing high blood cholesterol?	Yes	112	77.78	189	67.26
		No	12	8.33	45	16.01
		Don't Know	20	13.89	47	16.73
4	Do you think high blood pressure can be prevented?	Yes	115	79.86	206	73.31
		No	9	6.25	32	11.39
		Don't Know	20	13.89	43	15.3
5	Should we use plenty of vegetables and fruits?	Yes	131	90.97	234	83.27
		No	5	3.47	17	6.05
		Don't Know	8	5.56	30	10.68
6	Do you think medicines for high blood pressure must be taken every day?	Yes	100	69.44	105	37.37
		No	22	15.28	130	46.26
		Don't Know	22	15.28	46	16.37

Table 4.8 shows the result of attitude of respondents either suffering from hypertension or are non-hypertensive. If we consider the overall attitude of all respondents, towards cause of HBP, it was positive. For example most of the hypertensive respondents agreed, that they should mostly use vegetables and fruits, it is necessary to lose weight and should reduce salt intake to control HBP. Most of the hypertensive respondents agreed that medicines for high blood pressure must be taken each day. Most of the respondents unanimously agreed that high blood pressure can be prevented.

This shows positive attitude of respondents towards reduction of salt. Because only 7% of the subjects are unaware about the less use of salt to control high blood pressure. Most of the respondents unaimously agreed the statement. The

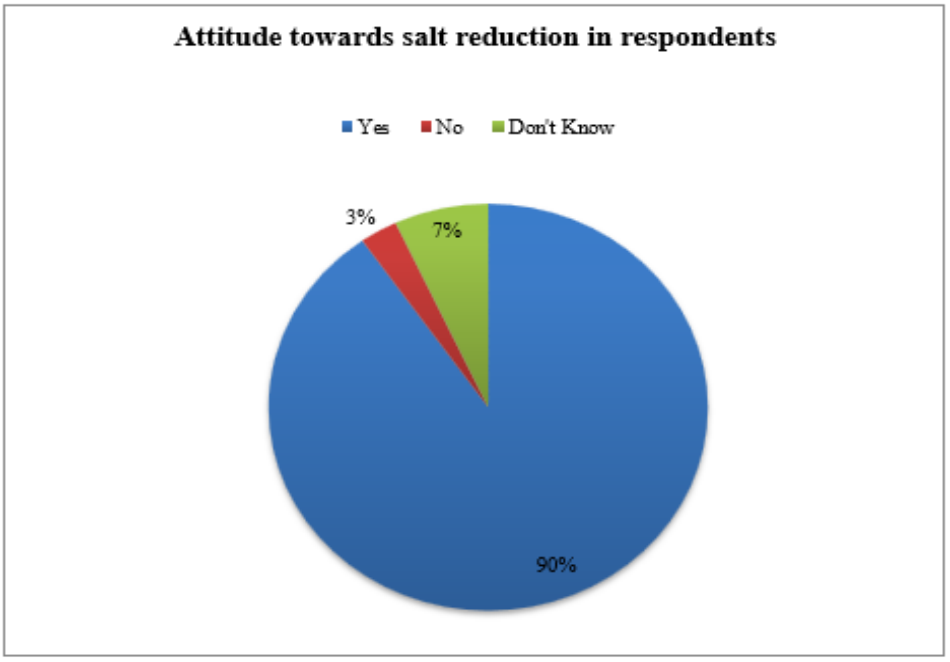

FIGURE 4.8: Attitude towards salt reduction in respondents of hypertension study

pie chart in **figure 4.8** represents attitude towards salt reduction in respondents in Hunza. In answering the question , "should we reduce salt to prevent hypertension?", 90% of the subjects said "Yes", 2% said "No" and 6% said "Don't know".

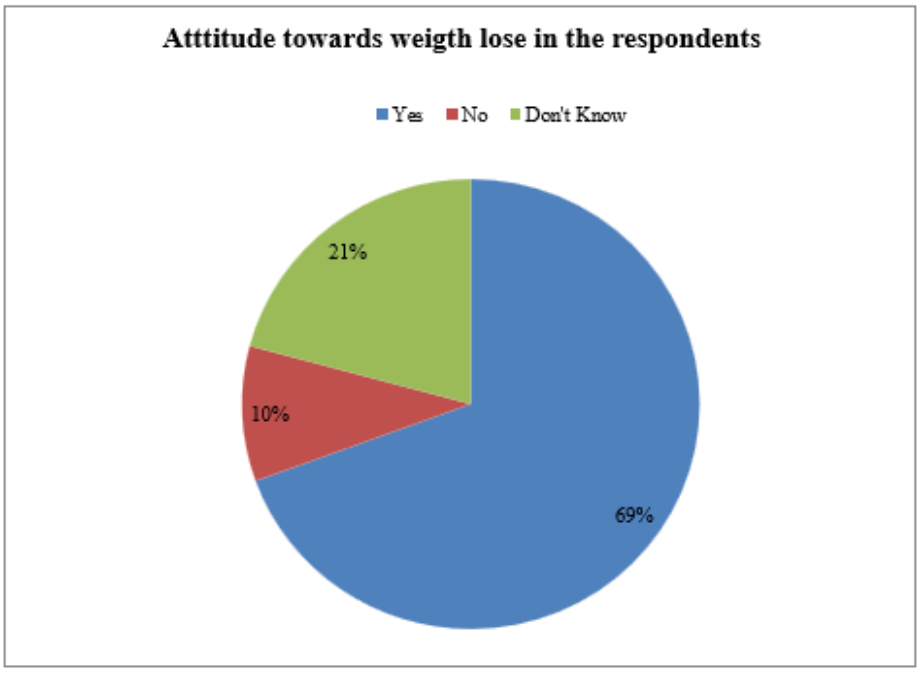

FIGURE 4.9: Attitude towards weight lose in respondents of hypertension study

The pie chart in **figure 4.9** represents attitude towards weight lose in respondents of hypertension study in Hunza. In answering the question , "What do you think we lose our weight", 69% of the subjects said "Yes", 10% said "No" and 21% said "Don't know".

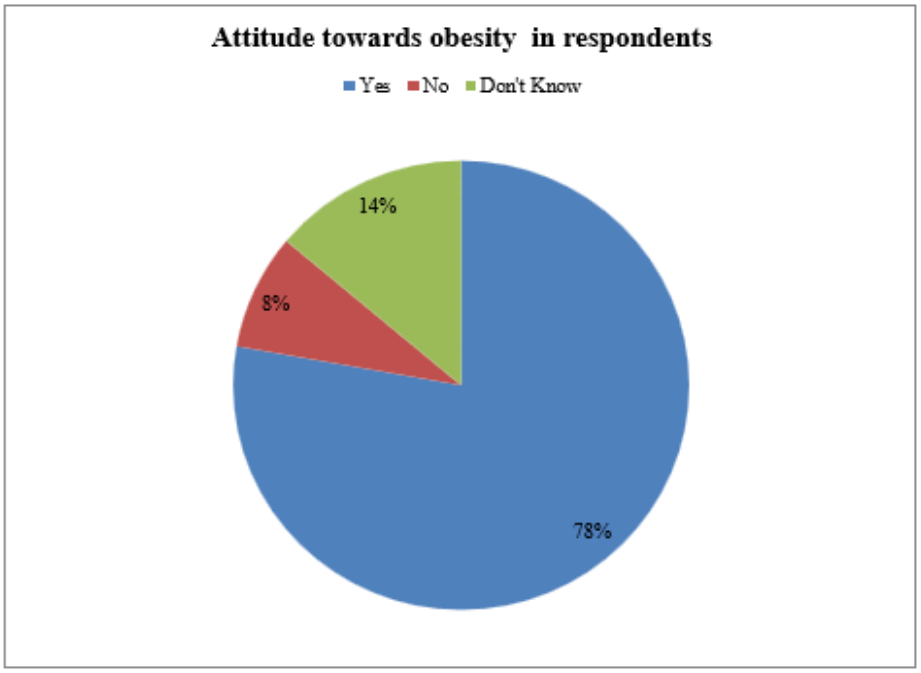

FIGURE 4.10: Attitude towards obesity in respondents of hypertension study

The pie chart in **figure 4.10** represents attitude towards obesity in respondents of hypertension study in Hunza.

