KNOWLEDGE, ATTITUDE AND PRACTICE ABOUT HYPERTENSION AND DIETARY PRACTICES AMONG ANTI-HYPERTENSIVE MEDICATION USERS OF DHARAN SUB-METROPOLITAN, CITY

by

Nikita Karki

Department of Nutrition and Dietetics

Central Campus of Technology

Institute of Science and Technology

Tribhuvan University, Nepal

2025

Knowledge, Attitude and Practice about Hypertension and Dietary Practices among Anti-Hypertensive Medication Users of Dharan Sub-Metropolitan, City

A dissertation submitted to the Department of Nutrition and Dietetics, Central Campus of Technology, Tribhuvan University, in partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Dietetics

by

Nikita Karki

Department of Nutrition and Dietetics

Central Campus of Technology

Institute of Science and Technology

Tribhuvan University, Nepal

August, 2025

Tribhuvan University

Institute of Science and Technology

Department of Nutrition and Dietetics

Central Campus of Technology, Dharan

Approval Letter

This ***dissertation*** entitled ***Knowledge, Attitude and Practice about Hypertension and Dietary Practices among Anti-Hypertensive Medication users of Dharan Sub-Metropolitan, City*** presented by **Nikita Karki** has been accepted as the partial fulfillment of the requirement for the **B.Sc. degree in Nutrition and Dietetics**

Dissertation Committee

1. **Head of the Department** — HEAD OF DEPARTMENT NUTRITION & DIETETICS
   (Mrs. Pallavi Vyas Jaisani, Asst. Prof.)
2. **External Examiner**
   (Mr. Birendra Kumar Yadav, Assoc. Prof.)
3. **Supervisor**
   (Mr. Aashik Kumar Jha, Teaching Asst.)
4. **Internal Examiner**
   (Mr. Devendra Bhattarai, Teaching Asst.)

August 29, 2025

Acknowledgements

It is a genuine pleasure to express my deep sense of thanks and gratitude to my supervisor Mr. Aashik Kumar Jha, Teaching Assistant of Central Campus of Technology, Hattisar, Dharan for his continuous guidance, support, encouragement, motivation and enthusiasm throughout this journey. I am thankful to Prof. Mr. Basanta Kumar Rai, Campus Chief of Central Campus of Technology for his kind cooperation and suggestion and for providing facilities to perform dissertation work easily and successfully. I would also like to show gratitude towards Assistant Professor Mrs. Pallavi Vyas Jaisani, Head of Department, Nutrition and Dietetics.

I would like to express my gratitude to the officials of Dharan Sub-Metropolitan City, Mr. Bed Prasad Sapkota, Head of Administrative Division and Mr. Umesh Mehta, Head of Health Division for their invaluable collaboration. The provision of critical data and resources by them was indispensable for the successful conclusion of this thesis. I also extend my sincere appreciation to the residents of Dharan Sub-Metropolitan City for their generous spirit and cooperation during the data gathering process.

I am thankful to my respected sister Vatsala Rai for her tremendous help and support at every stage of my dissertation and my senior Babita Ghimire for her constant presence and support during this research.

I am also indebted to my parents and my brother Niraj Karki for their constant encouragement, love and support, without whom this work could not have been completed. My sense of gratitude goes to everyone who directly or indirectly supported me during my research activity.

Date of submission: August 29, 2025

(Nikita Karki)

Abstract

This community based cross-sectional descriptive study aimed to evaluate the knowledge, attitude and practices concerning hypertension and dietary habits among individuals using anti-hypertensive medication in Dharan Sub-Metropolitan, City. 4 out of 20 wards were selected by using simple random sampling technique. The study included 141 clinically diagnosed hypertensive patients aged 20-80 years, who had been on anti-hypertensive medication for over 6 months. Data was collected using anthropometric measurements and a semi-structured questionnaire. Chi square tests, Fisher's exact test and Pearson's correlation tests were used to assess the association between the variables.

The study revealed that 78.7%, 93.6% and 22.0% of the patient had a good knowledge, attitude and practice score respectively. A majority 68.8% had family history of hypertension and 67.4% of them had hypertension for over 2 years. About 95.7% of the respondent knew that regular medication is important to prevent high blood pressure and 93.6% understood that regular exercise contributes to a healthy life. The medication adherence score was found to be 86.5%. However, 17.0% never performed any sorts of exercise. 85.8% and 56.7% of the respondents never smoke and consumed alcoholic beverages. 50.3% reported the presence of one or more co-morbidity of which diabetes mellitus 30.5% was found to be the most comorbid condition. Despite of having good knowledge and attitude of participant towards healthy lifestyle habits, the practice regarding lifestyle modification among hypertensive patients is low.

Contents

Approval Letter.....**ii**

Acknowledgements..... **iii**

Abstract.....**iv**

List of Tables..... **ix**

List of Figures.....**xi**

List of Abbreviations..... **xii**

1. Introduction.....**1-5**

1.1 General introduction..... 1

1.2 Statement of the problem.....3

1.3 Objectives of the study..... 4

1.3.1 General Objectives.....4

1.3.2 Specific Objectives..... 4

1.4 Research Questions.....5

1.5 Significance of the study..... 5

2. Literature review..... **6-19**

2.1 Hypertension.....6

2.2 Classification of Blood Pressure.....6

2.3 Hypertension Status.....7

2.4 Symptoms of hypertension..... 8

2.5 Risk factors of hypertension..... 8

2.6 Complications of hypertension..... 12

2.7 Lifestyle modification.....12

2.7.1 Dietary modification..... 12

2.7.2 Physical activity.....14

2.7.3 The termination of confinement of tobacco consumption and the ingestion of alcoholic beverages.....15

2.8 Knowledge, attitude and practice related literatures..... 16

2.9 Prevention, control and management..... 17

2.10 Dietary assessment..... 18

3. Materials and methods..... 20-26

3.1 Research method.....20

3.2 Study location.....20

3.3 Target population.....20

3.4 Study Variables.....20

3.5 Sampling technique..... 20

3.6 Sample size calculation..... 21

3.7 Data collection tools and techniques..... 21

3.7.1 Grading of the score.....23

3.8 Pre- testing.....24

3.9 Validity and reliability.....24

3.10 Food frequency and dietary recall..... 24

3.11 Data analysis.....25

3.12 Ethical consideration..... 25

3.13 Conceptual framework..... 26

4. Results and discussion..... 27-62

4.1 Socio-demographic and health status..... 27

4.1.1 Classification of age of respondents..... 27

4.1.2 Gender distribution..... 28

4.1.3 Religion distribution..... 28
4.1.4 Distribution by ethnicity, family type and food preference.....29
4.1.5 Socio-economic characteristics.....30
4.1.6 Marital and Hypertension status..... 31
4.1.7 Duration of Hypertension..... 32
4.1.8 Disease status.....32
4.1.9 Sleeping time..... 33
4.1.10 Current systolic and diastolic blood pressure..... 34
4.2 Anthropometric measurements.....35
4.3 Dietary practices.....36
4.4 Dietary intake..... 37
4.4.1 Dietary intake preceding one day..... 37
4.4.2 Food frequency questionnaire.....39
4.5 Physical Activity.....47
4.6 KAP score of hypertensive respondents.....49
4.6.1 Knowledge related score of the respondents..... 49
4.6.2 Attitude related score of the respondents.....51
4.6.3 Practice related score of the respondents.....52
4.6.4 Medication adherence related score of the respondents..... 54
4.7 Association between socio-demographic and associated factors with the knowledge regarding HTN among the adults using antihypertensive medications.....56
4.7.1 Association between knowledge and socio-demographic variables.....56
4.7.2 Association between knowledge and blood pressure.....57
4.8 Association between socio-demographic and associated factors with attitude regarding HTN among the adults using antihypertensive medications.....58

4.9 Association between socio-demographic and associated factors with the practice regarding HTN among the adults using antihypertensive medications.....59

4.10 Association between socio-demographic and associated factors with the medication adherence regarding HTN among the adults using antihypertensive medications.....60

4.11 Association of salt intake with KAP.....61

4.12 Correlation between KAP regarding hypertension.....61

5. Conclusions and Recommendations.....63-64

5.1 Conclusion.....63

5.2 Recommendations..... 63

6. Summary.....65

References.....66-84

Appendices.....85-95

List of Tables

Table No.	Title	Page No.
2.1	Categorization of BP	7
2.2	Classification of BMI	11
4.1	Distribution of age	27
4.2	Distribution of ethnicity, family type and food preference	30
4.3	Distribution of literacy rate	31
4.4	Distribution of occupation	31
4.5	Distribution of marital and hypertension status	32
4.6	Duration of hypertension	32
4.7	Sleeping time of the respondents	33
4.8	Distribution of blood pressure	35
4.9	Categorization of BMI	35
4.10	Eating pattern	36
4.11	Daily dietary practices of the respondents	37
4.12	Mean and median distribution of nutrients	38
4.13	Nutrient distribution	39
4.14	Distribution of cereals	40
4.15	Distribution of pulses	41
4.16	Distribution of fruits and vegetables	42
4.17	Distribution of dairy products	44
4.18	Distribution of non-veg products	45
4.19	Distribution of processed products	46
4.20	Distribution of physical activity	47
4.21	Distribution of duration of physical activity	48
4.22	Responses to knowledge questions	49
4.23	Responses to attitude questions	52
4.24	Responses to practice questions	53
4.25	Responses to medication adherence questions	54
4.26	Association between knowledge level and socio-demographic variables	56

4.27	Association between knowledge level and systolic blood pressure	58
4.28	Association between knowledge level and diastolic blood pressure	58
4.29	Association between attitude level and socio-demographic variables	59
4.30	Association between practice level and socio-demographic variables	60
4.31	Association between medication adherence and socio-demographic variables	61
4.32	Correlation between KAP	62

List of Figures

Figure No.	Title	Page No.
3.1	Conceptual framework	26
4.1	Gender distribution	28
4.2	Religion distribution	29
4.3	Distribution of comorbidities among respondents	33
4.4	Knowledge score of respondents	49
4.5	Attitude score of respondents	51
4.6	Practice score of respondents	52
4.7	Medication adherence score of respondents	54

List of Abbreviations

Abbreviations	Full form
ACE	Angiotensin Converting Enzyme
BMI	Body Mass Index
BP	Blood Pressure
CHO	Carbohydrate
CI	Confidence Interval
CVD	Cardio Vascular Disease
DALY	Disability Adjusted Life Year
DASH	Dietary Approaches to Stop Hypertension
DBP	Diastolic Blood Pressure
DFTQC	Department of Food Technology and Quality Control
ESH	European Society of Hypertension
FFQ	Food Frequency Questionnaire
GLV	Green Leafy Vegetables
HIC	High Income Country
HTN	Hypertension
ICMR	Indian Council of Medical Research
IQR	Inter Quartile Range
KAP	Knowledge, Attitude and Practice
LMIC	Low or Middle Income Country
MABP	Mean Arterial Blood Pressure
NIH	National Institute of Health
PHC	Primary Health Center
POR	Prevalence Odds Ratio
PP	Percentage Points
RAAS	Renin Angiotensin Aldosterone System
SBP	Systolic Blood Pressure
SD	Standard Deviation
SPSS	Statistical Package for Social Science
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

Part I

Introduction

1.1 General introduction

Hypertension is a medical condition characterized by chronically elevated blood pressure, where the force of blood against artery walls is consistently too high. This can ultimately result in health complications, notably heart disease. Medically, it's defined as a sustained systolic blood pressure of 140 mmHg or greater, or a diastolic blood pressure of 90 mmHg or greater (Benjamin *et al.*, 2017). High blood pressure, or hypertension is a widespread chronic illness affecting a significant portion of adults globally. As a major public health concern, it elevates arterial blood pressure and significantly increases the risk of serious health problems like strokes, heart attacks, vascular diseases and kidney failure (Ngwogu *et al.*, 2021).

The prevalence of hypertension has been increasing in low and middle-income (LMICs) countries gradually. According to World Health Organization (WHO), the prevalence of hypertension among adults was higher in LMICs than in high-income countries (HICs) respectively 31.5% (1.04 billion) and 28.5% (349 million) people (Mills *et al.*, 2020). Although 25% of Nepalese adults have hypertension, a significant gap exists in diagnosis and management. Less than a third (28%) are aware of their condition, only 11% of those diagnosed are treated and successful blood pressure control is seen in just 4% (Dhimal *et al.*, 2020).

A comprehensive strategy encompassing consistent medication use, regular blood pressure monitoring by the individual and healthy lifestyle changes is crucial for managing hypertension and lowering the risk of heart-related complications (Carey *et al.*, 2021). Self-care for optimal health includes: medication adherence, a low-salt, low-fat diet, no smoking, limited alcohol, stress and weight management, regular exercise, blood pressure monitoring and routine medical checkups (Aung *et al.*, 2012).

Research analyzing knowledge, attitude and practice (KAP) seeks to understand not only general health behaviors but also the personal understanding each individual possesses about a disease. These individual perspectives often contain misconceptions and

a lack of understanding can create a significant barrier to behavior modification (Ralapanawa *et al.*, 2020a). These factors are often the source of misconception. The barrier to change may be lack of knowledge (Ralapanawa *et al.*, 2020b). While the study appears simple, the results have a large community impact. Because disease prevention is difficult with insufficient knowledge, it is extremely important to measure the level of public knowledge about hypertension (Erkoc *et al.*, 2012; Olaoluwa and Amosu, 2021).

Recent review provided evidence of a huge gap in the cascade of hypertension care in Nepal (Dhungana *et al.*, 2022). The study done in the community setting of Nepal reported that 37.5% (Bhattarai *et al.*, 2021) of hypertensive patients had a high level of adherence whereas in a hospital setting, only 23.9% (Khadka *et al.*, 2021) of hypertensive patients had a high level of adherence. The recent meta-analysis of Nepal reported that half of the hypertensive population of Nepal is non-adherent to their anti-hypertensive medications, posing a higher risk of cardiovascular events (Pokharel *et al.*, 2023). Therefore, it is crucial to identify the factors associated with adherence to antihypertensive medication to improve the control of blood pressure among patients with hypertension in Nepal (Pokharel *et al.*, 2023).

Several studies have reported the presence of co-morbidity, alcohol consumption, self-purchasing of medications (Asgedom *et al.*, 2018; Pokharel *et al.*, 2023), forgetfulness (Khadka *et al.*, 2021; Pokharel *et al.*, 2023) unavailability of hypertensive medicines at the nearest health facilities (Shrestha *et al.*, 2018), large number of medications prescribed, irregular follow-up (Bhandari *et al.*, 2015; Roka and Ghimire, 2020) were all linked to non-adherence to antihypertensive medication and all identified factors were modifiable. The Seventh Report of the Joint National Committee (JNC 7) emphasized that for hypertension management to succeed, patients must not only understand their condition but also actively engage in a lifestyle that supports their health (Mitwalli *et al.*, 2013). There are many factors that can affect the management of HTN, the most important barrier is the lack of knowledge and awareness of HTN and its complications (Erkoc *et al.*, 2012).

1.2 Statement of the problem

Hypertension is an emerging health problem in developing world with the consumption of energy dense diet and inactive lifestyle. The problem is further expanded due to ignorance and lack of knowledge. The KAP scores of hypertensive patients on hypertension were found to be low (Shrestha *et al.*, 2019).

A 2016 analysis of the Demographic and Health Survey in Nepal highlighted a critical public health issue: a substantial proportion of hypertensive individuals were unaware of their condition (62%) and a very limited number (18%) were receiving necessary treatment (Mehata *et al.*, 2018). Socio-demographic disparities exist within the hypertension care pathway, particularly affecting younger South Asians, who exhibit significantly reduced hypertension control compared to other age cohorts (Gupta *et al.*, 2017). Similarly, women, poor members of society (lowest wealth quintile), individuals with low levels of education and those living in rural settings were more likely to have untreated and uncontrolled high blood pressure or be unaware of their hypertension (Gupta *et al.*, 2017). An Indian study observed that single men participants from rural areas and individuals with lower household wealth had a poorer status at each step in the cascade of care process (Prenissl *et al.*, 2019a).

Recent studies conducted in Nepal also have shown inadequate knowledge of hypertension and its treatment, poor medication adherence, irregular follow-up, lack of availability of uniform treatment guidelines and the inability of healthcare providers to deliver lifestyle modification messages as major challenges for high blood pressure management (Devkota *et al.*, 2016; Shrestha *et al.*, 2018).

Targeted behavioral interventions, including habit modification and nutrition education, significantly influence nutritional and health outcomes for people with hypertension (Meurer *et al.*, 2020). High blood pressure significantly reduces well-being, leading to increased death and illness and severely diminishes quality of life through disabilities, strokes and heart disease (Mounica, 2015; Amini *et al.*, 2021).

To improve the health and quality of life for individuals managing chronic illnesses, the global healthcare community recognizes the critical role of disease knowledge. Therefore, health professionals have a responsibility to inform patients, particularly those with hypertension, about the positive effects of their medications and how to take them

correctly. This guidance is crucial for enabling patients to effectively control their blood pressure over time and decrease their risk of hypertension-related complications (Liu *et al.*, 2020; Wieczorek *et al.*, 2023). A lack of adequate knowledge, awareness and understanding of hypertension, its symptoms and available treatments can lead to poor treatment adherence. Furthermore, a good knowledge about disease improves self-management, which is critical for patients to self manage their situations (Al-Hazmi *et al.*, 2025).