In answering the question , "Can being overweight or obese put you risk for developing high blood cholesterol?, 78% of the subjects said "Yes", 8% said "No" and 14% said "Don't know".

This also shows the positive attitude of respondents toward prevention of high blood pressure among subjects, because 80% of the subject agreed that high blood pressure can be prevented and only 14% were unaware of the prevention. In this study 6% of the subjects disagreed the statement.

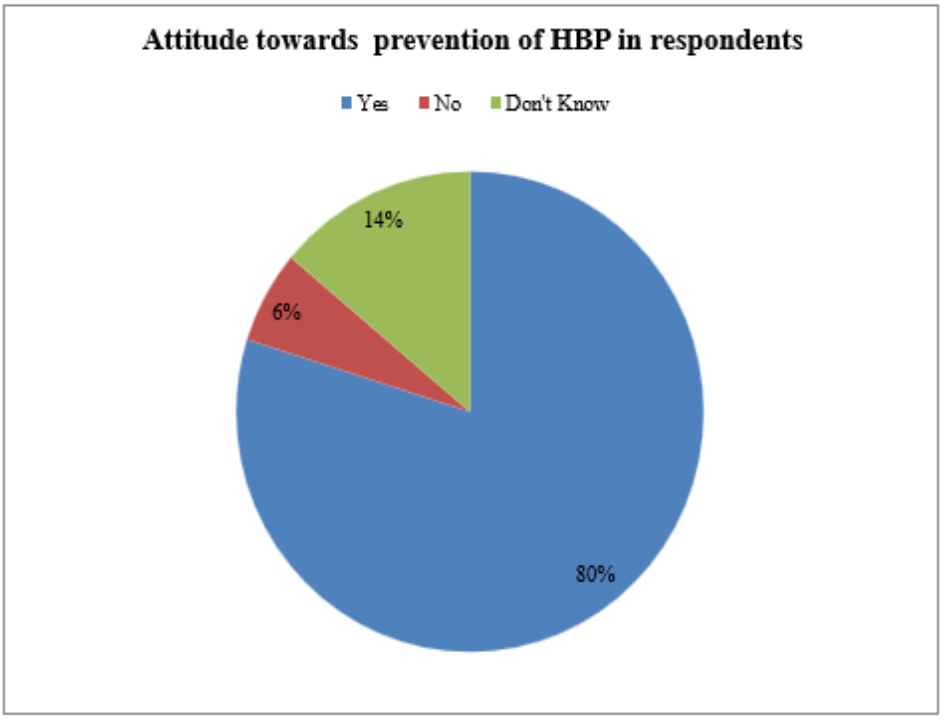

FIGURE 4.11: Attitude towards prevention of HBP in respondents of hypertension study

The pie chart in **figure 4.11** represents attitude towards prevention of HBP in respondents of hypertension study in Hunza. In answering the question , "Do you think high blood pressure can be prevented?, 80% of the subjects said "Yes", 6% said "No" and 14% said "Don't know".

This figure also shows the positive attitude of respondents towards the control og HBP. As 91% of the respondents agreed that its important to use plenty of vegetables and fruits to control HBP.

And only 6% are unaware about use of fruits and vegetables toward control of high blood pressure and only 3% of the subject disagreed the statement.

As hunza is for some fruits as apple, cherry, graphs so people mostly use these fruits.

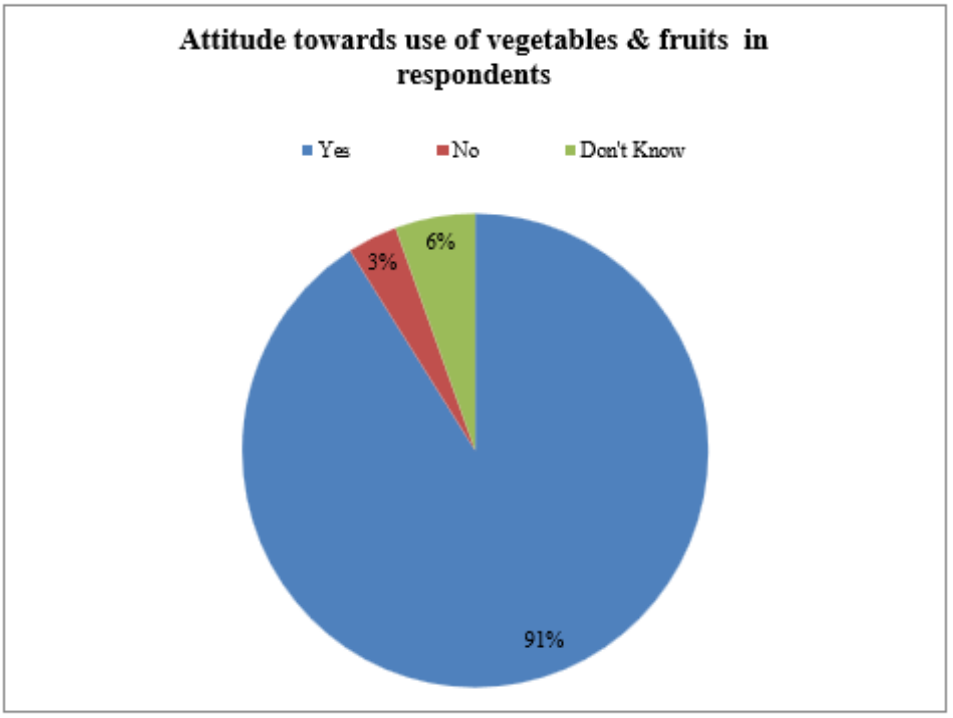

FIGURE 4.12: Attitude towards use of vegetables and fruits in respondents of hypertension study

The pie chart in **figure 4.12** represents attitude towards use of vegetables and fruits in respondents of hypertension study in Hunza.

In answering the question , "Should we use plenty of vegetables and fruits?, 91% of the subjects said "Yes", 3% said "No" and 6% said "Don't know".

Table 4.9: Practices towards hypertension among the residents of Hunza 2020

Sr.#	Statement	Options	Hypertensive		Non Hypertensive	
			(n)	(%)	(n)	(%)
1	Are you currently taking medicines for high blood pressure?	Yes	84	58.3	60	21.4
		No	60	41.7	221	78.6
2	Are you changing eating habits to help lower or control your blood pressure?	Yes	101	70.1	170	60.5
		No	43	29.9	111	39.5
3	Are you cutting down salt to help lower or control your blood pressure?	Yes	105	72.9	181	64.4
		No	39	27.1	100	35.6
4	Are you exercising to help lower or control your blood pressure?	Yes	64	44.4	158	56.2
		No	80	55.6	123	43.8
5	How frequently do you check your blood pressure?	Daily	4	2.8	2	0.7
		Weekly	12	8.3	29	10.3
		Monthly	39	27.1	88	31.3
		When fall ill	89	61.8	162	57.7
6	What is the frequency of eating oily and fatty food?	Not frequent	92	63.9	157	55.9
		Frequent	41	28.5	101	35.9
		Much frequent	11	7.6	23	8.2

Continued Table: 4.9 : Practices towards hypertension among the residents of Hunza 2020

Sr.#	Statement	Options	Hypertensive		Non Hypertensive	
			(n)	(%)	(n)	(%)
7	What is the frequency of deep frying?	Not frequent	62	43.1	137	48.8
		Frequent	41	28.5	84	29.9
		Much frequent	41	28.5	60	21.4
8	What is the frequency of consumption of salt?	Not frequent	66	45.8	126	44.8
		Frequent	59	41	125	44.5
		Much frequent	19	13.2	30	10.7
9	How often do you put extra salt on your food or fruits before eating?	Most of the time	10	6.9	20	7.1
		Some of the time	68	47.2	113	40.2
		None of the time	66	45.8	148	52.7

Table 4.9 shows that majority of the respondants (n=251) said that they follow checking their blood pressure when fall ill. Mostlt they agreed that they were not using oils and fatty food and deep fries frequently. Interestly of 84 hypertensive patients consume their medicine on daily basis. much than half of the respondents report that they were doing exercise daily. If we consider the over all practices of respondents towards changing eating habits to control BP, it was positive as mostly said "Yes".

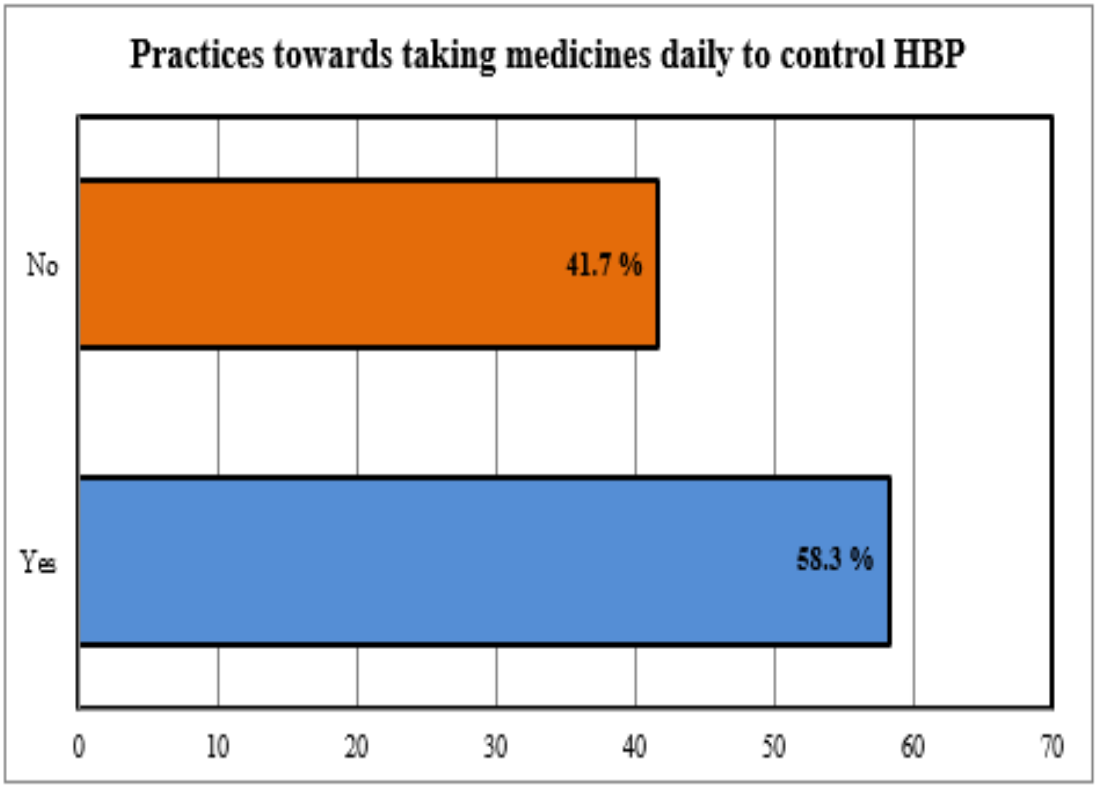

FIGURE 4.13: Practices towards use of medicine on daily basis to control HBP in respondents of hypertension study

The bar graph in **figure 4.13** represents practices towards taking medicines daily. In answering the question, " Are you currently taking medicines for high blood pressure?", 58.3% hypertensive subjects said "Yes" and 41.7% subjects said "No".

The bar graph in **figure 4.14** represents practices towards change in eating habits to control HBP in respondents of hypertension study. In answering the question, "Are you changing eating habits to help lower or control your blood pressure?, 70.1% hypertensive subjects said "Yes" and 29.9% subjects said "No".

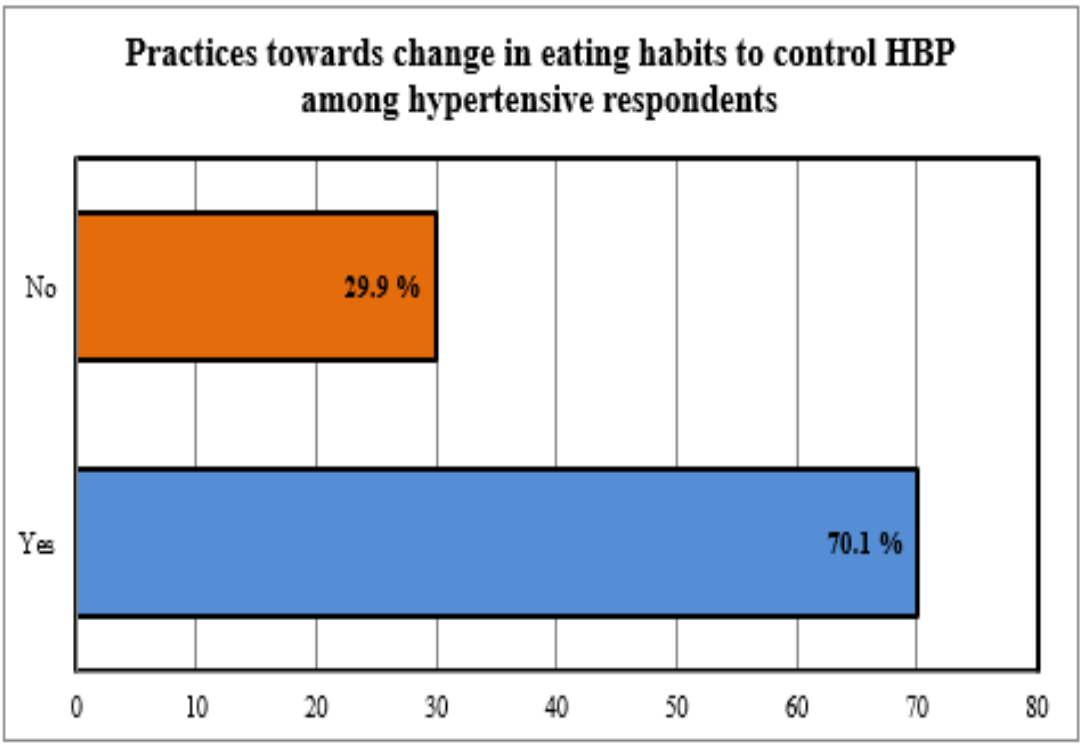

FIGURE 4.14: Practices towards change in eating habits to control HBP in respondents of hypertension study