Due to a lack of extensive research on the knowledge, attitudes and practices (KAP) of diagnosed hypertensive patients in Nepal, studies in this area are critical for developing effective control and prevention strategies, particularly in resource-poor nations. As unhealthy lifestyles contribute to hypertension, understanding patient KAP is essential. Therefore, this study seeks to assess the KAP regarding hypertension care among hypertensive individuals living in urban areas. The resulting information can be used to create through educational programs emphasizing self-care and community support to manage hypertension and its complications. Moreover, it can inform preventive efforts and encourage healthier lifestyles in the wider population.

1.3 Objectives of the study

1.3.1 General Objectives

The general objective of the study is to assess the knowledge, attitude and practice regarding hypertension among adults and older adults hypertensive patients of Dharan Sub- Metropolitan City.

1.3.2 Specific Objectives

1) To assess the factor associated with KAP score of hypertensive patients.
2) To identify the socio-demographic characteristics of anti-hypertensive medication users in Dharan Sub-Metropolitan City.
3) To analyze the association between physical activity levels and blood pressure control among hypertensive patients.
4) To assess the anthropometric characteristics of anti-hypertensive medication users.

1.4 Research Questions

1) What is the knowledge and attitude of hypertensive patient regarding hypertension?
2) What are their dietary practices regarding hypertension?
3) What is the practice status of hypertensive patients about the care of hypertension?
4) What is the medication adherence status of hypertensive patients in managing their condition?

1.5 Significance of the study

1) By providing a clear understanding of hypertension prevalence and trends, this information is vital for guiding resource allocation and the development of targeted prevention and control measures.
2) Understanding the causes and risk factors of hypertension and adopting healthy practices are crucial for individual well-being.
3) Identifying and acknowledging problematic behaviors is the foundational step towards personal improvement.
4) It promotes understanding of how dietary modifications can significantly impact hypertension prevention and control.
5) Promoting medication adherence contributes to a healthier community by reducing the burden of preventable of cardiovascular diseases.
6) This will offer hypertensive patients in Dharan Sub-Metropolitan a clearer understanding of how to manage their condition.

Part II

Literature review

2.1 Hypertension

Hypertension or high blood pressure, is a serious medical condition characterized by persistently elevated blood pressure in the arteries. It is diagnosed when systolic readings are 140 mmHg or higher, and/or diastolic readings are 90 mmHg or higher (Unger *et al.*, 2020). Hypertension is a global public health issue that accounted for an estimated 141 deaths and 2,869 disability-adjusted life years (DALYs) per 100,000 population in 2016. Similarly, an estimated 874 million adults had hypertension in 2015, with an increase expected within the next decade. Globally, in 2015, hypertension was the leading risk factor for deaths and health loss largely from ischemic heart disease, hemorrhagic and ischemic stroke (Forouzanfar *et al.*, 2017).

There are two types of hypertension; Primary and Secondary hypertension. Primary hypertension, major type of hypertension also known as essential hypertension is the most common type of hypertension where there is no single identifiable cause. There is no apparent underlying disease, condition or disorder causing the high blood pressure. Instead, hypertension occurs because of genes, diet and lifestyle (Bosu *et al.*, 2019).

Secondary hypertension is significantly less common than primary hypertension, its true prevalence is not precisely known, but it is assumed to be about (5-10)% of all hypertensive cases, and often remains unrecognized. Secondary forms of hypertension require specific diagnostic procedures, which allows to discover their specific causes and to choose an effective drug treatment or an appropriate interventional treatment that controls or treats elevated blood pressure (Mancia *et al.*, 2023). Secondary hypertension can harm organs directly not just through raised blood pressure, but this damage can be reversed with proper treatment. Identifying the underlying cause of secondary hypertension allows for effective interventions that can improve well-being and lower the risk of heart disease and death (Sarathy *et al.*, 2022).

2.2 Classification of Blood Pressure

The classification of systolic and diastolic blood pressure is shown in **Table 2.1.**

Table 2.1 Categorization of BP

Blood pressure category	Systolic (mm Hg)		Diastolic (mm Hg)
Optimal	< 120	And	< 80
Normal	120-129	And	80-84
High-Normal	130-139	And/or	85-89
Hypertension Grade I	140-159	And/or	90-99
Hypertension Grade II	160-179	And/or	100-109
Hypertension Grade III	≥ 180	And/or	≥ 110

Source: ESH (2023)

2.3 Hypertension Status

Nearly 1 in 4 people in Nepal is affected by hypertension. Specifically, more than 20% of the population aged 15 and above has high blood pressure. Despite the high prevalence, less than 5% of those diagnosed have their condition under control (Regmi *et al.*, 2023).

The STEPS survey conducted in 2019 identified the prevalence of HTN among adults aged 15 to 69 years to be 24.5% with a greater prevalence in men (29.8%) than in women (19.7%) (Bista *et al.*, 2021). Another systematic review of 23 studies identified hypertension prevalence to be 27.3% (Huang *et al.*, 2019). Despite its widespread occurrence, hypertension in Nepal is largely characterized by a lack of diagnosis, inadequate treatment and poor management (Bista *et al.*, 2021; Shrestha *et al.*, 2021).

A study conducted in central India found that 22.3% of individuals aged 18–69 years had HTN and only 11.8% of those with HTN were being treated (Kokane *et al.*, 2020). In Madhya Pradesh, treatment coverage for HTN was found to be 14.4%, while only 9.3% of individuals with HTN had their blood pressure in the controlled range (Prenissl *et al.*, 2019b). A research conducted in 2022 among hypertensive adult patients (18+ years) attending primary health centers (PHC) in the Kingdom of Saudi Arabia (KSA) shows that only 36% of the hypertensive patients had high adherence to the treatment (Thirunavukkarasu *et al.*, 2022). A study conducted in Ghana shows that the prevalence of hypertension is 27.3% and is the third most common cause of mortality in the general population (Sarkodie *et al.*, 2020; Tannor *et al.*, 2022). A community-based cross-sectional study was used with a sample size of 3,368 participants in 2017 in southern Ethiopia, and

the results revealed that the prevalence of HTN was 18.92%, with associated factors such as old age, overweight, khat chewing and low fruit consumption (Chuka *et al.*, 2020).

A recent analysis found that the prevalence of hypertension among Nepalese adults is 44.2% (Al Kibria *et al.*, 2018). Hypertension prevalence differs significantly across subgroups. Individuals with a BMI of 30 or higher show an almost 30% point increase, those over 70 experience a 20% point rise and individuals in the wealthiest 20% have a 6% point higher prevalence. Current research in Nepal has primarily examined the prevalence of hypertension and its associated factors (Dhungana *et al.*, 2016; Al Kibria *et al.*, 2018). Age, sex, BMI, education, marital status, wealth and smoking/drinking habits are frequently examined factors. While hypertension studies in Nepal haven't considered ethnicity, occupation or household food security, research elsewhere indicates a strong positive link between unmet social needs (like food security) and negative health outcomes (Cole and Nguyen, 2020).

2.4 Symptoms of hypertension

For the most times hypertensive people have no symptoms at all. Some signs and symptoms that hypertension causes include headache, shortness of breath, dizziness, chest pain and palpitations of the heart. It can be dangerous to ignore such symptoms, but nothing of them can directly signify hypertension. Hypertension is a serious warning sign in which significant lifestyle changes are required. The condition can be a silent killer and it is important for everyone to know their blood pressure reading (Fryar *et al.*, 2017).

2.5 Risk factors of hypertension

Risk factors for hypertension consist of 2 categories: non modifiable risk factors and modifiable risk factors (Sen *et al.*, 2015). The non-modifiable risk factors are attributes or characteristics in the individual that cannot be changed or adjusted, hence they are out of our control and little or nothing can be done to control them. Such factors include age, sex, race, family history, genetic composition, etc. On the other hand modifiable risk factors of hypertension are attributes, characteristics, exposures or life style patterns that can be adjusted or changed to prevent the development of the disease. They include physical inactivity, obesity, high intake of calories, high levels of dietary sodium intake and alcohol consumption (Ibekwe, 2015).

a) Age

Age is a major factor in developing hypertension. As we get older, our blood vessels naturally become less flexible and more stiff. This process, combined with reduced sensitivity in blood pressure-regulating mechanisms, leads to higher blood pressure. Research shows that the prevalence of hypertension significantly rises after age 40, and this risk continues to climb with each passing decade (Sood *et al.*, 2024). Systolic blood pressure (SBP) has a progressive rise during lifetime with a difference of 20-30 mm Hg between early and late adulthood. Diastolic BP tends to be consistent until the fifth decade. The mean systolic and diastolic BP in men is higher than women in early adulthood, but this difference reverses by the sixth or seventh decade (Yazdanpanah *et al.*, 2015).

Women are about as likely as men to develop high blood pressure during their lifetimes. However, for people younger than 45 years old, the condition affects more men than women. For people 65 years old or older, high blood pressure affects more women than men (Mozzafarian *et al.*, 2015). A study of urban and rural communities of AkwaIbom State for the prevalence of hypertension and its predictors showed that age was also found as independent predictors of hypertension occurrence. Mean arterial blood pressure (MABP) was rising as age was increasing in both groups (Akpan *et al.*, 2015).

b) Race

High blood pressure is particularly common among blacks, often developing at an earlier age than it does in whites. Serious complications, such as stroke, heart attack and kidney failure, also are more common in blacks (Mozzafarian *et al.*, 2015). A study conducted reported that race/ethnicity was a single independent predictor of hypertension, with non-Hispanic black more likely to be hypertensive compare with Hispanic, prevalence odds ratio (POR), 2.38, 99% Confidence Interval (CI), 2.17–2.61 and non-Hispanic white, POR, 1.64, 99% CI, 1.52–1.77 (Holmes *et al.*, 2013).

The challenges to understanding the science of racial differences and disparities in cardiovascular disease are substantial. Race and ethnicity are difficult to define and classify. The biology is driven by a complex set of gene/gene, environment/environment and gene/environment interactions. Among the environmental influences are social issues that may induce stress and potentially influence multiple physiological functions. These are

difficult to measure and understanding the biological consequences is difficult. Other social issues such as access to care have less interaction with biology, but these issues drive some of the differences in outcome (Jones and Hall, 2010).

c) Genetics / Family History

Those with a family history of hypertension had about 4 times the odds of having hypertension when compared to those without a family history of hypertension. It is known that genetics plays an important role in the development of hypertension and individuals with a positive family history of hypertension are more likely to be at risk. Family studies and twin studies have demonstrated a heritability of blood pressure ranging from 30% to 60% (Rani *et al.*, 2015). Shared genetic and environmental factors contribute to this association. Genetic studies have identified multiple genes associated with hypertension, including those involved in blood pressure regulation and renal sodium handling (Ostchega *et al.*, 2020).

A study conducted to determine prevalence of childhood and adolescent hypertension and its risk factors using children and adolescents aged 5 to 19 years. Prevalence of hypertension was found to be 4.7%. It was significantly associated with family history of hypertension. High blood pressure was categorized as pre-hypertension and hypertension. Pre-hypertension was considered as blood pressure (BP) equal or greater than the age and gender specific 90th percentile after adjusting for weight and height or BP equal or more than 120/80 mm of Hg. When BP was equal or over the age and gender specific 95th percentile value, it was considered as hypertension (Essouma *et al.*, 2015).

d) Overweight or Obesity

Body Mass Index (BMI) is a widely used tool that classifies adults into different weight categories by comparing their weight to their height. It is calculated by dividing a person's weight in kilograms by the square of their height in meters. The classification of BMI given by WHO is shown in **Table 2.2**

Table 2.2 Classification of BMI

BMI (kg/m²)	**Category**
< 18.5	Underweight
18.5-24.9	Normal weight
≥ 25.0	Overweight / pre-obesity
≥ 30.0	Obesity
30.0-34.9	Obesity class I
35.0-39.9	Obesity class II
Above 40	Obesity class III

Source: WHO (2010)

A study in Igbeagu, a rural community in South-Eastern Nigeria, found that body mass index (BMI), was associated with hypertension. Regression analysis showed that BMI is independent risk factors for hypertension. The prevalence of hypertension was 27.8%. Obesity was found in 22.0% of participants. Body mass index and blood glucose were positively associated with blood pressure (Egbi *et al.*, 2013). Obese individuals have increased fatty tissue which elevates vascular resistance and subsequently increases the workload on the heart to pump blood. Obesity provides an impetus for sympathetic nervous system activation as well as for changes in renal structure and function. The arterial-pressure control mechanism of diuresis and natriuretic seems to shift to higher blood pressure levels in obese individuals (Channanath *et al.*, 2015).

Another designed to establish the relationship between body mass index (BMI) and blood pressure (BP) in an increasingly industrialized town in Nigeria due to the rising prevalence of hypertension in non-industrialized countries. Factors associated with BMI and BP levels were determined in three hundred adult male and female subjects in Ota community of Ogun State, Nigeria. The levels of the overweight among the male and female subjects were 53.03% and 47.37% respectively. The levels of hypertensive male and female subjects were 40.91% and 35.34% respectively. The overweight and underweight among the hypertensive male were 54.29% and 0% respectively; while the overweight and underweight among the hypertensive female were 42.86% and 28.57% respectively. The study concluded that hypertension among the overweight, and hypotension among the underweight, are major health concern in Ota that requires intensive medical care (Afolabi *et al.*, 2015).

2.6 Complications of hypertension

The consequences of hypertension are related to its severity. There is no threshold for complications to occur as elevation of blood pressure is associated with increased morbidity throughout the whole range of blood pressure. The cardiac consequences of hypertension are left ventricular hypertrophy and coronary artery disease. Left ventricular hypertrophy is caused by pressure overload and is concentric. There is an increase in muscle mass and wall thickness but not ventricular volume (Foex and Sear, 2017).

Congestive heart failure, a serious condition in which the heart is unable to pump enough blood to supply the body's needs. Over working of left, ventricle leads to its hypertrophy and this impairs diastolic function, slowing ventricular relaxation and delaying filling. Left ventricular hypertrophy is an independent risk factor for cardiovascular disease, especially sudden death (Foex and Sear, 2017).

2.7 Lifestyle modification

The implementation of appropriate lifestyle modifications is of paramount importance in both the prevention and treatment of hypertension. It is imperative to emphasize however, that such modifications should not impede or postpone the commencement of pharmacological therapy in high-risk individuals. Furthermore, lifestyle interventions extend beyond blood pressure reduction, offering benefits in the management of other cardiovascular risk factors and associated clinical conditions (Williams *et al.*, 2018).

2.7.1 Dietary modification

a) Salt consumption

High sodium intake and increased BP levels are linked by changes in vascular resistances, but the mechanisms controlling this phenomenon may not be only viewed as a reflex pressor response aimed at increasing sodium excretion. Excessive salt intake may induce several adverse effects causing microvascular endothelial inflammation, anatomic remodeling and functional abnormalities even in normotensive subjects (Marketou *et al.*, 2019).

Besides high salt intake or preference for salty food is discussed to be positive associated with stomach cancer and according to recent studies probably also obesity risk. On the other hand, a reduction of dietary salt intake leads to a considerable reduction in blood pressure, especially in hypertensive patients but to a lesser extent also in normotensives as several meta-analyses of interventional studies have shown. It is estimated that about 50–60% of hypertensive are salt sensitive. In addition to genetic polymorphisms, salt sensitivity is increased in aging, in black people and in persons with metabolic syndrome or obesity (Rust and Ekmekcioglu, 2017).

As per World Health Organization guidelines, daily salt intake should not exceed 5 grams, with a corresponding sodium recommendation of under 2 grams. Individuals in middle and older age groups, as well as those with hypertension, diabetes or chronic kidney disease are advised to limit sodium to a maximum of 1.5 grams per day. Conversely, potassium consumption should be increased to approximately 4.7 grams daily and alcohol intake should be minimized (Rust and Ekmekcioglu, 2017).

b) DASH diet

The Dietary Approaches to Stop Hypertension diet was developed in the 1990s as a result of the National Institutes of Health (NIH) funding multiple research projects to examine the impact of specific dietary interventions on blood pressure (Challa *et al.*, 2023). This dietary approach is widely prescribed for the reduction of blood pressure and the management of hypertension-related conditions, representing a significant behavioral intervention, particularly given the global prevalence of cardiovascular disease as a primary cause of premature morbidity and mortality (Stice *et al.*, 2016; Patel *et al.*, 2018). While the DASH diet is primarily known for its cardiovascular benefits, increasing evidence suggests it may also improve mental health. Research has shown potential links to reduced depression, anxiety and aggression, but some studies have reported mixed outcomes (Zamani *et al.*, 2020; Polanska *et al.*, 2021).

Despite the DASH diet is recognized effectiveness in reducing blood pressure (BP), the underlying mechanisms responsible for its antihypertensive action remain unclear. However, various potential physiological effects of the DASH diet have been proposed and associated with this BP-lowering outcome (Valenzuela *et al.*, 2021). It is suggested that the DASH diet particularly affects the RAAS, potentially strengthening certain physiological

effects associated with ACE (angiotensin-converting enzyme) inhibition and consequently inducing a natriuretic and diuretic response (Maris *et al.*, 2019). The natriuretic action of the DASH diet has been mainly attributed to its high content in potassium and calcium, coming from its high content in fruits, vegetables and low-fat dairy products. Potassium is known for its role in regulating BP and its natriuretic action (Staruschenko, 2018) while calcium has also been shown to blunt the pressure effects of dietary sodium (Villa-Etchegoyen *et al.*, 2019).

The following outlines a representative portion guide for patients adhering to the Dietary Approaches to Stop Hypertension (DASH) diet:

1) Vegetables: about five servings per day
2) Fruits: about five meals per day
3) Carbohydrate: about seven servings per day
4) Low-fat dairy products: about two servings per day
5) Lean meat products: about two or fewer servings per day
6) Nuts and seeds: two to three times per week (Challa *et al.*, 2023).

2.7.2 Physical activity

Physical activity is as equally important or even more important than pharmacotherapy in reduction of cardiovascular mortality in hypertensive patients. An exercise frequency as once a week is more effective than pharmacotherapy in reducing all-cause mortality in hypertensive subjects (Brown *et al.*, 2013). Exercise is recommended in hypertensive adults by all professional committees and institutions. It is shown in various studies that physical activity causes BP reduction independent of weight loss in both normotensive and hypertensive individuals (Arroll and Beaglehole, 1992; Fagard, 2012).

Exercise intensity is measured by how much oxygen our body uses or our heart rate. Moderate exercise uses 45-64% of our maximum oxygen or 55-74% of our maximum heart rate. Vigorous exercise uses 70-85% of our maximum oxygen or reaches about 95% of our maximum heart rate. High-intensity exercise uses 70-100% of our maximum oxygen (Boutcher and Boutcher, 2017).

Randomized controlled studies provide the most compelling evidence that physical activity directly impacts blood pressure. Research has consistently verified that exercise

reduces blood pressure with individuals experiencing hypertension showing the most substantial improvements (Diaz and Shimbo, 2013). A 2021 meta-analysis demonstrated that a single session of aerobic exercise can reduce 24-hour ambulatory blood pressure in hypertensive adults, regardless of medication status. Vigorous aerobic exercise was found to have the most significant impact (Saco-Ledo *et al.*, 2021).

2.7.3 The termination of confinement of tobacco consumption and the ingestion of alcoholic beverages

Globally, tobacco smoking results in roughly 6 million deaths each year. In the United States, nearly 500,000 deaths are linked to smoking, with about 10% of those stemming from secondhand smoke. Research consistently shows that cigarette smoking significantly elevates the risk of heart attacks and deadly coronary artery disease (Barua and Ambrose, 2013). The impact of quitting the smoking habit has also been researched extensively. Quitting in early adolescence (40 years) has a whopping 90% decrease in the extra risks of death (Gallucci *et al.*, 2020). The influence of smoking on arterial stiffness may exert a more significant effect on central blood pressure, a metric closely correlated with target organ damage, relative to brachial blood pressure (Virdis *et al.*, 2010).

The consumption pattern of binge drinkers is associated with higher BP levels compared to non-consumers (Pajak *et al.*, 2013). A higher level of alcohol consumption associated with more than seven drinks per week taken out of the meals was most likely to lead to an elevation in BP (Vieira *et al.*, 2016).

International guidelines uniformly recommend smoking cessation and limiting alcohol intake as key lifestyle interventions for hypertension prevention, though there is some variation in specific recommendations (Maniero *et al.*, 2023). Alcohol consumption is consistently associated with higher blood pressure and increased hypertension risk, and synergistic effects with tobacco further elevate this risk (Vallee, 2023). Overall, effective hypertension prevention requires not only promoting cessation but also addressing knowledge gaps, behavioral triggers, and providing ongoing support for both tobacco and alcohol users, particularly among high-risk groups (Basu *et al.*, 2024).

2.8 Knowledge, attitude and practice related literatures

A cross-sectional study conducted in Damak municipality hospital showed that nearly half of the patients (49.5%) showed a good understanding of hypertension, their attitudes and practices regarding it were lacking with only 30% demonstrated positive attitudes and a mere 19% engaging in beneficial practices (Gautam *et al.*, 2023).

In a comparative study conducted in Nepal, respondents from metropolitan areas demonstrated significantly higher mean knowledge scores than those in urban and rural municipalities ($p < 0.001$). However, no significant difference was found in mean attitude scores across these areas (Sitaula *et al.*, 2022).

A KAP study conducted in Ethiopia showed that only 48.6% of hypertensive patients have good knowledge of hypertension, 47.8 % of them have good attitude and only 39.5% of the study participated have good practice towards control of hypertension (Bacha and Abera, 2019).

A study conducted in Namibia indicated strong awareness of hypertension among participants (84.55%), while attitudes toward the condition were neither overwhelmingly positive nor negative. Self-management practices for hypertension were inconsistent; although only 39.4% routinely checked their blood pressure, a substantial 69.7% did not have their blood pressure monitored by healthcare professionals (Tuwilika *et al.*, 2024).

A study conducted in India showed that 70% of participants recorded a moderate knowledge grade, 86% of them displayed a good attitude toward prevention and management of hypertension and despite a strong understanding and positive views on healthy behaviors, the participants' actual lifestyle practices and blood pressure monitoring habits were generally poor, with the exception of a high rate of non-smoking (93%). Their average practice score was low (4.37 ± 1.4). While almost half (48%) reported regular blood pressure monitoring, only about a quarter (26%). Although participants expressed positive attitudes towards proper diet and exercise, less than 40% consistently maintained a healthy diet and engaged in regular physical activity (Venkatraman *et al.*, 2024).

In a study conducted in Lebanon, a percentage of 74.85% of patients diagnosed with hypertension indicated a “Limited” level of knowledge about hypertension, with 33.9% having poor knowledge scores and 40.9% having fair knowledge scores. Merely 25.15% of

patients with hypertension demonstrated an “Adequate” level of knowledge on the subject. It was found that 32.75% of patients with hypertension reported a “Limited” attitude towards hypertension, with 2.0% having poor attitude scores and 30.7% having fair attitude scores. A majority, specifically 67.25%, of patients with hypertension displayed an “Adequate” attitude towards the condition. Moreover, a significant proportion of 78.07% of patients with hypertension exhibited a “Limited” practice level concerning hypertension, with 57.0% having poor practice scores and 21.1% having fair practice scores. Merely 21.93% of patients with hypertension demonstrated an “Adequate” practice level regarding hypertension (Machaalani *et al.*, 2022).

2.9 Prevention, control and management

Hypertension is the leading remediable risk factor for cardiovascular disease, affecting more than 1 billion people worldwide, and is responsible for more than 10 million preventable deaths globally each year. While hypertension can be successfully diagnosed and treated, only one in seven persons with hypertension have controlled blood pressure (Patel *et al.*, 2016). Numerous environmental factors are associated with BP, especially components of diet, physical activity and alcohol consumption. In many instances, changes in exposure to these factors have led to a corresponding change in BP, with the best-proven interventions being a healthy diet, reduced sodium intake, weight loss, augmentation of potassium intake, physical activity and abstinence or moderation in alcohol consumption. These 6 interventions are effective for prevention of hypertension, treatment of hypertension, enhancing the effect of antihypertensive medication and reducing the number of drugs needed to control BP (Whelton *et al.*, 2017).

A study conducted in Nepal showed that the pooled prevalence of hypertension, awareness, treatment and control for 2016-2020 was 32% (95% CI: 23-40%), 50% (95% CI: 30-69%), 27% (95% CI: 19-34%) and 38% (95% CI: 28-48%), respectively. The prevalence of hypertension varied by age, gender, education and geographical area. Hypertension increased by 6 percentage points (pp), awareness increased by 12 pp, treatment increased by 11 pp and control increased by 3 pp over the 20 years studied. Since 2000, the rate of increment of hypertension has been 3.5 pp per decade, where 44.7% of men are expected to suffer from hypertension by 2025 (Dhungana *et al.*, 2021).

The cross-sectional study conducted in Dhulikhel, Nepal as part of the Dhulikhel Heart Study involving 1073 adults revealed that 43.6% of the participants were aware of their hypertension condition. The awareness of hypertension was found to be associated with advancing age ($p < 0.001$), with over 76.1% of those informed about their condition receiving treatment. Significant differences in treatment status were noted in relation to gender, level of education, age, and BMI. Merely 35.3% of the participants had achieved blood pressure control (Vaidya *et al.*, 2012).

2.10 Dietary assessment

A dietary survey is a systematic method of collecting and analyzing data on food consumption, dietary habits and nutrient intake of individuals or groups to assess nutritional status and dietary patterns. It is used in public health, research and policy-making to identify nutritional deficiencies and inform interventions (Marias and Glasauer, 2014).

Dietary assessment involves the collection of information on foods and drinks consumed over a specified time that is coded and processed to compute intakes of energy, nutrients and other dietary constituents using food consumption tables. A wide variety of dietary assessment methods are available to collect dietary information, each one with different strengths and weaknesses. Consideration of the purpose for collecting dietary data is necessary to enable selection of the most appropriate method (Bates *et al.*, 2017). The most commonly used methods are food records, food frequency questionnaires and 24-hour dietary recall (Boushey *et al.*, 2017).

24 – Hour dietary recall

The 24-hour dietary recall is a subjective, retrospective method that requires a direct face to face or telephone interview, and can also be self-administered using computer programmes (on line retrospective self-reported data). The method consists of precisely recalling, describing and quantifying the intake of foods and beverages consumed in the 24 hour period prior to, or during the day before the interview, from the first intake in the morning until the last foods or beverages consumed at night (before going to bed or later, in the case of those who get up at midnight and eat and/or drink something). The information should describe the type of food and its characteristics (fresh, precooked,

frozen, canned, preserved), the net quantity consumed, method of preparation, commercial brands, sauces, dressings (type of fats and oils used), condiments, liquids, multivitamin supplements and food supplements, as well as the time and place of consumption (at home, away from home), etc. The information is collected via an open or predetermined questionnaire (paper format or digital format employing specially designed reliable software). The method requires diverse support instruments (examples of dishes, volumes and household measures, drawings, photographic models, three dimensional models, detailed recipe ingredients, etc). The estimated average interview time can vary between 20 to 30 minutes (Castell *et al.*, 2015).

Food frequency questionnaire

The Food Frequency Questionnaire (FFQ) is a method of dietary assessment that uses a questionnaire to collect information on how often people eat and drink certain items and sometimes the size of those portions, usually looking back over a month, three months, or a year (Chen *et al.*, 2019). FFQs consist of a list of food items with response categories to indicate the usual frequency of consumption over a certain time and estimated total energy and nutrient intakes are calculated by frequency of consumption of each food item, with consideration of portion size. Estimated total energy and nutrient intakes are calculated as the product of the frequency of consumption of each food item, portion size and the energy yield or nutrient composition (Lovell *et al.*, 2017).

Part III

Materials and methods

3.1 Research method

A community based cross-sectional study was conducted to assess the level of knowledge, attitude and practice about hypertension among anti-hypertensive medication users.

3.2 Study location

The study was conducted in Dharan, Sunsari which is a major city in eastern Nepal. The city is inhabited by people from various ethnic and cultural backgrounds, providing a rich demographic diversity for the study population. Data collection was conducted from March 30 to April 30, 2025.

3.3 Target population

The target population of the study were the patients that were diagnosed with hypertension 6 months prior to the investigation taking anti-hypertensive medications.

- Inclusion criteria: diagnosed with hypertension 6 months prior and taking anti-hypertensive medication.
- Exclusion criteria: pregnant women, unresponsive patients and critically ill people.

3.4 Study Variables

The dependent as well as independent variables of the study were briefly described below:

i. Dependent variable: knowledge, attitude, practice and medication adherence of hypertensive patients.
ii. Independent variables:
    - Socio demographic: age, sex, weight, education
    - Behavioral: smoking, alcohol consumption, exercise
    - Diet: salt, fat, green leafy vegetables and fruits, red meat

3.5 Sampling technique

The cross-sectional, population based study was conducted in Dharan, Sub-Metropolitan City. Among 20 wards of Dharan, only 4 wards (i.e. 3, 8, 14 and 15) were chosen by using

Simple Random Sampling Technique. The study population comprised a wide age range, including individuals from 20 years to 80 years old, who resided in households with atleast one person was a patient. In households with multiple patients, a lottery method was used to select a single participant.

3.6 Sample size calculation

The sample size for the data collection for this study was calculated by using a single proportion formula, with 20.5% as prevalence rate of hypertension (Ministry of Health and Population, 2022), 95% confidence interval (CI) and 7% margin of error (d).

Calculation of sample size for infinite population:

Sample size (n) = $\frac{z^2 x\ p(1-p)}{d^2}$ (Pradhananga, 2017)

Where,

Z = 1.96 (Confidence Interval at 95%)

P = 20.5% (prevalence of HTN)

d = 7% (margin of error)

Now,

n = $\frac{1.96^2 x\ 0.205(1-0.205)}{0.07^2}$ = 127.78 ≈ 128

The calculated sample size was 128.

Thus, calculated sample size was adjusted for non-response. Considering non-response rate as 10%, the adjusted sample size was calculated to be 141.

3.7 Data collection tools and techniques

A semi structured questionnaire was developed on the basis of objective to study the knowledge and practices related care of hypertension among antihypertensive medication users. Data was collected through face-to-face interview using semi-structured questionnaire and anthropometric measurement will be taken using:

- Stadiometer: A well calibrated stadiometer to measure the height (1 piece).

Height was measured using a stadiometer with participants barefoot and wearing minimal clothing, ensuring proper body alignment (heels together, arms at sides, straight legs, relaxed shoulders, Frankfort plane). The back of the head, shoulder blades, buttocks, and heels were aligned against the stadiometer's vertical surface. Measurements were recorded to the nearest 0.1 cm at eye level (CDC, 2021).

- Weighing balance:

To ensure accurate weight measurement, a calibrated electronic scale with 0.1kg precision was used. Respondents were instructed to remove footwear and bulky garments, then stand motionless at the center of the platform with their weight evenly distributed (CDC, 2021).

- Blood pressure was measured by a sphygmomanometer (1 piece).

The respondent was asked to loosen any tight clothing or remove long-sleeved garments so that it is possible to access the upper arm. The cuff was placed around the upper arm and secured. The cuff tubing was connected to the sphygmomanometer tubing. Respondents were asked to rest their arm on a surface level with the heart. The stethoscope was placed over the brachial artery (in the bend of the elbow) to listen to the pulse. The cuff was inflated slowly until the pulse disappeared. Then, the cuff was deflated very slowly while observing the mercury level in the sphygmomanometer. The levels where the pulse first appeared and disappeared were recorded. The first appearance of the pulse corresponded to the systolic pressure, and the point where the pulse disappeared corresponded to the diastolic pressure (Pickering and Stevens, 2013).

Interview was conducted with the patients to fill up the questionnaire and when they were not able to fill the form by themselves, then I helped fill out the questionnaire providing my assistance. Of those few respondents who filled out the form themselves were guided with my thorough supervision.

The questionnaire was divided into following parts:

A. Questions related to general information
B. Questions related to socio demographic information
C. Questions related to knowledge regarding HTN
D. Questions related to attitude towards HTN

E. Questions related to practice regarding HTN
F. 24- hour dietary recall
G. Food frequency table
H. Medication adherence scale

3.7.1 Grading of the score

The questionnaire had been divided into four distinct modules in order to measure the levels of various aspects of Knowledge, Attitude and Practice (KAP) and Medication adherence. Within each module, the respondents were asked relevant questions to assess their level of knowledge of hypertension in the Knowledge module. To evaluate knowledge, attitude, practices and medication adherence a total of 15, 5, 10 and 10 questions were asked respectively.

Knowledge and attitude answers were assigned a score of one for correct responses and zero for incorrect responses. On the other hand, the practice response was rated as two for consistent adherence to the guidelines, one for occasional adherence, and zero for nonadherence (never) for all questions except questions 6, 9, and 10, where non-adherence was scored as two, occasional adherence as one, and consistent adherence as zero (Shrestha *et al.*, 2016). And medication adherence was assigned with a 4-point rating where 4 for never and 1 for always for all questions except question 10. For question 10, the score was reversed: 1 for never and 4 for always (Al-Hazmi *et al.*, 2025). The total score for each variable was calculated by summing up the scores from each question.

Respondents who achieve knowledge scores above 60% were classified as having good knowledge, whereas those with scores below 60% were deemed to possess poor knowledge (Yusof *et al.*, 2018). Similarly, respondents who attain attitude scores of 80% or higher were regarded as having a good attitude, while those falling within the range of 60-79% were considered to have a moderate attitude, and individuals with scores below 59% were labeled as having an unacceptable attitude (Sara *et al.*, 2020). In the practice section, participants who score above 80% were classified as taking acceptable preventive measures, whereas those with scores below 80% were categorized as taking unacceptable preventive measures (Arbiol *et al.*, 2016). And in the medication adherence participants who score above 80% were classified as good medication adherence score, whereas those

with scores below 80% were categorized as poor medication adherence score (Alammari *et al.*, 2021).

3.8 Pre- testing

The instruments were tested before the actual survey by measuring the people. As no fault was found on the equipment they were confirmed and used for the actual survey. The questionnaire was pretested among the people to see if there were any ambiguous questions or not and also to see if all the questions and options present on the question was easily understandable by the community members or not. By taking the suggestions from the community people the questions were modified to achieve most practical format and the prepared questionnaire was translated to local language for collecting data.