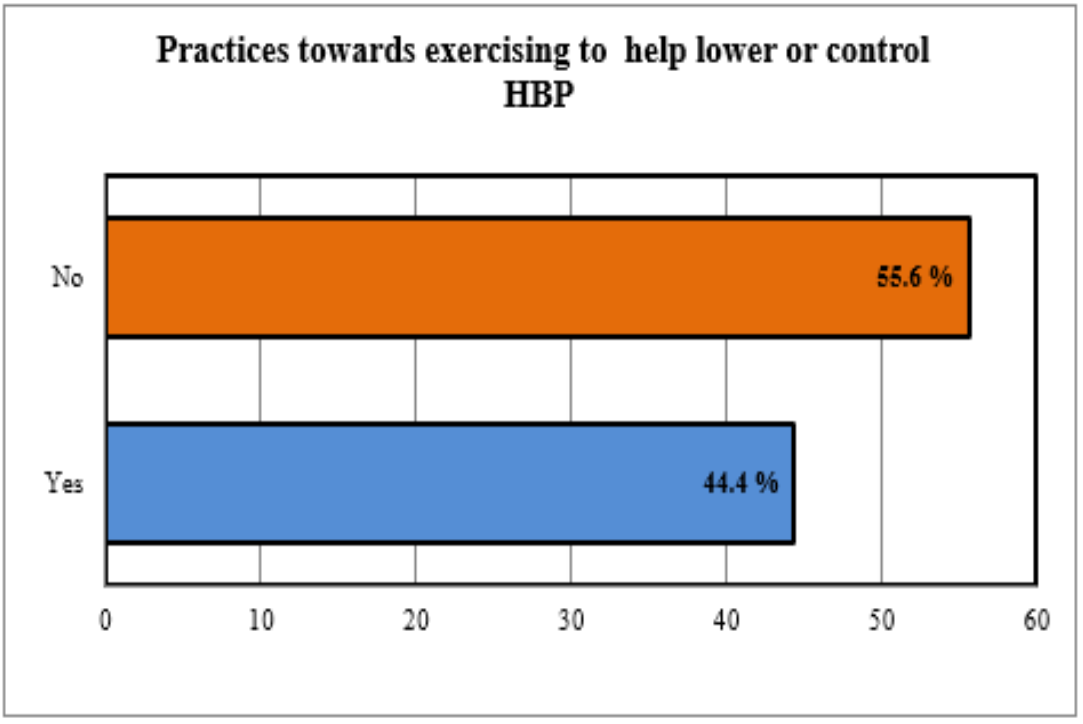

FIGURE 4.15: Practices towards exercising to help lower or control HBP in the respondents of hypertension study

The bar graph in **figure 4.15** represents practices towards exercising to help lower HBP in the respondents of hypertension study. In answering the question, "Are you exercising to help lower or control your blood pressure?, 44.4% hypertensive subjects said "Yes" and 55.6% subjects said "No".

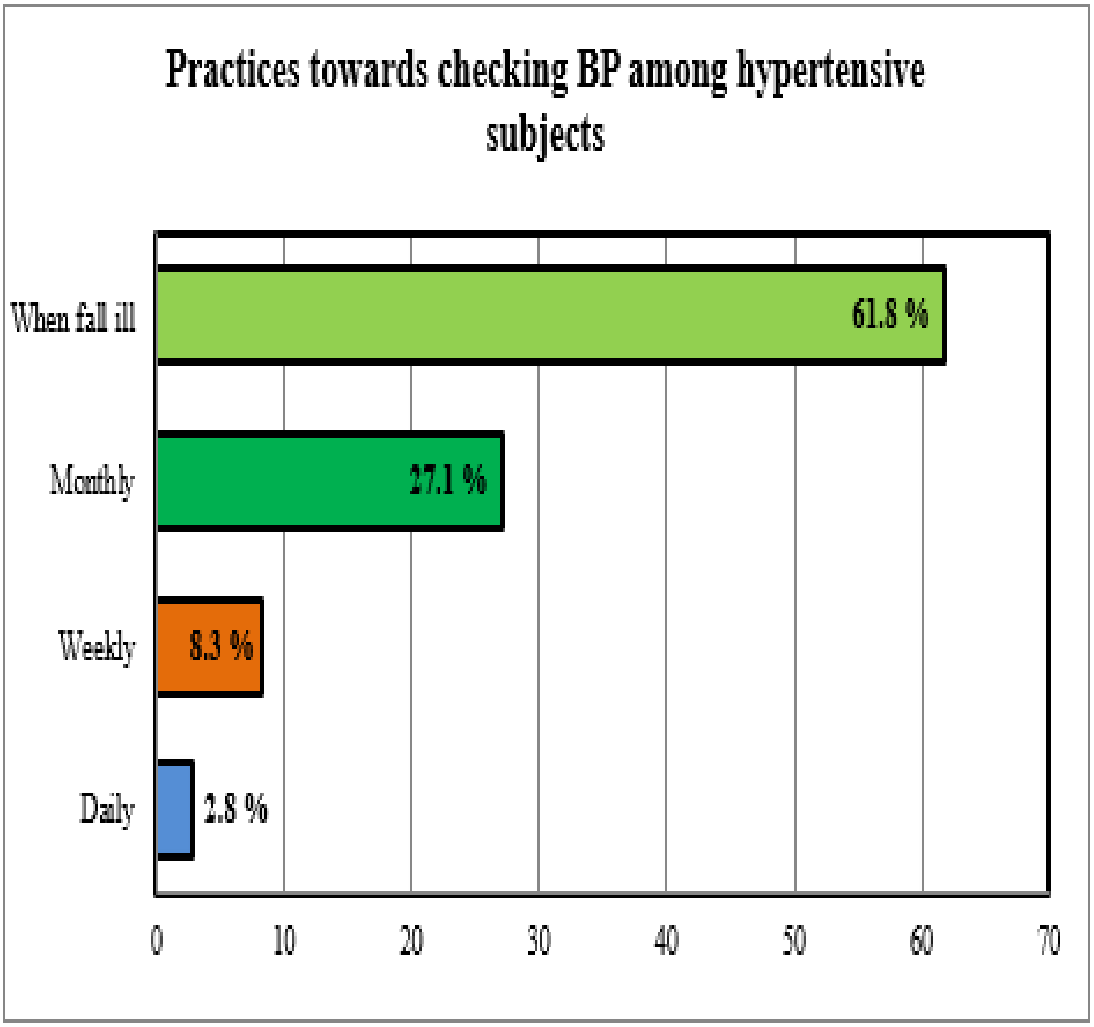

FIGURE 4.16: Practices towards checking of BP in the respondents of hypertension study

The bar graph in **figure 4.16** represents practices towards checking of hypertension in the respondents of hypertension study. In answering the question, "How frequently do you check your blood pressure?, 2.8% hypertensive subjects said "Daily", 8.3% subjects said "Weekly", 27.1% of the respondents were checking monthly and 61.8% respondents answered, "When fall ill".