3.9 Validity and reliability

Questionnaire in this research was prepared from review of published articles and research report (Shrestha *et al.*, 2016) and (Al-Hazmi *et al.*, 2025). The validity of the instruments and techniques were ascertained. The consistency or repeatability of the measure is reliability, utmost priority was given to reduce the bias and mistakes of both researcher and participant so that reliability can be attained to its maximum.

3.10 Food frequency and dietary recall

A comprehensive dietary assessment, employing both a food frequency questionnaire (FFQ) and a 24-hour dietary recall was conducted to investigate food consumption patterns and nutrient intake. The FFQ gathered data on the types of foods regularly eaten and how often they were consumed. The 24-hour recall involved detailed accounts of all food and beverages ingested by participants in the preceding day. To ensure accurate reporting of portion sizes, respondents received enough time, assistance and visual aids including comparisons with common household utensils and measuring cups (Thompson and Subar, 2017).

Following dietary recall, the gram equivalents of consumed foods were determined. These values were then converted into their corresponding nutrient intakes carbohydrate, protein, fat, iron and total calories by referencing a food composition table (DFTQC, 2012).

To ensure adequate nutrient intake, daily recommendations for individuals aged less than 60 years and greater than 60 years were taken from (ICMR, 2020).

3.11 Data analysis

The collected data were first checked for completeness and consistency; edited, organized, coded and entered into the statistical package for social science (SPSS v20). The data was analyzed both by descriptive and inferential statistics. Frequency and percentage distribution were used to describe demographic characteristics, socio-economic characteristics, dietary habit and behaviors, consumption of food groups, knowledge, attitude, practice and medication adherence regarding HTN. Mean, SD, IQR and median were used to describe the dietary intakes. Chi square and Fisher's test was used to find out the association of KAP and medication adherence with independent variables. Pearson's correlation was applied to assess the correlation among KAP.

3.12 Ethical consideration

Permission to conduct the survey was obtained from the office of Dharan Sub-Metropolitan City. Before the study, oral and written consent was obtained from the respondents of the survey. Privacy and confidentiality of the survey were assured at all levels.

3.13 Conceptual framework

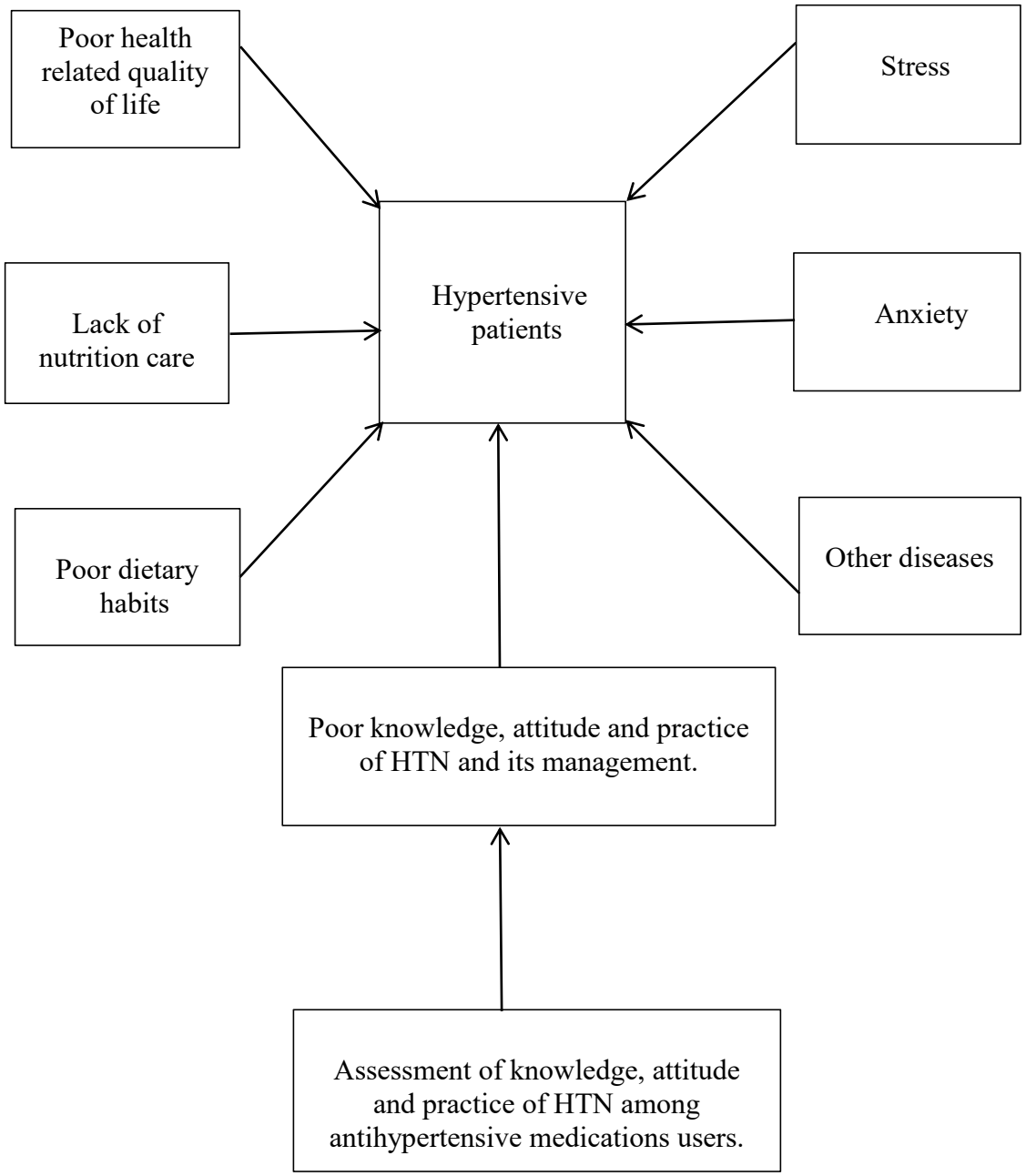


Fig. 3.1 Conceptual framework

Source: Pradhananga (2017)

Part IV

Results and discussion

A cross-sectional design was employed to evaluate participants' knowledge, attitudes and practices (KAP) in relation to blood pressure and their observed impact on blood pressure levels. Also, the study was carried out to assess the association of KAP with age, literacy, genetic history of hypertension, physical activity and their dietary practices. 141 patients were asked the well-structured questionnaire related to socio demographic status, lifestyle modifications, physical activity and medication adherence. The results and findings of the study are expressed into several following headings.

4.1 Socio-demographic and health status

4.1.1 Classification of age of respondents

Based on the survey findings, the age group of 40-50 years had the largest representation among individuals with hypertension, while those 20-30 years old made up the smallest proportion. The mean age was 51.936 ± 13.941. The distribution of participants by age group is shown below in **Table 4.1.**

Table 4.1 Distribution of age of the participants (n =141)

Age group	Frequency	Percent (%)
20-30	7	5.0
30-40	22	15.6
40-50	39	27.7
50-60	26	18.4
60-70	29	20.6
70-80	18	12.8
Total	141	100.0

There was a statistically significant difference in systolic blood pressure (SBP) across the different age groups ($p < 0.05$), whereas no significant difference was found in diastolic blood pressure (DBP) among the age groups ($p > 0.05$). It is due to physiological changes such as arterial stiffness and cumulative exposure to risk factors, which can lead to higher blood pressure in older adults compared to younger individuals (Rajan *et al.*, 2019). This

finding is consistent with the KAP study about hypertension among hypertensive patients done in Iraq where it was found that most of the respondents were of age group 40-50 years (Sadeq and Lafta, 2017).

4.1.2 Gender distribution

Information about the gender distribution of the studied population is presented in the **Fig 4.1.** The study shows that, majority of the participants in the study were male 51.5% as compared to female 48.9%. The finding is consistent with the study conducted in India, where it was found that there were more male respondents 51.7% than female 48.3% (Thomas *et al.*, 2021).

There is significant association between smoking and gender (p value < 0.05) whereas no significant association was found between smoking and BP (both SBP and DBP) (p value > 0.05). This is similar to the study done by (Tsai *et al.*, 2008) where significant gender differences was found in smoking behaviors in an Asian population, with a much lower smoking rate among women compared to men.

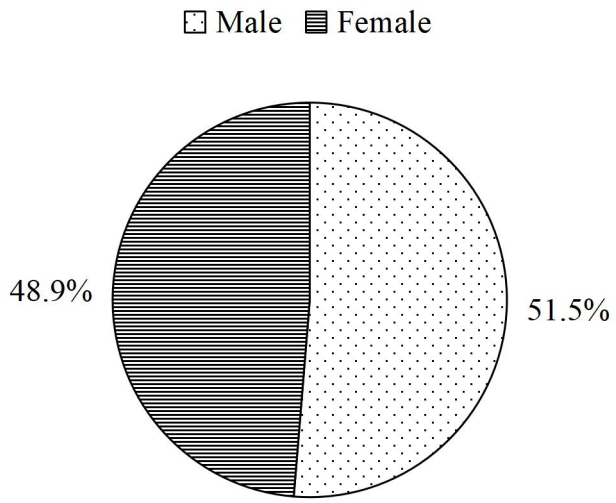


Fig. 4.1 Gender distribution of the respondents

4.1.3 Religion distribution

Fig. 4.2 shows the distribution of religion of the respondents. Of the 141 patients participating in the study, 120 (85.1%) were Hinduism. The other 21 patients (14.9%) reported following religions other than Hinduism. The underlying cause for the greater

percentage of hypertensive respondents being Hinduism is that it is the predominant religion in Nepal, and approximately 81% of people are Hinduism. Thus, it is to be expected that a large proportion of people encompassed in the studies of hypertension are Hinduism, which can be a reflection of naturally larger absolute numbers of cases of hypertension among Hindus by default. For instance, a study from a tertiary care hospital in Nepal reported that 85.8% of hypertensive patients were Hindus (Maharjan *et al.*, 2020).

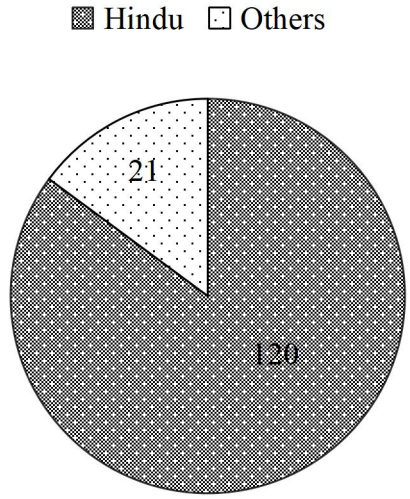


Fig. 4.2 Religion distribution of patients

4.1.4 Distribution by ethnicity, family type and food preference

The study participants represented a diverse range of ethnicities, with the largest proportion identifying as Janajati (49.6%). Other represented groups included Madhesi (14.9%), Chhetri (14.2%), Brahmin (11.3%) and Dalit (9.9%). A significantly larger proportion of participants resided in nuclear families (67.4%) compared to those living in joint families (32.6%). The dietary preferences of the 141 study participants showed that a large majority (86.5%) were non-vegetarian and a smaller group (13.5%) were vegetarian. The demographic breakdown of the participants regarding ethnicity, family type and food preference is presented below in **Table 4.2.**

The study found a statistically significant association between ethnicity and alcohol consumption, indicating that alcohol consumption patterns differ across ethnic groups. This suggests that individuals from certain ethnic backgrounds may have higher or lower frequencies of alcohol use, highlighting the need for culturally sensitive approaches in addressing alcohol-related behaviors. The study showed no significant association between

BP and food preference. This lack of association could be attributed to variations in consumption patterns, where individuals reporting a preference for non-vegetarian food may not consistently consume it in large quantities or on a daily basis.

Table 4.2 Distribution of ethnicity, family type and food preference of the respondents (n =141)

Variables	Frequency	Percent (%)
Ethnicity		
Brahmin	16	11.3
Chhetri	20	14.2
Dalit	14	9.9
Janajati	70	49.6
Madhesi	21	14.9
Family type		
Joint	46	32.6
Nuclear	95	67.4
Food preference		
Non-veg	122	86.5
Veg	19	13.5

4.1.5 Socio-economic characteristics

Table 4.3 and **Table 4.4** shows the frequency distribution of the literacy level and occupation of the respondents. Out of the 141 respondents, 37.6% had studied primary level education, 22.7% had studied informal education, 18.4% had studied secondary education, 13.5% had studied higher education and 7.8% were illiterate. The study shows there was no significant association between education level and smoking (p value > 0.05). This suggest that underlying factors such as socioeconomic status or genetic predisposition contribute to the observed link between education and smoking, suggesting that education alone is not the sole determinant.

The majority of respondents (73.7%) reported being employed, followed by those who were unemployed (24.1%), with students comprising the smallest group (2.1%). There was not statistically significant association (p value > 0.05) between occupation and blood pressure (both SBP and DBP). This suggest that occupation alone is not a direct risk factor

for hypertension, other lifestyle and genetic factors likely have a more significant influence. This finding is similar to the study done by (Jeem *et al.*, 2022) where occupation was not significantly associated with BP.

Table 4.3 Distribution of literacy rate of the respondents (n =141)

Education level	Frequency	Percent (%)
Illiterate	11	7.8
Informal	32	22.7
Primary	53	37.6
Secondary	26	18.4
Higher secondary and above	19	13.5

Table 4.4 Distribution of occupation of the respondents (n = 141)

Occupation	Frequency	Percent (%)
Government	15	10.6
Non-Government	14	9.9
Self-employed	67	47.5
Student	3	2.1
Unemployed	34	24.1
Others	8	5.7

4.1.6 Marital and Hypertension status

The survey revealed that most participants were married (95.0%), with smaller percentages being unmarried (2.1%), widowed (2.1%), and divorced (0.7%). There was no significant association between BP and marital status.

Among the hypertensive patients attending in the study, majority (68.8%) of the patients have genetic history of hypertension whereas genetic history was absent in (31.2%) patients. This observation aligns closely with findings from a prior study in Nepal investigating the link between family history and other factors in hypertensive individuals, where (69.03%) presented with genetic history of hypertension and (30.97%) did not (Kanchan *et al.*, 2023). The genetic history was not found to be significantly associated with BP. The reason might be environmental and lifestyle factors like diet, exercise, weight,

and other non-genetic influences are major contributors to blood pressure levels and hypertension risk. The frequency distribution of marital and hypertension status of the respondents is shown in **Table 4.5.**

Table 4.5 Distribution of marital and hypertension status of the participants (n = 141)

	Frequency	Percent (%)
Marital status		
Married	134	95.0
Unmarried	3	2.1
Widow/widower	3	2.1
Divorced	1	0.7
Hypertension genetic history		
Yes	97	68.8
No	44	31.2

4.1.7 Duration of Hypertension

Table 4.6 shows the frequency distribution of duration of hypertension of the respondents. A significant 67.4% of respondents indicated that their hypertension began more than 2 years ago. Another 21.3% reported an onset between 1-2 years prior, while 11.3% experienced it within the preceding 6-12 months.

Table 4.6 Duration of hypertension among the respondent (n =141)

HTN duration	Frequency	Percent (%)
6 months- 1 year	16	11.3
1-2 years	30	21.3
> 2 years	95	67.4
Total	141	100.0

4.1.8 Disease status

The distribution of comorbidities among the 141 respondents is presented in **Fig. 4.3**. Out of 141 participants 30.5% of individuals reported having diabetes, 8.5% suffered from heart problem, 2.1% had kidney problem and 9.2% indicated anxiety.

No significant association was found between diabetes, heart problem, kidney problem and anxiety with both SBP and DBP (p value > 0.05). This finding contrasts with a study conducted in Bangladesh by (Azab *et al.*, 2021) which reported a significant association between hypertension and diabetes complications. The study highlighted that elevated blood pressure (SBP and DBP) increases the risk of cardiovascular and kidney diseases, likely due to the detrimental effects of chronic hyperglycemia on vascular health.

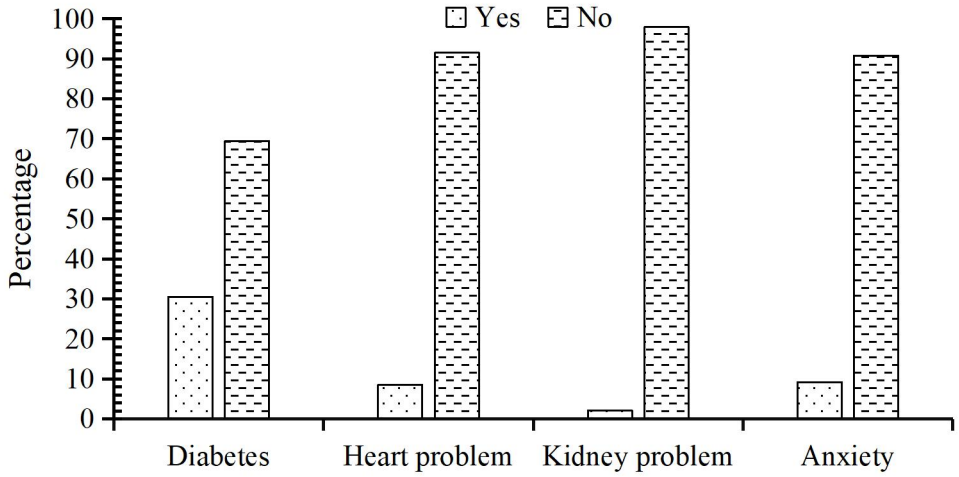


Fig. 4.3 Distribution of comorbidities among respondents

4.1.9 Sleeping time

Table 4.7 shows the sleeping time of the respondents. The largest group reported sleeping 6-8 hours per day. A smaller portion slept less than 5 hours, while the smallest group slept more than 8 hours. The study found no significant association between blood pressure and duration of sleep (p value > 0.05). The finding was in contrast with the study conducted in Iran where short sleep duration was significantly associated with a higher risk of developing hypertension (Hosseini *et al.*, 2024).

Table 4.7 Sleeping time of the respondents (n = 141)

	Frequency	**Percent (%)**
5 hours or less	16	11.3
6-8 hours	115	81.6
> 8 hours	10	7.1
Total	141	100.0

4.1.10 Current systolic and diastolic blood pressure

The average systolic blood pressure (BP) and diastolic BP of 141 participants were 128.581 ± 13.659 mmHg and 80.709 ± 8.835 mmHg. **Table 4.8** illustrates the distribution of systolic and diastolic blood pressure among the respondents. 35.5% were in the normal range, 36.1% were classified as high-normal, 27.7% were hypertensive and 0.7% were in the crisis category for systolic blood pressure. A majority of respondents (71.6%) had normal diastolic blood pressure, while 28.4% were hypertensive.

No significant association was found between smoking and BP. A similar result was reported in a cross-sectional study among Chinese men by (Li *et al.*, 2017), where current smokers were found to have lower adjusted BP than non-smokers, and no significant dose-dependent effect of smoking on BP was observed, possibly due to physiological adaptations or confounding by other health behaviors.

Dietary factors like (rice, roots and tubers, maize) consumption were not found to be significant association with blood pressure. This finding is similar to study done by (Tung *et al.*, 2023). The reason behind this may be overall dietary patterns, such as the DASH, Mediterranean and Nordic diets have a greater impact on blood pressure than individual foods. These beneficial diets, characterized by their abundance of fruits, vegetables, whole grains, nuts, limited meat and sweets demonstrably lower blood pressure. This highlights that specific foods like rice or roots and tubers likely don't have a strong independent effect on blood pressure due to complex nutrient interactions within a complete diet.

Wheat consumption was found to be significant association with DBP (p value =0.047). This finding is similar to the study conducted in Japan by (Kashino *et al.*, 2020) that higher whole grain consumption was associated with lower odds of developing hypertension, with a multivariate-adjusted odds ratio of 0.36 (p for trend = 0.04).

Table 4.8 Distribution of blood pressure of the respondents (n = 141)

	Frequency	Percent (%)
Systolic Blood pressure		
Normal	50	35.5
High-Normal	51	36.1
Hypertensive	39	27.7
Crisis	1	0.7
Diastolic Blood pressure		
Normal	101	71.6
Hypertensive	40	28.4

4.2 Anthropometric measurements

Table 4.9 illustrates the frequency distribution of respondents BMI. The average height was 158.89 ± 7.338 cm and average weight was 65.36 ± 11.29 kg, resulting in a mean BMI of 25.84 ± 3.94. Most respondents (47.5%) were in the normal weight category, while only 2.8% were underweight.

The study found no significant difference in blood pressure (BP) among respondents across different Body Mass Index (BMI) categories. The finding is similar with the finding of the study conducted by (Asante *et al.*, 2023). It might be visceral obesity was more significantly associated with high BP than BMI; hence visceral obesity was a more accurate predisposing risk factor than BMI, in predicting susceptibility to hypertension (Aduroja *et al.*, 2018).

Table 4.9 Categorization of BMI of the respondents (n =141)

BMI	Frequency	Percent (%)
Underweight	4	2.8
Normal	67	47.5
Overweight	46	32.7
Obese	24	17.0
Total	141	100.0

4.3 Dietary practices

Dietary intake was evaluated using a questionnaire that gathered information on specific food consumption, such as (salad and red meat) and broader eating patterns like (frequency of eating at home vs. outside). The respondents dietary habits are shown in the **Table 4.10** and **Table 4.11.**

Nearly half of the respondents (48.9%) reported rarely eating red meat. Weekly consumption was less common, with 22.7% eating it once a week, and 17.0% never consuming it. Only a small percentage (11.3%) ate red meat more frequently than once a week. Regarding dining out, 63.9% rarely did so, while 24.8% never dined outside.

Table 4.10 Eating pattern of the respondents (n = 141)

	Frequency	**Percent (%)**
Red meat consumption		
> Once a week	16	11.3
Once a week	32	22.7
Rarely	69	48.9
Never	24	17.0
Total	141	100.0
Dining outside		
> Once a week	3	2.1
Once a week	13	9.2
Rarely	90	63.9
Never	35	24.8
Total	141	100.0

There was no significant association between consumption of salad daily and blood pressure (p value > 0.05). This findings contrasts to the study conducted by (Cai *et al.*, 2024) where consuming salad and raw vegetables is causally associated with a decreased risk of hypertension. There was no significant association between salt intake and blood pressure (p value > 0.05). The reason might be individuals reaction to salt varies significantly. Some are salt sensitive, experiencing an increase in blood pressure with higher sodium intake, while others are salt-resistant and show minimal or no change.

Table 4.11 Daily dietary practices of the respondents (n = 141)

	Frequency	Percent (%)
Salad daily		
Yes	108	76.6
No	33	23.4
Meals in a day		
2 times	10	7.1
3 times	103	73.0
> 3 times	28	19.9
Salt intake		
5 g (1 tsp)	128	90.8
> 5 g	13	9.2
Separate meal preparation		
Yes	10	7.1
No	131	92.9
Oil type		
Sunflower	87	61.7
Mustard	16	11.3
Soyabean	10	7.1
Sunflower and mustard	25	17.7
Khukuri	3	2.1

4.4 Dietary intake

4.4.1 Dietary intake preceding one day

The mean (±SD) calorie intake was 1758.524 (190.627) kcal, mean (±SD) protein intake was 69.609 (10.041) g, mean (±SD) CHO intake was 266.106 (37.985) g and mean (±SD) fat intake was 46.184 (8.612) g. This is similar to the findings where mean calorie intake was 1749.2 kcal (Heidari *et al.*, 2019), mean protein intake was 64.3 g (Hengeveld *et al.*, 2020), mean CHO intake was 250 g (Sobotka *et al.*, 2023) and mean fat intake was 42.4 g (Vidal *et al.*, 2018).

Table 4.12 Mean and median distribution of nutrients

Nutrients	Median (IQR) intake	Mean (±SD) intake
Energy	1740 (302) kcal	1758.524 (190.627) kcal
Protein	68 (14.50) g	69.609 (10.041) g
Carbohydrate	260 (50.50) g	266.106 (37.985) g
Fat	46 (14.50) g	46.184 (8.612) g

A significant proportion of participants 73.75% (104) individuals were found to consume inadequate calories in their diet, compared to 26.24% (37) individuals who consumed adequate calories. The finding is similar to the study done by (Locher *et al.*, 2008) where 70% of the respondents consume inadequate calories.

The respondents who had enough protein was 122, which represents 86.5% whereas only 19 (13.5%) individuals did not get enough protein. The finding is similar to the study conducted by (Paddon-Jones and Leidy, 2014) where it was found that 88% of the participants consume enough protein. 2.1% (3) of the participants were identified as consumers of low carbohydrate, while 80.1% (113) were found to consume adequate carbohydrate and 17.7% (25) were found to consume high carbohydrate. The finding is similar to the study conducted by (Misra and Khurana, 2008) where it was found that only 2% of the participants consume low carbohydrate. Similarly, regarding fat intake, most participants 109 individuals (77.3%) demonstrated adequate consumption levels. In contrast, only 5 participants (3.5%) had high fat intake, while 27 participants (19.1%) were identified as having low fat consumption.

The study found that 90.8% (128) participants consumed 5 grams of salt daily, with 9.2% (13) participants consuming in excess of 5 grams per day. This contrast with findings from a study on the Spanish population, which reported a significant majority (90.8%) consumed more than 5 gm of salt per day (Partearroyo *et al.*, 2019). The nutrient adequacy among the participants is shown in **Table 4.13.**

Table 4.13 Nutrient distribution among the respondents (n = 141)

	Frequency	Percent (%)
Calorie		
Adequate	37	26.24
Inadequate	104	73.75
Protein		
Adequate	122	86.5
Inadequate	19	13.5
Carbohydrate		
Low	3	2.1
Adequate	113	80.1
High	25	17.7
Total fat		
Low	27	19.1
Adequate	109	77.3
High	5	3.5
Salt intake		
5 gm (1 tsp)	128	90.8
> 5 gm	13	9.2

Dietary factors like calorie adequacy, carbohydrate adequacy and fat adequacy were not found to be significant association with BP. However, protein adequacy (p value = 0.012) was found to be significant association with DBP. This suggest adequate protein intake is associated with better weight management and improved metabolic health, which can indirectly contribute to blood pressure regulation (Kerstetter *et al.*, 2011).

4.4.2 Food frequency questionnaire

Table 4.14 indicates that rice is a staple in the daily diet of most respondents, with 97.2% reporting daily consumption. A smaller proportion of participants consumed rice less frequently 2.1% ate it 3-4 times per week and 0.7% consumed it once a week or less.

Daily consumption of wheat products was reported by 21.3% of respondents, substantially surpassing the daily intake of maize/barley (1.4%) and millet/buckwheat (0.7%). Less frequent wheat consumption included 36.2% eating it 3-4 times weekly,

24.1% once a week or less, 12.1% monthly, and 6.3% never. While 7.8% never consumed maize or barley, a greater proportion (37.6%) never ate millet or buckwheat. There was no significant association (p value > 0.05) found between these dietary factors (rice, maize/barley, millet/buckwheat) and blood pressure (BP). However, wheat consumption was found to be significant association with DBP (p value = 0.047). A study done by (Tighe *et al.*, 2010) concluded daily consumption of 3 portions of whole grain foods can significantly reduce cardiovascular disease risk in middle-aged people mainly through blood pressure lowering mechanisms.

Table 4.14 Distribution of cereals consumption among the respondents (n= 141)

Cereals	Frequency	Percent (%)
Rice		
Daily	137	97.2
3-4 times a week	3	2.1
Once a week or less	1	0.7
Wheat		
Daily	30	21.3
3-4 times a week	51	36.2
Once a week or less	34	24.1
Monthly	17	12.1
Never	9	6.3
Maize or barley		
Daily	2	1.4
3-4 times a week	4	2.8
Once a week or less	20	14.2
Monthly	104	73.8
Never	11	7.8
Millet or Buckwheat		
Daily	1	0.7
3-4 times a week	3	2.1
Once a week or less	10	7.1
Monthly	74	52.5
Never	53	37.6

Table 4.15 shows that (85.9%) of the individuals reported to consume whole daal daily followed by (11.3%) 3-4 times a week, (2.1%) once a week or less and (0.7%) monthly. Most of the respondents reported to consume grams, beans and peas 3-4 times a week, closely followed by once a week. 3.5%, 2.9% and 6.4% reported to consume monthly, daily and never respectively.

Table 4.15 Distribution of pulses consumption among the respondents (n =141)

	Frequency	**Percent (%)**
Whole Daal		
Daily	121	85.9
3-4 times a week	16	11.3
Once a week or less	3	2.1
Monthly	1	0.7
Grams beans or peas		
Daily	4	2.9
3-4 times a week	86	61.0
Once a week or less	37	26.2
Monthly	5	3.5
Never	9	6.4

Table 4.16 shows that a substantial majority of respondents, 91.5% reported consuming green leafy vegetables (GLV) daily. Less frequent consumption was observed among 6.4% of respondents who ate GLV 3-4 times a week and 1.4% who consumed them once a week or less. Only a negligible 0.7% of respondents reported never consuming GLV.

96.5% (136) of participants indicated that they eat other vegetables on a daily basis, while 3.5% (5) reported consuming them 3-4 times per week. Daily consumption of roots and tubers was the most common, with 72.3% (102) of respondents reporting this frequency. Following far behind, 9.2% (13) consumed them 3-4 times a week and 7.1% (10) consumed them once a week or less. Monthly consumption was reported by 6.4% (9) while 5.0% (7) never consumed roots and tubers.

The study shows that 39.7% (56) of the respondents reported to consume fruits daily, followed by consumption on a 3-4 times a week i.e. 36.2% (51). 17.0% (24), 5.0% (7) and

2.1% (3) of the respondents of the study reported to consume fruits once a week or less, monthly and never respectively. This findings is similar to the study conducted by (Choi *et al.*, 2019) where 32.6% consume fruits daily.

Table 4.16 Distribution of fruits and vegetables consumption among the respondent (n = 141)

Fruits and vegetables	Frequency	Percent (%)
GLV		
Daily	129	91.5
3-4 times a week	9	6.4
Once a week or less	2	1.4
Never	1	0.7
Other Vegetables		
Daily	136	96.5
3-4 times a week	5	3.5
Roots and tubers		
Daily	102	72.3
3-4 times a week	13	9.2
Once a week or less	10	7.1
Monthly	9	6.4
Never	7	5.0
Fruits		
Daily	56	39.7
3-4 times a week	51	36.2
Once a week or less	24	17.0
Monthly	7	5.0
Never	3	2.1

Consumption of GLV, other vegetables, roots and tubers and fruits were not found to be significant association with blood pressure. A meta-analysis conducted by (Wu *et al.*, 2016) indicated that higher overall fruit and vegetables consumption is linked to a reduced risk of developing hypertension, with a 1.9% decrease in risk for each additional serving of fruit.

Daily milk consumption is significantly higher than curd consumption among respondents, according to **Table 4.17.** While 68.8% drink milk daily, only 35.5% consume curd each day. This observation aligns with findings from (Pallathadka *et al.*, 2022) who also reported a 68.8% daily milk consumption rate. Following this, 13.5% consume milk 3-4 times a week, 5.7% once a week or less and a mere 0.7% monthly. For curd, 41.8% consume it 3-4 times a week, 14.2% once a week or less, and 0.7% monthly. Notably, 11.3% never consume milk and 7.8% never consume curd.

Regarding ghee consumption, a significant portion of respondents (37.6%) indicated they never consume it. Other consumption frequencies, in descending order, included monthly, once a week or less, and daily. A minority (6.4%) reported consuming ghee 3-4 times a week. In contrast, paneer or cheese was most commonly consumed monthly by 76.6% of respondents. Never and once a week or less were the next most common responses, while only 5.7% consumed paneer or cheese 3-4 times a week.

No significant association was found between dairy products and both SBP and DBP (p value > 0.05). A study conducted by (Feng *et al.*, 2022) suggests that total dairy product is associated with a low risk of overweight or obesity, hypertension, and T2DM, especially milk and yogurt for overweight or obesity, low-fat dairy and milk for hypertension, and yogurt for T2DM.

Table 4.17 Distribution of dairy products consumption among the respondents (n =141)

Dairy products	Frequency	Percent (%)
Milk		
Daily	97	68.8
3-4 times a week	19	13.5
Once a week or less	8	5.7
Monthly	1	0.7
Never	16	11.3
Curd		
Daily	50	35.5
3-4 times a week	59	41.8
Once a week or less	20	14.2
Monthly	1	0.7
Never	11	7.8
Ghee		
Daily	12	8.5
3-4 times a week	9	6.4
Once a week or less	15	10.6
Monthly	52	36.9
Never	53	37.6
Paneer or cheese		
3-4 times a week	8	5.7
Once a week or less	9	6.4
Monthly	108	76.6
Never	16	11.3

As shown in **Table 4.18,** among animal products, eggs are preferred for daily consumption above all others. 28.4%, 34.8% and 4.3% reported to consumed eggs 3-4 times a week, once a week or less and monthly respectively. 18.4% of the respondent reported to never consume egg. This is similar to the study done in China by (Guo *et al.*, 2018) where 13.1% of the respondents consume egg daily.

The study shows that 58.9% of the respondents reported to consume chicken 3-4 times a week, followed by never and once a week or less i.e. 19.1% and 17.8%. And consistent 2.1% of the respondents of the study reported to consume chicken on daily and monthly basis respectively. Both fish and red meat were primarily consumed on a monthly basis. 16.3% reported eating fish on once a week or less, compared to 22.7% for red meat. More frequent consumption 3-4 times a week was low for both: 2.1% for fish and 11.4% for red meat. Notably, 21.3% never ate fish while 17.0% never consume red meat.

Table 4.18 Distribution of consumption of non-veg products (n = 141)

	Frequency	**Percent (%)**
Chicken		
Daily	3	2.1
3-4 times a week	83	58.9
Once a week or less	25	17.8
Monthly	3	2.1
Never	27	19.1
Fish		
3-4 times a week	3	2.1
Once a week or less	23	16.3
Monthly	85	60.3
Never	30	21.3
Red meat		
3-4 times a week	16	11.4
Once a week or less	32	22.7
Monthly	69	48.9
Never	24	17.0
Egg		
Daily	20	14.1
3-4 times a week	40	28.4
Once a week or less	49	34.8
Monthly	6	4.3
Never	26	18.4

A study done by (Schwingshackl *et al.*, 2017) suggested that higher intakes of red and processed meats are associated with increased risk of hypertension, while higher intakes of whole grains, fruits, nuts and dairy are associated with decreased risk. No significant association was found between BP and any of the non-veg products: chicken, fish, red meat and egg.