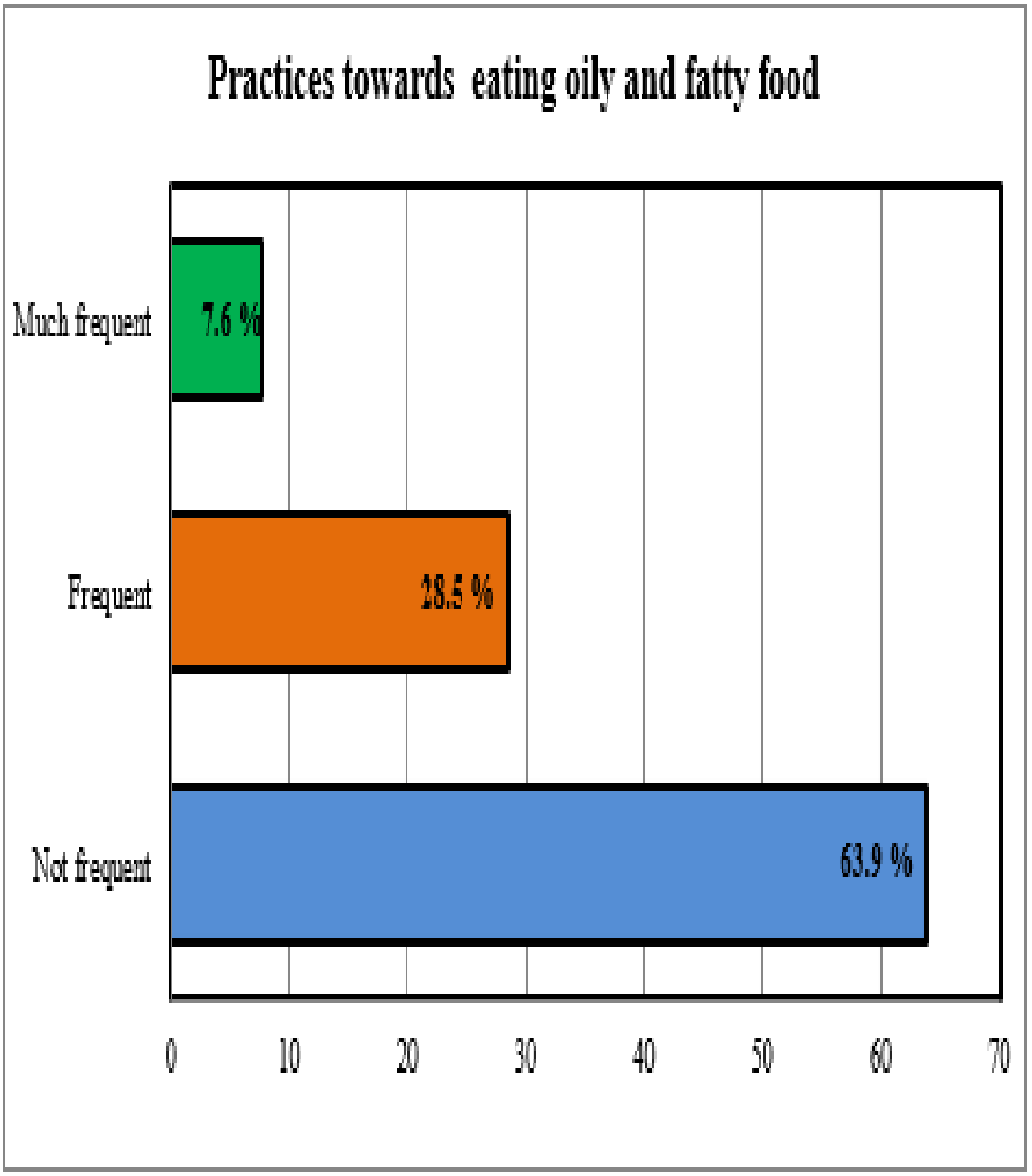

FIGURE 4.17: Practices towards eating oily and fatty food in respondents of hypertension study

The bar graph in **figure 4.17** represents practices towards eating oily and fatty food in the respondents of hypertension study. In answering the question, "What is the frequency of eating oily and fatty food?, 63.9% hypertensive subjects were not frequent, 28.5% subjects were frequent, 7.6% of the respondents were much frequent in eating oily and fatty food.

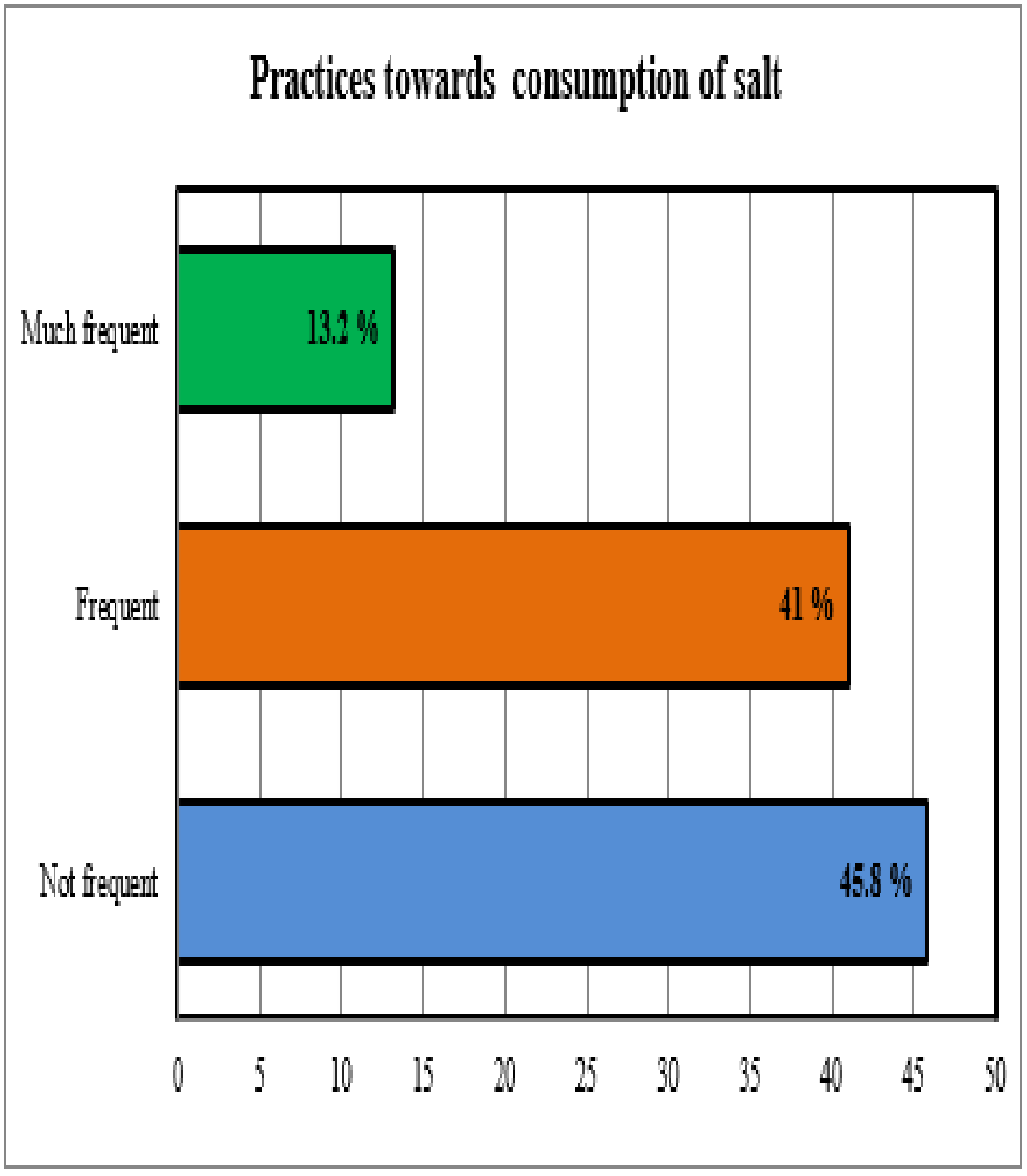

FIGURE 4.18: Practices towards consumption of salt in the respondents of hypertension study