Table 4.19 Distribution of processed products consumption among the respondents (n =141)

	Frequency	**Percent (%)**
Carbonated drinks		
Daily	1	0.7
3-4 times a week	3	2.1
Once a week or less	9	6.4
Monthly	87	61.7
Never	41	29.1
Packaged foods		
Daily	4	2.8
3-4 times a week	7	5.0
Once a week or less	8	5.7
Monthly	90	63.8
Never	32	22.7

Daily consumption rates for carbonated drinks and packaged foods were reported as 0.7% and 2.8% respectively. However monthly consumption of carbonated drinks was 61.7% and packaged foods was 63.8%. The survey also detailed less frequent consumption for both categories, including once a week or less and 3-4 times a week. 29.1% and 22.7% of the respondents reported that they had never consume carbonated drinks and packaged foods respectively.

A study conducted by (Johny *et al.*, 2018) reported that 66% of participants consume carbonated drinks monthly. The study conducted by (Bhattacharya *et al.*, 2022) reported 91.3% of the participants consume packaged foods monthly which contrasts to our study. No significant association was found between BP and both carbonated drinks and packaged foods.

4.5 Physical Activity

Table 4.20 Distribution of physical activity of the respondents (n = 141)

	Frequency	Percent (%)
Household chores		
Too much	20	14.1
Lot	49	34.8
Little	55	39.0
Very less	18	12.1
Walking or jogging		
Daily	50	35.5
Few times a week	23	16.3
Sometimes	45	31.9
Never	23	16.3
Heart racing exercise		
Daily	18	12.8
Few times a week	8	5.7
Sometimes	17	12.0
Never	98	69.5
Sitting or reclining time		
< 90 min	47	33.3
> 90 min	94	66.7
Total	141	100.0

Table 4.21 Distribution of duration of physical activity of the respondents (n = 141)

	Frequency	Percent (%)
Walking or jogging		
< 30 minutes	48	34.0
30-60 minutes	56	39.7
> 60 minutes	14	9.9
Total	118	83.7
Heart racing exercise		
< 30 minutes	23	16.3
30-60 minutes	16	11.3
> 60 minutes	4	2.8
Total	43	30.5

An analysis of physical activity types **(Table 4.20)** revealed that a substantial majority of respondents (118 out of 141, or 83.7%) regularly walked or jogged. However, only 43 (30.5%) engaged in activities that elevate heart rate. No significant association was found between systolic and diastolic blood pressure and either the timing of walking (morning or evening) or participation in heart-racing activities (p value > 0.05). This contrast to a cross-sectional study conducted on Japanese workers revealed that engaging in exercise during the evening hours (18:00-21:00) was associated with lower blood pressure than exercising at other times of the day (Imamura *et al.*, 2022).

As shown in **Table 4.21**, the duration of physical activity varied among respondents. Among the 83.7% who walked or jogged, the largest proportion (39.7%) spent 30-60 minutes on each session, followed by those who walked for less than 30 minutes (34.0%) and more than 60 minutes (9.9%). For the 30.5% of respondents who performed heart-racing activities, the breakdown was 16.3% for less than 30 minutes, 11.3% for 30-60 minutes, and 2.8% for over 60 minutes. Studies show that 30–60 minutes of moderate-intensity activity, like walking or jogging is associated with significant improvements in both physical health and subjective well-being (Wicker and Frick, 2015).

4.6 KAP score of hypertensive respondents

4.6.1 Knowledge related score of the respondents

Knowledge questionnaires about blood pressure and hypertension were asked with the respondents and then the answers were analyzed. The frequency distribution of the responses about knowledge by the respondents is shown in **Table 4.22.** The knowledge score varied between 3 and 15 points with an average of 12.178 ± 3.252. The study shows that 78.7% had good knowledge whereas, 21.3% had poor knowledge regarding hypertension as shown in **Fig. 4.4.** This finding is consistent with the finding of the study conducted in Nigeria on Knowledge, Attitude and Perception of Hypertension among staff of a tertiary institution, where it was found that 77.1% of the respondents had good knowledge about hypertension (Mgbahurike and Lelesi, 2022).

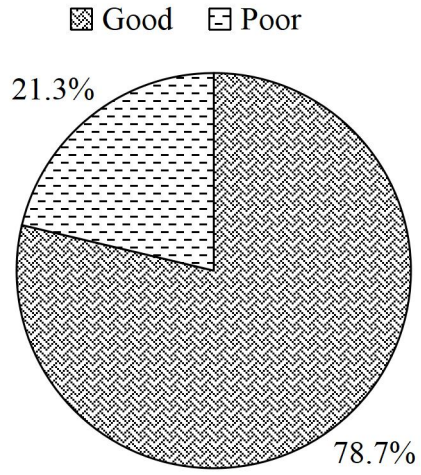


Fig. 4.4 Knowledge score of respondents

Table 4.22 Responses to knowledge questions by the respondents (n = 141)

Questions	Frequency
Do you know normal BP reading?	Yes: 121 (85.8%)
	No: 20 (14.2%)
What is HTN?	A higher level of BP than normal: 118 (83.7%)
	A lower level of BP than normal: 1 (0.7%)
	Either higher or lower BP than normal: 3 (2.1%)
	I do not know: 19 (13.5%)

Do you know the Causes of HTN?	Yes: 116 (82.3%)
	No: 25 (17.7%)
Do you know Symptoms of HTN?	Yes: 120 (85.1%)
	No: 21 (14.9%)
Do you know Symptoms of low BP?	Yes: 117 (83.0%)
	No: 24 (17.0%)
Is HTN heritable?	Yes: 109 (77.3%)
	No: 24 (17.0%)
	I don't know: 8 (5.7%)
Is HTN curable?	Yes: 49 (34.8%)
	No: 81 (57.4%)
	I don't know: 11 (7.8%)
Do you know what complications can arise if BP is not controlled?	Heart disease: 8 (5.7%)
	Diabetes mellitus: 3 (2.1%)
	Eye problem: 1 (0.7%)
	Kidney diseases: 2 (1.4%)
	All of the above: 114 (80.9%)
	I do not know: 13 (9.2%)
Do antihypertensive medicines sometimes lower your BP below normal?	Yes: 115 (81.6%)
	No: 20 (14.2%)
	I do not know: 6 (4.3%)
Is excessive salt intake one of the risk factors for developing high BP?	Yes: 132 (93.6%)
	No: 3 (2.1%)
	I do not know: 6 (4.3%)
Is excessive alcohol intake one of the risk factors for developing high BP?	Yes: 127 (90.1%)
	No: 4 (2.8%)
	I do not know: 10 (7.1%)
Is being overweight one of the risk factors for developing high BP?	Yes: 118 (83.7%)
	No: 8 (5.7%)
	I do not know: 15 (10.6%)
Is regular BP measurement necessary for high BP patients?	Yes: 128 (90.8%)
	No: 4 (2.8%)
	I do not know: 9 (6.4%)

Do you have to take antihypertensive medicines for life long?	Yes: 105 (74.5%) No: 25 (17.7%) I do not know: 11 (7.8%)
What changes in life should be taken to control or prevent HTN?	Control your blood sugar: 1 (0.7%) Limit alcohol consumption and smoking: 4 (2.8%) Maintaining healthy body weight: 2 (1.4%) Limit salt intake: 22 (15.6%) All of the above: 96 (68.1%) I do not know: 16 (11.3%)

Note: values in parentheses are the percentage distribution of the sample.

4.6.2 Attitude related score of the respondents

The frequency distribution of the attitude related answers by the respondents is shown in **Table 4.23.** The attitude score varied between 0 and 5 with a median of 5. As shown in **Fig. 4.5,** the study shows that 93.6% had good attitude whereas, 2.1% had moderate and 4.3% had unacceptable attitude towards hypertension. This finding is consistent with the finding of the study conducted in Neno, rural Malawi on determinants of hypertension-related knowledge, Attitude and Practices (KAP) among caregivers, where it was found 93.3% of the respondents had good attitude towards hypertension (Maluwa *et al.*, 2025).

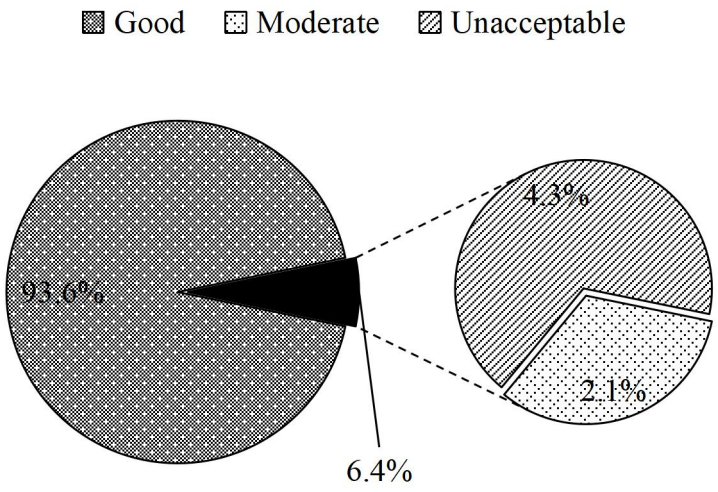


Fig. 4.5 Attitude score of respondents

Table 4.23 Responses to attitude questions by the respondents (n = 141)

Questions	Frequency
Should we reduce salt intake to prevent hypertension?	Yes: 134 (95.0%)
	No: 7 (5.0%)
Do you think regular checking of BP is important?	Yes: 130 (92.2%)
	No: 11 (7.8%)
Do you think regular medication is important in hypertension?	Yes: 135 (95.7%)
	No: 6 (4.3%)
Should we keep in touch with the physician regularly?	Yes: 132 (93.6%)
	No: 9 (6.4%)
Should we exercise regularly for healthy life?	Yes: 132 (93.6%)
	No: 9 (6.4%)

Note: values in parentheses are the percentage distribution of the sample.

4.6.3 Practice related score of the respondents

Table 4.24 presents the frequency distribution of respondents' practice related answers. The score varied between 6 and 20 with an average of 13.482 ± 2.953. The study demonstrated a proportion of 78.0% respondents reported unacceptable practice whereas, 22.0% had acceptable practice regarding hypertension. This finding aligns to the study done in Baghdad, Iraq on KAP about hypertension in hypertensive patients where it was found 76.0% of the respondents had unacceptable score of practice regarding hypertension (Sadeq and Lafta, 2017). **Fig. 4.6** shows the practice score of respondents.

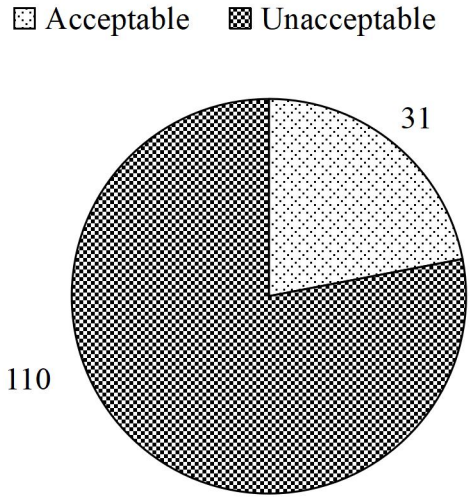


Fig. 4.6 Practice score of respondents

Table 4.24 Responses to practice questions by the respondents (n = 141)

Questions	Frequency
How often do you measure your BP?	Frequently: 57 (40.4%)
	Sometimes: 83 (58.9%)
	Never: 1 (0.7%)
How often do you moderate your salt intake?	Frequently: 100 (70.9%)
	Sometimes: 33 (23.4%)
	Never: 8 (5.7%)
How often do you avoid fatty food consumption?	Frequently: 91 (64.5%)
	Sometimes: 42 (29.8%)
	Never: 8 (5.7%)
How often do you smoke?	Daily: 6 (4.3%)
	Few times a week: 3 (2.1%)
	Rarely: 11 (7.8%)
	Never: 121 (85.8%)
How often do you perform physical exercise?	Frequently: 22 (15.6%)
	Sometimes: 95 (67.4%)
	Never: 24 (17.0%)
How often do you check your body weight?	Frequently: 38 (27.0%)
	Sometimes: 99 (70.2%)
	Never: 4 (2.8%)
How often do you consume alcohol?	Daily: 9 (6.4%)
	Few times a week: 15 (10.6%)
	Rarely: 37 (26.2%)
	Never: 80 (56.8%)
How often do you miss the dose of your medication?	Frequently: 2 (1.4%)
	Sometimes: 60 (42.6%)
	Never: 79 (56.0%)
How often do you consult your healthcare provider?	Frequently: 33 (23.4%)
	Sometimes: 102 (72.3%)
	Never: 6 (4.3%)
How often do you check your lipids?	Frequently: 12 (8.5%)
	Sometimes: 59 (41.8%)
	Never: 70 (49.6%)

Note: values in parentheses are the percentage distribution of the sample.

4.6.4 Medication adherence related score of the respondents

Table 4.25 shows the frequency distribution of the medication adherence answers by the respondents. The medication adherence score varied between 13 and 40 with a median of 36. As shown in **Fig. 4.7,** the study shows that 86.5% had good medication adherence whereas, 13.5% had poor medication adherence towards hypertension. This finding is consistent to the study conducted in Taif city, Saudi Arabia on factors related to treatment adherence among hypertensive patients: A cross-sectional study in primary healthcare centers where it was found that 86.0% of the respondent had good adherence towards hypertension (Alsofyani *et al.*, 2022).

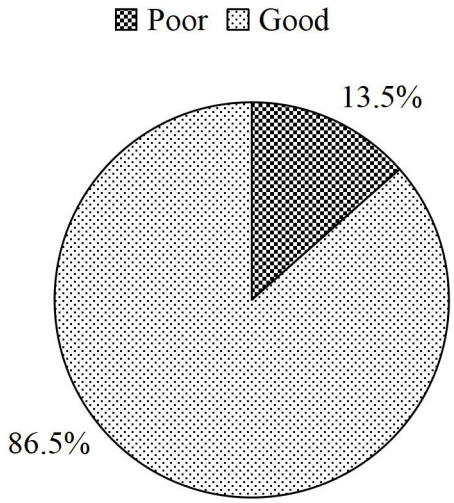


Fig. 4.7 Medication adherence score of respondents

Table 4.25 Responses to medication adherence questions by the respondents (n = 141)

Questions	Frequency
How often do you forget to take your medication to control blood pressure?	Never: 79 (56.0%) Once in a while: 59 (41.8%) Majority of the times: 3 (2.1%) Always: 0
How frequently do you choose not to take your medication?	Never: 122 (86.5%) Once in a while: 16 (11.3%) Majority of the times: 1 (0.7%) Always: 2 (1.4%)

Do you change the medicine dose or number of tablets without physician consultation?	Never: 100 (70.9%) Once in a while: 39 (27.7%) Majority of the times: 1 (0.7%) Always: 1 (0.7%)
Do you stop taking medications on the day you feel comfortable?	Never: 128 (90.8%) Once in a while: 6 (4.3%) Majority of the times: 5 (3.5%) Always: 2 (1.4%)
Have you ever stopped taking your medications without telling your doctor because of your perceived side effects?	Never: 124 (87.9%) Once in a while: 12 (8.5%) Majority of the times: 3 (2.1%) Always: 2 (1.4%)
How frequently do you forget to take medicine due to forgetfulness?	Never: 76 (53.9%) Once in a while: 58 (41.1%) Majority of the times: 6 (4.3%) Always: 1 (0.7%)
How often do you stop medicines when your blood pressure is controlled?	Never: 127 (90.1%) Once in a while: 10 (7.1%) Majority of the times: 1 (0.7%) Always: 3 (2.1%)
How frequently have you stopped taking blood pressure medicine while you are sick due to other acute illnesses such as flu?	Never: 111 (78.7%) Once in a while: 26 (18.4%) Majority of the times: 2 (1.4%) Always: 2 (1.4%)
Have you ever been annoyed by adhering to the treatment plan, as some patients feel discomfort taking it daily?	Never: 102 (72.3%) Once in a while: 33 (23.4%) Majority of the times: 4 (2.8%) Always: 2 (1.4%)
How frequently do you refill well in advance before the blood pressure medicine finishes?	Never: 11 (7.8%) Once in a while: 69 (48.9%) Majority of the times: 27 (19.1%) Always: 34 (24.1%)

Note: values in parentheses are the percentage distribution of the sample.

4.7 Association between socio-demographic and associated factors with the knowledge regarding HTN among the adults using antihypertensive medications

4.7.1 Association between knowledge and socio-demographic variables

Table 4.26 Association between knowledge level and socio-demographic variables (n = 141)

	Knowledge level		$\chi 2$	P value
	Good	**Poor**		
Age group				
< 50	64	8	9.433	**0.009*$_a$**
≥ 50	47	22		
Education level				
Illiterate	0	11	43.178	**0.001*$_e$**
Literate	111	19		
Duration of HTN				
6 months- 1 year	13	3	1.428	0.861$_e$
1-2 years	25	5		
> 2 years	73	22		
Genetic history				
Yes	76	21	1.294	0.524$_a$
No	35	9		

* denotes p value significant at 0.05 level

$_a$ Tested by Chi- square Test

$_e$ Tested by Fisher's Exact Test

The association between knowledge level and socio-demographic variables is shown in **Table 4.26**. No significant association was reported between the knowledge scores concerning HTN and some of the studied factors: duration of onset of HTN, genetic history of HTN (all p values > 0.05).

The reason behind why duration of onset of HTN association with knowledge didn't reach significant association might be even with a longer duration of HTN, individuals might not seek or receive adequate education about their condition. And for genetic history to not reach statistical significance, it might be many individuals with a genetic history

may remain unaware of the disease's etiology, prevention, and management unless actively educated.

However, there is a significant association between the knowledge scores concerning HTN and age group (p value = 0.0098) and education level (p value = 0.001). The finding of the study is consistent with the findings of the study conducted in Nepal by (Bashyal and Thapa, 2020). It might be older individuals may have more life experiences or exposure to health issues, potentially enhancing their awareness and knowledge about HTN. And higher education levels are often associated with better health literacy, enabling individuals to understand medical advice, terminology and the importance of managing HTN.

Salt intake was not significantly associated (p value = 0.098) with knowledge level. The reason might be people may be aware of the dangers of excessive salt, knowledge often fails to change actual eating behaviors due to factors like taste preferences, cultural habits, food availability and the widespread presence of hidden salt in processed foods.

4.7.2 Association between knowledge and blood pressure

Table 4.27 and **Table 4.28** shows the association between knowledge with SBP and DBP respectively. No statistically significant relationship was found between blood pressure levels and knowledge, attitude, or practice (p value > 0.05). This suggest that having knowledge isn't always enough to change behavior or control blood pressure effectively. People might be aware of hypertension and healthy habits, but face challenges putting that knowledge into practice. These hurdles can be personal, like a lack of motivation; social, like cultural norms; or systemic, like limited access to healthcare or financial constraints. Another factor is that individual body chemistry and daily habits, regardless of what someone knows can significantly impact blood pressure levels. The finding of the study is consistent with the study done by (Buang *et al.*, 2019) where attitude and practice scores did not show significant correlation between BP (p value > 0.05). The reason might be positive attitude does not always lead to effective or consistent practices that influence blood pressure levels.

Table 4.27 Association between knowledge level and systolic blood pressure (n = 141)

Systolic BP	Knowledge level		χ2	P value
	Good	Poor		
Non-Hypertensive	80	20	1.008	0.604
Hypertensive	31	10		

Note: p value significant at 0.05

Table 4.28 Association between knowledge level and diastolic blood pressure (n = 141)

Diastolic BP	Knowledge level		χ2	P value
	Good	Poor		
Normal	80	21	0.159	0.923
Hypertensive	31	9		

Note: p value significant at 0.05

4.8 Association between socio-demographic and associated factors with attitude regarding HTN among the adults using antihypertensive medications

The association between attitude level and socio-demographic variables is shown in **Table 4.29**. No significant association was reported between the attitude scores concerning HTN and some of the studied factors: age group, duration of onset of HTN, genetic history of HTN (all p values > 0.05). However, there is a significant association between education level, and attitude level (p value = 0.002). The reason might be higher education typically equips individuals with expanded knowledge, sharpened critical thinking abilities and exposure to a wider range of viewpoints.

The study shows there is no significant association between sodium intake and attitude level (p value = 0.195). The finding is similar with the study conducted by (Marakis *et al.*, 2023).

Table 4.29 Association between attitude level and socio-demographic variables (n = 141)

	Attitude level			χ2	P value
	Good	**Moderate**	**Poor**		
Age group					
< 50	70	0	2	3.686	0.097[e]
≥ 50	62	3	4		
Education level					
Illiterate	7	1	3	12.658	**0.002***[e]
Literate	125	2	3		
Duration of HTN					
6 months- 1 year	15	1	0	4.533	0.254[e]
1-2 years	27	0	3		
> 2 years	90	2	3		
Genetic history					
Yes	91	2	4	0.373	1.000[e]
No	41	1	2		

* denotes p value significant at 0.05 level

[e] Tested by Fisher's Exact Test

4.9 Association between socio-demographic and associated factors with the practice regarding HTN among the adults using antihypertensive medications

Table 4.30 shows the association between socio-demographic and associated factors with the practice regarding HTN. No significant association was reported between the practice scores concerning HTN and any of the studied factors: age, education level, duration of onset of HTN, genetic history of HTN (all p value > 0.05). The reason might be health practices related to HTN are often influenced more by individual awareness, access to healthcare, and cultural or community factors rather than basic demographic characteristics alone. For instance, while older age or higher education might suggest improved health practices, these factors alone don't ensure better knowledge or adherence if health education and screening programs are either inadequate or fail to effectively reach all populations.

The study shows there is significant association between sodium intake and practice level (p value = 0.006). This finding is similar to the study done by (Singer *et al.*, 2015) where no significant association was found between sodium intake and cardiovascular mortality in hypertensive individuals over an 18.6 year follow-up.

Table 4.30 Association between practice level and socio-demographic variables (n = 141)

	Practice level		χ2	P value
	Acceptable	**Unacceptable**		
Age group				
< 50	15	57	0.555	0.758_a
≥ 50	16	53		
Education level				
Illiterate	1	10	3.324	0.220_e
Literate	30	100		
Duration of HTN				
6 months- 1 year	3	13	1.118	0.916_e
1-2 years	5	25		
> 2 years	23	72		
Genetic history				
Yes	26	71	4.769	0.092_a
No	5	39		

p-value Statistically Significance at 0.05

a Tested by Chi- square Test

e Tested by Fisher's Exact Test

4.10 Association between socio-demographic and associated factors with the medication adherence regarding HTN among the adults using antihypertensive medications

Table 4.31 shows the association between medication adherence level and socio-demographic variables. There was a significant association between the medication adherence score concerning HTN and some of the studied factors: education level (p value =0.001), duration of onset of HTN (p value = 0.024) and genetic history of HTN (p value

=0.017). The finding of the study is similar with the study in Iran by (Esmaeili *et al.*, 2017) where education level and duration of onset of HTN was significantly associated.

However, there was no significant association reported between medication adherence score concerning HTN and age groups (p value > 0.05). Some studies indicate that older age may correlate with better adherence due to factors like retirement and fewer prescribed medications (Uchmanowicz *et al.*, 2019).

Table 4.31 Association between medication adherence level and socio-demographic variables (n = 141)

	Adherence level		$\chi 2$	P value
	Good	**Poor**		
Age group				
< 50	65	7	4.590	0.079_e
≥ 50	57	12		
Education level				
Illiterate	5	6	15.371	**0.001*$_e$**
Literate	117	13		
Duration of HTN				
6 months- 1 year	12	4	9.751	**0.024*$_e$**
1-2 years	26	4		
> 2 years	84	11		
Genetic history				
Yes	82	15	7.824	**0.017*$_e$**
No	40	4		

* denotes p value significant at 0.05 level

$_e$ Tested by Fisher's Exact Test

4.11 Association of salt intake with KAP

There was no significant association between knowledge, attitude with salt intake whereas, it was found that practice and salt intake were significantly associated. This finding is similar to the study conducted in Bangladesh by (Chandra *et al.*, 2025) where practice and salt intake were significantly associated.

4.12 Correlation between KAP regarding hypertension

The correlation is estimated through bivariate analysis model to explore the relationship between the KAP scores. The correlation between KAP is shown in **Table 4.32.**

Table 4.32 Correlation between KAP

Variables	Pearson correlation	P-value	Interpretation
Knowledge and attitude	+0.714**	< 0.001	Positive correlation
Knowledge and practice	+0.291**	< 0.001	Weak correlation
Attitude and practice	+0.401**	< 0.001	Moderate correlation

**Correlation is significant at the 0.01 level (2-tailed)

Part V

Conclusions and Recommendations

5.1 Conclusion

The study was aimed at assessing the patient's knowledge, attitude and practice about hypertension and dietary practices on hypertension among anti-hypertensive medications users of Dharan Sub- Metropolitan, City. The findings of this study lead to the following conclusions:

a) A study of hypertensive patients in Dharan found that knowledge was present in 78.7%, a positive attitude in 93.6% and relevant practices in 22.0% of patients.
b) About half of the patients 67 (47.5%) were self-employed while a majority of the patients had atleast a primary education 53 (37.6%). Only 11 (7.8%) of the patients reported being illiterate.
c) Most of the respondents i.e. 86.5% are non-vegetarian and 95.0% are married. 67.4% of the respondents are living with HTN for over 2 years.
d) 85.8% and 56.7% of the respondents never smoke and consume alcohol respectively.
e) It was found that majority of participants 73.75% consumed inadequate calories, 86.5% consumed adequate protein and 90.8% consumed 5 gm of salt in a day.
f) The medication adherence score was found to be 86.5%.
g) Majority of them (76.6%) consumed salad daily and 19.9% consumed meals more than 3 times a day. Almost half of them i.e. 48.9% consumed red meat on monthly basis and 24% never consumed red meat.
h) There is a significant association between knowledge scores concerning HTN and both age groups and education level.

5.2 Recommendations

The study can be further continued with the following recommendations:

a) Despite of having good knowledge and attitude of participant towards healthy lifestyle habits, the practice regarding lifestyle modification among hypertensive patients is low. Therefore, educational interventions and awareness programs targeting hypertensive patients should be initiated.
b) Proper and regular use of anti hypertensive drugs among known hypertensives will help reduce morbidity and mortality rates of hypertension crisis.

c) Comparative study of KAP of old hypertensive patients and newly diagnosed hypertensive patients can be done.
d) Comparative study on KAP of before and after an awareness campaign on hypertension can be conducted.

Part VI

Summary

Hypertension is a major contributor to the global disease burden. The prevalence and rate of diagnosis of hypertension in children, adolescents and adults appears to be increasing. Hypertension possess a significant global health crisis. Prevention, detection, treatment and control of this condition should receive high priority. Among 20 wards, only 4 wards were selected by using simple random sampling technique and patients of age group 20 years to 80 years old for sample data collection. This community based cross-sectional study assessed the knowledge, attitudes and practices among 141 individuals with hypertension in Dharan, all of whom had been diagnosed with the condition at least six months prior to the study. A face to face interview using a semi-structured questionnaire was carried out for data collections and anthropometric measurements were taken. Socio demographic characteristics of the participants were determined.

The study assessed that 78.7%, 93.6% and 22.0% of the patients had a good knowledge, attitude and practice score respectively. Majority 68.8% had family history of hypertension and 67.4% of them had hypertension for over 2 years. 95.7% of the respondent knew that regular medication is important to prevent high blood pressure and 93.6% understood that regular exercise contributes to a healthy life. However, 17.0% never performed any sorts of exercise. The medication adherence score was found to be 86.5%. 85.8% and 56.7% of the respondents never smoke and consumed alcoholic beverages. No statistically significant relationship was found between blood pressure levels and knowledge of the participants. This suggest that having knowledge isn't always enough to change behavior or control blood pressure effectively.

In conclusion, although participants demonstrated good knowledge and a positive attitude toward healthy lifestyle habits, their actual implementation of lifestyle changes among hypertensive patients was generally low. However, the favorable attitude observed should be nurtured and introducing a lifestyle intervention program could enhance the adoption of healthier practices for better management and control of hypertension. Additionally, community awareness initiatives should be expanded to reach the broader population.

References

Aduroja, E. P., Isola, O., Akinboye, O. and Akinboye, O. D. (2018). Relationship of visceral obesity and BMI with blood pressure among Osun State College of Education staff, Nigeria. *Adv. Res*. **7** (6), 1-14. [doi:10.9734/AIR/2016/27342].

Afolabi, I. S., Chinedu, S. N., Iweala, E. E. J., Ogunlana, O. O. and Azuh, D. E. (2015). Body mass index and blood pressure in a semi-urban community in Ota, Nigeria. *Food Public Health*. **5** (5), 157-163. [doi:10.5923/j.fph.20150505.02].

Akpan, E. E., Ekrikpo, U. E., Udo, A. I. A. and Bassey, B. E. (2015). Prevalence of hypertension in Akwa Ibom State, South-South Nigeria : rural versus urban communities study. *Int. J. Hypertens.* **2015** (1), 975819. [doi:10.1155/2015/975819].

Al-Hazmi, A. H., Alanazi, A. D. M., Thirunavukkarasu, A., Alriwely, N. S., Alrais, M. M. F., Alruwaili, A. B. S., Alnosairi, M. S. and Alsirhani, A. I. (2025). Evaluation of hypertension knowledge and its association with medication adherence among hypertensive patients attending primary health centers: a cross-sectional study from eastern Saudi Arabia. *Front. Public Health* **12**, 1378561. [doi:10.3389/fpubh.2024.1378561].

Al Kibria, G. M., Swasey, K., Mirbolouk, M., Sakib, M. N., Sharmeen, A., Chadni, M. J. and Stafford, K. A. (2018). Estimated change in prevalence of hypertension in Nepal following application of the 2017 ACC/AHA guideline. *JAMA Netw. Open*. **1** (3), e180606. [doi:10.1001/jamanetworkopen].

Alammari, G., Alhazzani, H., AlRajhi, N., Sales, I., Jamal, A., Almigbal, T. H., Batais, M. A., Asiri, Y. A. and AlRuthia, Y. (2021). Validation of an Arabic version of the adherence to refills and medications scale (ARMS). *Healthcare*. **9** (11), 1430. [doi:10.3390/healthcare9111430].

Alsofyani, M. A., Aloufi, A. O., Al-Qhtani, N. S., Bamansour, S. O. and Almathkori, R. S. (2022). Factors related to treatment adherence among hypertensive patients: a cross-sectional study in primary healthcare centers in Taif city. *J. Fam. Community Med.* **29** (3), 181-188. [doi:10.4103/jfcm.jfcm_153_22].

Amini, M., Zayeri, F. and Salehi, M. (2021). Trend analysis of cardiovascular disease mortality, incidence, and mortality-to-incidence ratio: results from global burden of disease study 2017. *BMC public health*. **21**, 1-12. [doi:10.1186/s12889-021-10429-0].

Arbiol, J., Orencio, P. M., Romena, N., Nomura, H., Takahashi, Y. and Yabe, M. (2016). Knowledge, attitude and practices towards Leptospirosis among Lakeshore communities of Calamba and Los Banos, Laguna, Philippines. *Agric.* **6** (2), 18. [doi:10.3390/agriculture6020018].

Arroll, B. and Beaglehole, R. (1992). Does physical activity lower blood pressure: a critical review of the clinical trials. *J. Clin. Hypertens.* **45** (5), 439-447. [doi:10.1016/0895-4356(92)90093-3].

Asante, D. O., Dai, A., Walker, A. N., Zhou, Z., Kpogo, S. A., Lu, R., Huang, K. and Zou, J. (2023). Assessing hypertension and diabetes knowledge, attitudes and practices among residents in Akatsi South District, Ghana using the KAP questionnaire. *Front. Public Health*. **11**, 1056999. [doi:10.3389/fpubh.2023.1056999].

Asgedom, S. W., Atey, T. M. and Desse, T. A. (2018). Antihypertensive medication adherence and associated factors among adult hypertensive patients at Jimma University Specialized Hospital, southwest Ethiopia. *BMC Res. Notes*. **11** (27). [doi:10.1186/s13104-018-3139-6].

Aung, M. N., Lorga, T., Srikrajang, J., Promtingkran, N., Kreuangchi, S., Tonpanya, W., Vivarakanon, P., Jaiin, P., Praipaksin, N. and Payaptom, A. (2012). Assessing awareness and knowledge of hypertension in an at-risk population in the Karen ethnic rural community, Thasongyang, Thailand. *Int. J. Med.* **5**, 553-561. [doi:10.2147/IJGM.S29406]

Azab, A. E., Mansour, A. M. and Albasha, M. O. (2021). The correlation between diabetes, hypertension & kidney disease with others diabetic induced disease and factors among diabetic patients in Bangladesh. *J. Biotechnol.* **4** (4), 19-24. [doi:10.36347/sjams.2020.v08i08.013].

Bacha, D. and Abera, H. (2019). Knowledge, attitude and self-care practice towards control of hypertension among hypertensive patients on follow-up at St. Paul's Hospital, Addis Ababa. *Ethiop. J. Health Sci.* **29** (4), 421-430. [doi: 10.4314/ejhs.v29i4.2].

Barua, R. S. and Ambrose, J. A. (2013). Mechanisms of coronary thrombosis in cigarette smoke exposure. *Arterioscler. Thromb. Vasc. Biol.* **33** (7), 1460-1467. [doi:10.1161/ATVBAHA.112.300154].

Bashyal, S. P. and Thapa, N. (2020). Knowledge and perception regarding hypertension among hypertensive patients at a tertiary hospital in Kathmandu, Nepal. *J. Adv. Acad. Res.* **7** (1), 51-62. [doi:10.3126/jaar.v7i1.35467].

Basu, S., Maheshwari, V., Malik, M., Chowdhury, S. S. A. and Kundu, S. (2024). Patterns and predictors of tobacco and alcohol use among older and elderly patients with diabetes and hypertension: findings from the longitudinal ageing study in India. *J. Public Health*. 1-10. [doi:10.1007/s10389-024-02200-7].