The bar graph in **figure 4.18** represents practices towards consumption of salt in the respondents of hypertension study. In answering the question, "What is the frequency of consumption of salt?, 45.8% hypertensive subjects were not frequent, 41% subjects were frequent, 13.2% of the respondents were much frequent in salt consumption.

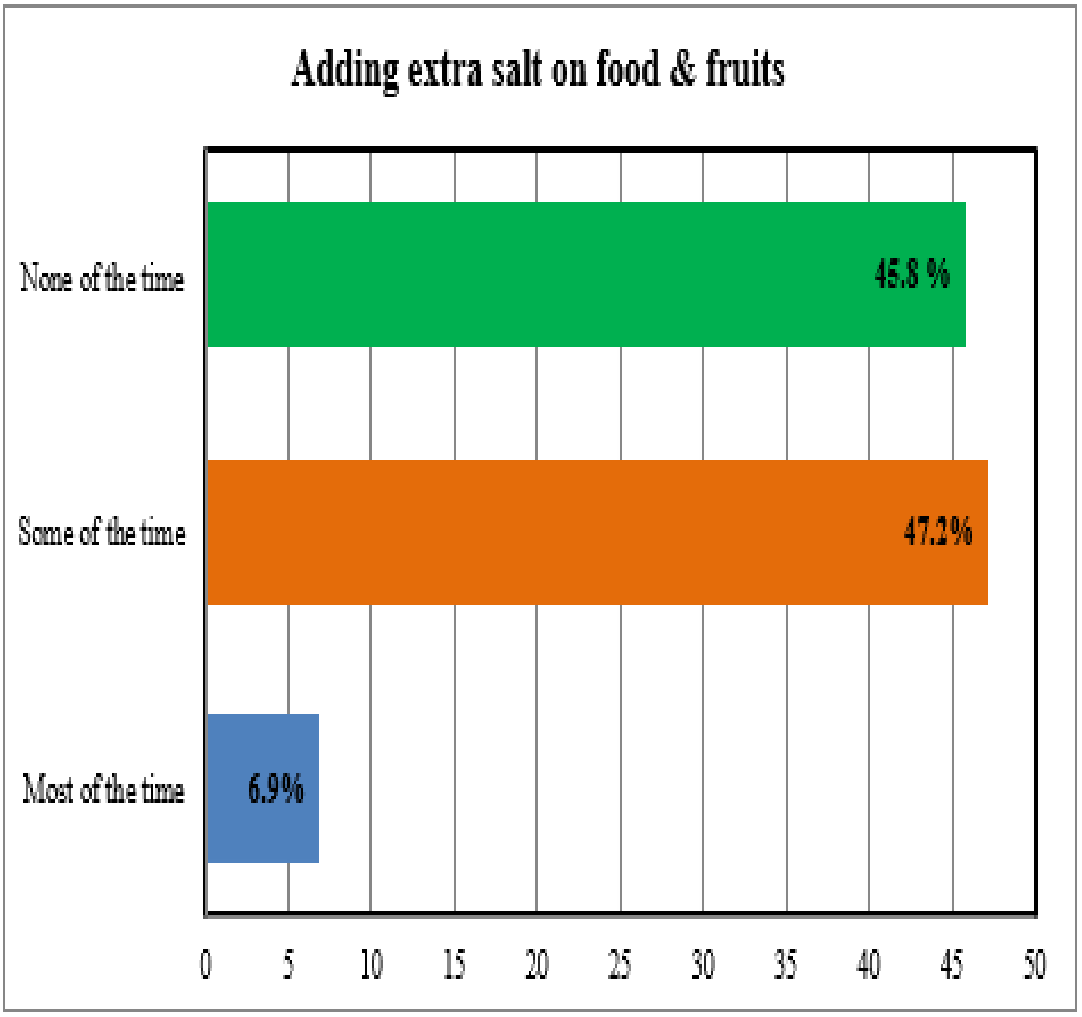

FIGURE 4.19: Practices towards adding extra salt on food and fruits before eating in the respondents of hypertension study

The bar graph in **figure 4.19** represents practices towards adding extra salt on food and fruits before eating in the respondents of hypertension study. In answering the question, "How often do you put extra salt on your food or fruits before eating?, 45.8% hypertensive subjects said "Much of the time", 47.2% subjects said "Some of the time" and 6.9% of the respondents said "Most of the time".

4.2 Discussion

In general prevalence of hypertension in our study was (33.88%) [144/425] STEPS surveys were conducted in several villages in Hunza, the valley in the north of

Pakistan. In 1998, the prevalence of hypertension was studied in Ghizar district which is an area near to Hunza. Its prevalence was 14.89 % in Ghizar. My studies showed that there is increase in hypertension prevalence in Hunza which might be due to change in dietry habits, and other factors as much use of processed meat, less physical activity and much consumption of salt.

A total of 425 adults aged 25-90 years from 170 house holds were studied. If we considered the sex distribution of the respondents it was male (37.65 %) [160/425] and female (62.35 %) [265/425]. In my studies there were more female respondents. These findings are agree with the same findings in a survey conducted in Ghizar district in 1998. In this study patients practices were observed, in which (61.8 %) respondents answered that they checked their blood pressure when they fall ill.

"My research revealed that age and family history are associated with hypertension, as aging reduces the elasticity of blood vessels leading to an increase in blood pressure" [41]. "There will be some other possible reasons as older people pay less attention to take care of their health, or may be due to lack of financial means for their health care. Also, the accumulation of hypertension risk factors increase along with the age of individuals"[43]. This study showed that 40% of the population above 65 years have hypertension, the occurance of hypertension and among older in this study population was some what lower (23.26%). This increase in hypertension with age is a well known fact.

Obesity is one of the major risk factor in developing hypertension, participants with BMI ¿ 25 are at higher risk as compared to those having BMI less than 25. This fact is supported by many other studies and they have reported a strong connection between BMI and hypertension.

If we consider the previous studies, it is found that "High HBP is common, complex and phylogenetic disease whose phenotype is the result of multiple interactions between genes and the environment" [5].

If I link this with my studies, these environmental aspects might be linked to dietary habits of an individual and his cultural aspects which could explain the connection between the family history and the hypertension. As my study strongly showed this association.

The study has provided information on the subject of hypertension its prevalence and related factors of hypertension among adults living in the urban population of Hunza. It has demostrated a (33.88%) prevalence of hypertersion. "My present study depict that having family history of hypertension, being aged, having much weight,diabetes mellitus, and obesity was significantly associated with hypertension. In my studies, the individuals with positive family history were more likely to be hypertensive, this could be explained by the fact that genetic factors accounted for one third to one half of the risk of hypertension. Blood relatives tend to have many of the same genes that can predispose a person to high blood pressure, heart diseases or stroke" [6-7].

If we consider the on the whole prevalence of hypertension, it is significantly elevated, than the studies conducted in 1998 in north of pakistan. This could be due to fact that people have changed dietary habits and life style modification. This high prevalence in the area has found to be serious public health implications as there are much chances of risk of cardiovascular disease.

In this study, prevalence of hypertension increased with age. "Prevalence increases from (12.5%) in 35-44 age group, (16.67%) in 45-54 age group, (18.06%) in 55-64 age group, (20.14%) in 65-74 age group and (26.39%) in $\leq$ 75. As compared to studies in the western countries, where 40% of the population over age 65 have hypertension" [36]. The occurance of hypertension found that this study population was some what lower.

Our studies showed that there was not any significant association between use of tobacco and increase in hypertension. This is inconsistant with the other findings where tobacco was considered as leading factor in increasing hypertension. The results of my studies was inversely propotional due to low level of tobacco use among the respondents of Hunza.

Research reveals that the life style modifications are one of important determinants of our physical health is an helpful tool to manage and maintain HBP. If we consider physical activity, most of the respondents said that they were doing physical activity daily and understood that exercise plays positive role in hypertension control. Our findings are agreed by other studies and its proved that physical

activity plays significant role in medicine free management of hypertension. In this study majority of the respondents also agreed that consumtpion of fruits and vegetables also plays an important role in controlling HBP.

The use of fats was related with hypertension. There is much use of saturated fats (butter, meat, lurd fat or margarine, whole milk etc) is common in these areas. As Hunza is very cold area and mostly covered with snow so people like to eat meat with animal fat and denatured oil from fries are are also reused for cooking. A study onducted in 1998 shows the similar findings.Interestly i have found inverse relationship between fats and oil consumption and hypertension, this could be explained by the fact that might be all hypertensive subjects changed their dietary habits towards low consumption of fats under medical advice.

"Consumption of extra table salt, in addition to what has already been included in the dish is associated with HBP and stroke and this has been proven by clinical studies" [33]. There is much use of salted tea in the north of Pakistan specially in Hunza, as almost all the respondents drink salted tea. "Another study carried out in the salted tea drinking population in Indian-hold Kashmir showed an independent effect of salt intake on blood pressure" [28].

The current study showed that there is low propertion of hypertension among those with control salt intake being hypertensive, this could also be explained by the fact that might be the hypertensive respondents were using less salt under medical advice.

Studies found that marital status was also associated with hypertension. If we consider a single individual, he might be expose to stress more because of low socialization while married individuals, are more secure .

"If we consider the diet there is less control over diet in married individuals, as prefer to eat processed food meals out door. These kind of meals are saltier also faltier and contain more spices and broths" [8].

In this study it was observed that hypertension was more common in over weight adults as compared to normal weight adults. "Obesity as been idnetified as the most important risk factor for developing hypertension. Several epidemological

studies have reported the significancant association between obesity and hypertension" [23]. Thus weigh lose has been proved a powerful mean of preventing hypertension.

There msut be further improvement in high blood pressure related knowledge. This will lead to better and improved sustainable health outcome. If we consider the attitude towards high blood pressure, this study found that mostly respondents as both non hypertensive and hypertensive. Moreover, this showed positive attitude toawards predictions of HBP. All the participants agreed that intake of vegetables and fruits, regular checkup of blood pressure and discussion with physician can help in controlling HBP.

People with high level of education are usually more concern about health matters so adopt healthy life style, health diet, exercise, quit smoking and weight control. While with low education are not much conscious about health related issues and tend to be less informative. It is identified that the majority of individuals suffering from high blood presure are not suffering from particular symptoms until complications arise results in sudden deaths due to heart attacks and also results in severe disabilities such as stroke as well as heart failure.

This study found that Diabetes was also associated with increase in hypertension. "The coexistance of diabetes and hypertension might be due to common risk factors as smoking , unhealthy diet, physical inactivity.The studies conducted in china and India found that almost a quarter of hypertensive patients were found to have diabetes" [19-24]. This study only include self reported diabetes cases, further research is needed in this population to accurately estimate the impact of diabetes on hypertension.

In this study most of study participants were never examined for blood pressure. I observed that many participants are even unaware of their hypertension status. This may lead to hidden epidemic in particular population. However, the use of preventive measures and positive activities, awarness regarding HBP are most effective ways of controlling hypertension. This is because of the fact that control of high blod pressure depends upon individual's attitude and practices, which may include firstly, life style changed, as physical activity, health weight, healthy

diet and avoiding the use of tobacco and alcohol as well as close monitoring after daignosis.

This study has a number of advantages includeing being a community based study this can truly describe the general population as compared to several other studies that have reports from hospital based studies. Hypertension is always a tough medical condition among non-communicable diseases of a certain population. We can overcome HTN by rising public awareness and knowledge about risks and related factors of HBP.

Chapter 5

Conclusion and Recommendations

5.1 Conclusion

Hypertension a mojor public health problem is directly responsible for cardiovascular deaths in most parts of the world. The risk factors which lead to hypertension are altered life style, less attention to health care related practices, much consumption of processed food, and some other factors as use of oily and fatty food, much cosumption of salt, stress etc. So accurate estimates of hypertension is necessary to paln accurate and effective control measures.

The present study was done in this direction to estimate the increase in occurence of hypertension and to examine its risk factors and practices in Hunza valley in the north of Pakistan. This study was undertaken by selecting 425 subjects in the cross sectional study conducted in September – December 2020. All the subjects were personally contacted in their houses, interviewed using questionnaire. The data was obtained from subjects of 25 years and above. There BP readings were recorded and average of last two was considered as final reading.

Male comparised about 37.65% and female comprised about 62.35% of the study. If we look at the educated profile, majority of respondents consist of primary and secondary levels. Most of the participants were female and mostly living in

the community for more than 30 years. The results show that the prevalence of hypertension was steady with increase in age. In this study most of the subjects were agriculturists.

In this study the prevalence of hypertension was 33.88% . The study which was conducted in 1998, showed that the prevalence was 14.89% in Ghizar valley near Hunza. This means that there was much increase in the hypertension prevalence with in 22 years in Hunza.

There are many causes of hypertension and it is much influenced by demographic characteristics such as age, gender, social status, obesity, family history of hypertension, alcohol use, tobacco use, stress and many other factor. My study found that the prevalence of hypertension has direct relation with family history of hypertension, obesity, physical inactivity and tobacco use.

Hunza is the cold area located in the north of Pakistan and mostly covered with snow in winters. The staple food of locals of this area in winters is meat and meat products. More than 90% locals use salty tea many tinmes a day and specially in winters the consumption of salty tea increases. This might be also one of the contributing factor in high blood pressure.

If we consider the attitude and knowledge regarding hypertension, the respondents showed the positive response. Mostly have knowledge predictors as regular checkup, exercise and less use of processed meat are helpful to control blood pressure. These results found that the subjects with more knowledge and had positive attitude than subjects having less awareness. During survey when practices were elavated, it was found that mostly check their blood pressure when fall ill. Interestly mostly subjects control the use of salt to control HBP. Most of the hypertensive subjetcs use their medicines regularly.

According to National Health Survey of Pakistan the hypertension affects 18% of adults population and 33% of the adults above 45 years old. In contrast very few population based surveys were conducted to show the prevalence of hypertension in Pakistan. There is considerable increase over time and future so there is need for good quality study, which specially fousing the management and treatment of hypertension in Pakistan.

The study concluded that there was increase in prevalence of hypertension in Hunza, a valley in the north of Pakistan. The prevalence was 33.8% which was alarming with its associated risk factors.

- When practices were elevated regarding the risk factors and life style modifications, it was found that mostly subjects control the use of salt, much oil and use their medicines regularly.
- The findings of this study indicated that hypertension has become important health problem among adults in Hunza. There are certain risk factors as consumption of processed meat, meal with fats, less vegetable and fruits consumption and less physical activity were related with increase in HBP. Hypertension and majority of its risk factors are preventable as through screening programmes. These programmes should be arranged at community level and its risk factors are need to be find out.
- This study found that prevalence of hypertension increased with increase in age as majority of hypertensive patients are above 65 years old. This study showed that 40% of the population above 65 years are hypertensive. This increase in hypertension with the age is a well known factor.
- Our results suggests to create awareness about HBP among the people, as the manisfestation of hypertension depends on life style factors, life dietary and other factors. Hypertension is major health problem in northern Pakistan, so health care sessions are needed to overcome this emerging health problem. These studies suggests the existance of much awareness about high blood pressure in educated people as compared to low educated or uneducated.

5.2 Recommendations

1. Population screening for high blood pressure is the most effective method for diagnosis and managing hypertension. This is not possible in developing countries as Pakistan, so screening by private organizations should be encourged.

2. There must be health education as part of formal education in every country which should focus on weight lose, restrictions on smoking, restriction on alcohol intake, increase physical activity and restriction on dietary salt intake.

3. There must be specilized channels of communication, and youth at their colleges and universities should provide unique opportunities to promote the adaptation of health life style.

4. The programme for weight lose, proper exercise, life style modification, and control over blood pressure should be introduced at community level.

5. More research work in the area of primary prevention of high blood pressure should be encouraged. There must be development of hypertension related programmes which can be implemented in general population.

6. It is necessary to avoid the processed food as burgers, salted snakes, hot dogs, sausages and canned meat because it contains large amount of salt.

7. It is recommended that, there must be programmes at community level which will convince people to quitting smoking.

8. Stress which is also a contributing factor of hobbies hypertension can be manage by active hobbies such as gardening, walking, good aerobic exercise.

9. Public education plays an important role for the successful national compaign to creat and treat hypertension.

10. As the prevalence of hypertension increasing and becoming a global problem so it is necessary that routine health screening should be under taken by health services of various countries.

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Appendix-A

Questionnaire

"To Study the Increase in Hypertension, General Consideration and Epidemiological Study of Risk Factors and impacts on the Residents of Valley of Hunza, in North of Pakistan"

Supervisor: Dr. Shaukat Iqbal Malik

Name:———— Age:————Years

Gender: Male/ Female Nationality:————

Education: Primary/ Secondary/ Tertiary

Marital Status: Married/ Unmarried/ Divorced

Work Status: Employed/ Self Employed/ Unemployed

Duration of Stay in community:————

BP Value: 1st Reading ——— / ———

2nd Reading ——— / ———

3rd Reading ——— / ———

Weight: ——— Kg Height:——— Smoker: Yes / No

Part B:

This part consists of some questions about your blood pressure:

1- How often do you check your blood pressure?

I. Daily

II. Weekly

2- Have you ever been told by a doctor or other health professional that you have high blood pressure?

I. Yes

II. No

III. Don't Know

3- Are you currently taking medicine for high blood pressure?

I. Yes

II. No

III. Don't know

4- Do you think drugs for high blood pressure must be taken every day?

I. Yes

II. No

III. Don't Know

5- Do you think high blood prssure can be prevented?

I. Yes

II. No

III. Don't Know

Part C:

This part consist of some questions about your diet and fat or oil used.

6- How often do you eat processed meat?

I. More than once a day

II. About once a day

III. Once a week

IV. Not at all

7- How often do you drink regular soft drinks? Coke/ Pepsi etc.

I. More than once a day

II. About once a day

III. Once a week

IV. Not at all

8- Should we use plenty of vegetables and fruits?

I. Yes

II. No

III. Not Sure / don't know

9- What will you prefer to eat in your lunch?

I. Fried meat

II. Vegetables

III. Fruits

10- Are you changing eating habits to help lower or control your blood pressure?

I. Yes

II. No

III. Don't know (Not Sure)

11- What types of food will you prefer to eat?

I. Fast food

II. Home Made food

III. Not Sure (Don't Know)

12- What kind of fat or oil do you use in cooking?

I. Butter

II. Olive Oil, Corn Oil

III. Vegetable Oil

IV. Vanaspati Ghee

13- What do you think can eating too much fat raise your cholesterol levels?

I. Yes

II. No

III. Not Sure

14- What is the frequency of eating oily and fatty food?

I. Not frequent

II. Frequent

III. Much frequent

15- What is the frequency of deep frying?

I. Frequent

II. Not frequent

III. Not at all

16- What do you think are causes of hypertension?

I. Fats in body

II. High Cholesterol

III. High Intake of Salt

IV. Sugar

Part D:

This part consists of questions related to your salt consumption:

17- What is the frequency of consumption of salt?

I. Much frequent

II. Frequent

III. Not frequent

18- Should we reduce salt to prevent hypertension?

I. Yes

II. No

III. Don't know

19- Do you add extra salt to cook food?

I. Yes

II. No

III. Don't Know

20- Are you cutting down salt to help lower or control your blood pressure?

I. Yes

II. No

III. Don't Know

21- How often do you put extra salt on your food or fruits before eating?

I. Most of the time

II. Some of the time

III. None of the time

Part E:

Now this part consists of questions regarding your exercise and weight:

22- Are you exercising to help or lower your blood pressure?

I. Yes

II. No

III. Don't Know

23- Are you doing some physical activity every day?

I. Yes

II. No

III. Don't Know

24- Can being overweight or obese put you at risk for developing high blood cholesterol?

I. Yes

II. No

III. Don't Know

25- What do you think should we lose our weight?

I. Yes

II. No

III. Don't know

Part F:

This part consists of questions related to family history: 26- Do you have positive history of hypertension?

I. Yes

II. No

III. Don't Know

27- Do you have positive family history of diabetes?

I. Yes

II. No

III. Don't Know

28- Do you have high blood sugar levels?

I. Yes

II. No

III. Don't know

29- Does anyone in your family have hypertension?

I. Yes

II. No

III. Don't Know

Part G:

Now this part consists of some questions related to stress:

30- Have you been under stress in your life?

I. Most of the time

II. Some times

III. Often

IV. Never

31- How often does stress affect you?

I. Most of the time

II. Some times

III. Often

IV. Never

32- Does the lack of sleep affect your physical health?

I. Most of the time

II. Some times

III. Often

IV. Never

33- For how many hours do you sleep daily?

I. Less than 6 hrs

II. 6 hrs

III. 8 hrs