Bates, C. J., Bogin, B. and Holmes, B. (2017). Nutritional assessment methods. *In:* "Human Nutrition" (13th ed.). (C. Geissler and H. Powers, Eds.). pp. 613-646. United Kingdom. Oxford University Press. [ISBN 978-0-19-876802-9].

Benjamin, E. J., Blaha, M. J., Chiuve, S. E., Cushman, M., Das, S. R., Deo, R. D. D. F. S., Floyd, J., Fornage, M. and Gillespie, C. (2017). Heart disease and stroke statistics—2017 update: a report from the American Heart Association. *AHA*. **135** (10), e146-e603. [doi:10.1161/CIR.0000000000000485s]

Bhandari, B., Bhattarai, M., Bhandari, M., Ghimire, A., Pokharel, P. K. and Morisky, D. E. (2015). Adherence to antihypertensive medications: population based follow up in Eastern Nepal. *J. Nepal Health Res. Counc.* **13** (1), 38-42.

Bhattacharya, S., Bera, O. P. and Shah, V. (2022). Consumers' perception about front of package food labels (FOPL) in India: a survey of 14 states. *Front. public health*. **10**, 936802. [doi:10.3389/fpubh.2022.936802].

Bhattarai, H., McLachlan, C. S., Khanal, P., Adhikari, T. B., Ranabhat, K., Koirala, S., Parajuli, S. B., Pokharel, Y., Paudel, S., Soti, P. B. and Subedi, B. (2021). May measurement month 2019: an analysis of blood pressure screening results from Nepal. *Eur. Heart J. Suppl.* **23** (Supplement_B), B110-B113. [doi:10.1093/eurheartj/suab042].

Bista, B., Dhimal, M., Bhattarai, S., Neupane, T., Xu, Y. Y., Pandey, A. R., Townsend, N., Gyanwali, P. and Jha, A. K. (2021). Prevalence of non-communicable diseases risk factors and their determinants: results from STEPS survey 2019, Nepal. *PloS one*. **16** (7), e0253605. [doi:10.1371/journal.pone.0253605].

Bosu, W. K., Reilly, S. T., Aheto, J. M. K. and Zucchelli, E. (2019). Hypertension in older adults in Africa: a systematic review and meta-analysis. *PloS one*. **14** (4), e0214934. [doi:10.1371/journal.pone.0214934].

Boushey, C. J., Spoden, M., Zhu, F. M., Delp, E. J. and Kerr, D. A. (2017). New mobile methods for dietary assessment: review of image-assisted and image-based dietary assessment methods. *Proc. Nutr. Soc.* **76** (3), 283-294. [doi:10.1017/S0029665116002913].

Boutcher, Y. and Boutcher, S. (2017). Exercise intensity and hypertension: what's new? *J. Hum. Hypertens*. **31** (3), 157-164. [doi:10.1038/jhh.2016.62].

Brown, R. E., Riddell, M. C., Macpherson, A. K., Canning, K. L. and Kuk, J. L. (2013). The joint association of physical activity, blood-pressure control, and pharmacologic treatment of hypertension for all-cause mortality risk. *Am. J. Hypertens.* **26** (8), 1005-1010. [doi:10.1093/ajh/hpt063].

Buang, N. F. B., Rahman, N. A. A. and Haque, M. (2019). Knowledge, attitude and practice regarding hypertension among residents in a housing area in Selangor, Malaysia. *Med. Pharm. Rep.* **92** (2), 145. [doi:10.15386/mpr-1227].

Cai, J., Sun, X., Li, M., Luo, R., Wang, W., Wang, Z., Akkaif, M. A. and Liu, H. (2024). Dietary factors in relation to hypertension: a mendelian randomization study. *J. Health Popul. Nutr.* **43** (1), 91. [doi:10.1186/s41043-024-00575-7].

Carey, R. M., Wright Jr, J. T., Taler, S. J. and Whelton, P. K. (2021). Guideline-driven management of hypertension: an evidence-based update. *Circ. Res.* **128** (7), 827-846. [doi:10.1161/CIRCRESAHA.121.318083]

Castell, G. S., Serra-Majem, L. and Ribas-Barba, L. (2015). What and how much do we eat? 24-hour dietary recall method. *Nutr. Hosp.* **31** (3), 46-48. [doi:10.3305/nh.2015.31.sup3.8750].

CDC. (2021). Healthy weight, nutrition and physical activity. CDC. Retrieved from https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/measuring_children.html. (Last update 25 August, 2021). [Accessed 12 January, 2024].

Challa, H. J., Ameer, M. A. and Uppaluri, K. R. (2023). "DASH Diet To Stop Hypertension". StatPearls Publishing. Treasure Island (FL).

Chandra, P., Islam, A., Robertson, S., Sayed, M. A., Ahona, A. A., Parvin, M. N. and Gupta, P. S. (2025). Knowledge, attitude and practice regarding high salt intake and association with hypertension among rural women in Chandpur district of Bangladesh. *Health Sci. Rep.* **8** (1), e70387. [doi:10.1002/hsr2.70387].

Channanath, A. M., Farran, B., Behbehani, K. and Thanaraj, T. A. (2015). Association between body mass index and onset of hypertension in men and women with and

without diabetes : a cross-sectional study using national health data from the State of Kuwait in the Arabian Peninsula. *BMJ open*. **5** (6), e007043. [doi: 10.1136/bmjopen-2014-007043].

Chen, H. G., Sheng, L. T., Zhang, Y. B., Cao, A. L., Lai, Y. W., Kunutsor, S. K., Jiang, L. and Pan, A. (2019). Association of vitamin K with cardiovascular events and all-cause mortality: a systematic review and meta-analysis. *Eur. J. Nutr.* **58**, 2191-2205. [doi:10.1007/s00394-019-01998-3].

Choi, A., Ha, K., Joung, H. and Song, Y. (2019). Frequency of consumption of whole fruit, not fruit juice, is associated with reduced prevalence of obesity in Korean adults. *J. Acad. Nutr. Diet.* **119** (11), 1842-1851. [doi:10.1016/j.jand.2019.04.015].

Chuka, A., Gutema, B. T., Ayele, G., Megersa, N. D., Melketsedik, Z. A. and Zewdie, T. H. (2020). Prevalence of hypertension and associated factors among adult residents in Arba Minch Health and Demographic Surveillance Site, Southern Ethiopia. *Plos One*. **15** (8), e0237333. [doi:10.1371/journal.pone.0237333].

Cole, M. B. and Nguyen, K. H. (2020). Unmet social needs among low-income adults in the United States: associations with health care access and quality. *Health Serv. Res.* **55**, 873-882. [doi:10.1111/1475-6773.13555].

Devkota, S., Dhungana, R. R., Pandey, A. R., Bista, B., Panthi, S., Thakur, K. K. and Gajurel, R. M. (2016). Barriers to treatment and control of hypertension among hypertensive participants: a community-based cross-sectional mixed method study in municipalities of Kathmandu, Nepal. *Front. Cardiovasc. Med.* **3**, 26. [doi:10.3389/fcvm.2016.00026].

DFTQC. (2012). "Food Composition Table for Nepal". Department of Food Technology and Quality Control (Ministry of Agriculture Development), Nepal. Retrieved from https://www.fao.org/fileadmin/templates/food_composition/documents/regional/Nepal_Food_Composition_table_2012.pdf. [Accessed 2 April, 2024].

Dhimal, M., Bista, B., Bhattarai, S., Dixit, L. P., Hyder, M. K. A., Agrawal, N. and Rani, M. (2020). Report of non communicable disease risk factors: STEPS Survey Nepal 2019 Kathmandu.

Dhungana, R. R., Pandey, A. R., Bista, B., Joshi, S. and Devkota, S. (2016). Prevalence and associated factors of hypertension: a community-based cross-sectional study in

municipalities of Kathmandu, Nepal. *Int. J. Hypertens.* **1**, 1656938. [doi:10.1155/2016/1656938].

Dhungana, R. R., Pandey, A. R. and Shrestha, N. (2021). Trends in the prevalence, awareness, treatment and control of hypertension in Nepal between 2000 and 2025: a systematic review and meta-analysis. *Int. J. Hypertens.* **2021** (1), 6610649. [doi:10.1155/2021/6610649].

Dhungana, R. R., Pedisic, Z., Dhimal, M., Bista, B. and Courten, M. D. (2022). Hypertension screening, awareness, treatment, and control: a study of their prevalence and associated factors in a nationally representative sample from Nepal. *Glob. Health Action*. **15** (1), 2000092 [doi:10.1080/16549716.2021.2000092].

Diaz, K. M. and Shimbo, D. (2013). Physical activity and the prevention of hypertension. *Curr. Hypertens. Rep*. **15**, 659-668. [doi:10.1007/s11906-013-0386-8].

Egbi, O. G., Okafor, U. H., Meibodei, K. E., Kunle-olowu, O. E. and Unuigbe, E. I. (2013). Prevalence of hypertension in an urban population in Bayelsa State. *J. Med. Res. Pract.* **2** (1), 11-15.

Erkoc, S. B., Isikli, B., Metintas, S. and Kalyoncu, C. (2012). Hypertension knowledge-level scale (HK-LS): a study on development, validity and reliability. *Int. J. Environ. Res. Public Health*. **9** (3), 1018-1029. [doi:10.3390/ijerph9031018s].

ESH. (2023). Guidelines for the management of arterial hypertension. Journal of Hypertension. Retrieved from https://www.eshonline.org/guidelines/2023-esh-guidelines-for-the-management-of-arterial-hypertension/. (Last update June, 2023). [Accessed 1 May, 2024].

Esmaeili, R., Matlabi, M., Khajavi, A., Aliasghari, E. and Sajjadi, M. (2017). Factors affecting adherence to antihypertensive medication: results from a rural population study in East of Iran. *Glob. J. Health Sci.* **9** (5), 286-286. [doi:10.5539/gjhs.v9n5p286].

Essouma, M., Noubiap, J. J. N., Bigna, J. J. R., Nansseu, J. R. N., Jingi, A. M., Aminde, L. N. and Zafack, J. (2015). Hypertension prevalence, incidence and risk factors among children and adolescents in Africa : a systematic review and meta-analysis protocol. *BMJ open*. **5** (9), e008472. [doi:10.1136/bmjopen-2015-008472].

Fagard, R. H. (2012). Physical activity, fitness and mortality. *J. Hypertens.* **30** (7), 1310-1312. [doi:10.1097/HJH.0b013e3283551eb2].

Feng, Y., Zhao, Y., Liu, J., Huang, Z., Yang, X., Qin, P., Chen, C., Luo, X., Li, Y., Wu, Y. and Li, X. (2022). Consumption of dairy products and the risk of overweight or obesity, hypertension, and type 2 diabetes mellitus: a dose–response meta-analysis and systematic review of cohort studies. *Adv. Nutr.* **13** (6), 2165-2179. [doi:10.1093/advances/nmac096].

Foex, P. and Sear, J. W. (2017). Hypertension: pathophysiology and treatment. **4** (3), 71-75.

Forouzanfar, M. H., Liu, P., Roth, G. A., Ng, M., Biryukov, S., Marczak, L., Alexander, L., Estep, K., Abate, K. H., Akinyemiju, T. F. and Ali, R. (2017). Global burden of hypertension and systolic blood pressure of at least 110 to 115 mm Hg, 1990-2015. *J. Am. Med. Assoc.* **317** (2), 165-182. [doi:10.1001/jama.2016.19043].

Fryar, C. D., Ostchega, Y., Hales, C. M., Zhang, G. and Kruszon-Moran, D. (2017). Hypertension prevalence and control among adults: United States, 2015–2016. *NCHS*. **289**.

Gallucci, G., Tartarone, A., Lerose, R., Lalinga, A. V. and Capobianco, A. M. (2020). Cardiovascular risk of smoking and benefits of smoking cessation. *J. Thorac. Dis.* **12** (7), 3866-3876. [doi:10.21037/jtd.2020.02.47].

Gautam, P., Dahal, P., Paul, D. and Alam, K. (2023). Health-related knowledge attitude practice and quality of life among diabetic hypertensive patients in Eastern Nepal. *Ph.* **14** (2), 11-18. [doi:10.51847/KvPxG6nVX5].

Guo, Y., Zhou, Y., Chen, J., Chen, Z., Yu, C., Liu, J., Li, L., Chen, Y., Yang, L., Lv, J., Bian, Z., Zhang, H., Si, J. and Qin, C. (2018). Associations of egg consumption with cardiovascular disease in a cohort study of 0.5 million Chinese adults *Heart*. **104** (21), 1756-1763. [doi:10.1136/heartjnl-2017-312651].

Gupta, R., Kaur, M., Islam, S., Mohan, V., Mony, P., Kumar, R., Kutty, V. R., Iqbal, R., Rahman, O., Deepa, M., Antony, J. K. K. V., Kazmi, K., Yusuf, R., Mohan, I., Panwar, R. B., Rangarajan, S. and Yusuf, S. (2017). Association of household wealth index, educational status, and social capital with hypertension awareness, treatment, and control in south Asia. *Am. J. Hypertens*. **30** (4), 373-381. [doi:10.1093/ajh/hpw169].

Heidari, Z., Feizi, A., Azadbakht, L., Mohammadifard, N., Maghroun, M. and Sarrafzadegan, N. (2019). Usual energy and macronutrient intakes in a large sample of Iranian middle-aged and elderly populations. *Nutr. & Diet.* **76** (2), 174-183. [doi:10.1111/1747-0080.12431].

Hengeveld, L. M., Boer, J. M., Gaudreau, P., Heymans, M. W., Jagger, C., Mendonca, N., Ocke, M. C., Presse, N., Sette, S., Simonsick, E. M. and Tapanainen, H. (2020). Prevalence of protein intake below recommended in community-dwelling older adults: a meta-analysis across cohorts from the PROMISS consortium. *J. Cachexia Sarcopen. Muscle.* **11** (5), 1212-1222. [doi:10.1002/jcsm.12580].

Holmes, J., Hossain, J., Ward, D. and Opara, F. (2013). Racial/ethnic variability in hypertension prevalence and risk factors in national health interview survey. *Int. Sch. Res. Notices*. **2013** (1), 257842. [doi:10.5402/2013/257842].

Hosseini, K., Soleimani, H., Tavakoli, K., Maghsoudi, M., Heydari, N. and Farahvash, Y. (2024). Association between sleep duration and hypertension incidence: systematic review and meta-analysis of cohort studies. *PloS One.* **19** (7), e0307120. [doi:10.1371/journal.pone.0307120].

Huang, Y., Guo, P., Karmacharya, B. M., Seeruttun, S. R., Xu, D. R. and Hao, Y. (2019). Prevalence of hypertension and prehypertension in Nepal: a systematic review and meta-analysis. *Glob. Health Res. Policy*. **4** (11), 1-10. [doi:10.1186/s41256-019-0102-6].

Ibekwe, R. U. (2015). Modifiable risk factors of hypertension and socio-demographic profile in Oghara, Delta State; prevalence and correlates. *Ann. Med. Health Sci. Res.* **5** (1). [doi:10.4103/2141-9248.149793].

ICMR. (2020). Recommended Dietary Allowances and Estimated Average Requirements for Indians - 2020. India. Retrieved from https://www.im4change.org/upload/files/RDA_short_report%281%29.pdf. [Accessed 2 April, 2024].

Imamura, M., Tahara, Y., Suiko, T., Nagamori, Y. and Shibata, S. (2022). Association between blood pressure and circadian timing of physical activity of Japanese workers. *Front. Physiol.* **13**, 992945. [doi:10.3389/fphys.2022.992945].

Jeem, Y. A., Pratama, Y. Y., Adnan, M. L. and Nirwingsyah, N. R. (2022). The correlation between the type of occupation toward blood pressure and cholesterol levels in individuals with hypertension. *J. Health Sci.* **15** (3), 210-217. [doi:10.33086/jhs.v15i03.2857].

Johny, S., Meenu, K. M., D'Silva, R., D'Costa, S. L., Abraham, L. and Fernandes, P. J. (2018). A study on attitude and practice regarding the consumption of carbonated

drinks among students in selected colleges of Mangalore. *Int. J. Health Sci. Res.* **8** (5), 180-185.

Jones, D. W. and Hall, J. E. (2010). Racial and ethnic differences in blood pressure Biology and Sociology. *AHA*. **114** (25), 2757-2759. [doi:10.1161/CIRCULATIONAHA.106.668731].

Kanchan, K. C., Katwal, S., Yadav, G. K., Adhikari, A., Thapa, R. K., Jha, S. K., Sharma, A., Rijal, T., Giri, S. and Khadka, S. (2023). Family history of hypertension and its relation to other variables in hypertensive patients: a cross-sectional study from a tertiary care hospital. *IJS Global Health*. **6** (5), e0235. [doi:10.1097/GH9.0000000000000235].

Kashino, I., Eguchi, M., Miki, T., Kochi, T., Nanri, A., Kabe, I. and Mizoue, T. (2020). Prospective association between whole grain consumption and hypertension: The Furukawa Nutrition and Health Study. *Nutr.* **12** (4), 902. [doi:10.3390/nu12040902].

Kerstetter, J. E., Kenny, A. M. and Insogna, K. L. (2011). Dietary protein and skeletal health: a review of recent human research. *Curr. Opin. Lipidol.* **22** (1), 16-20. [doi:10.1097/MOL.0b013e3283419441].

Khadka, S., Maharjan, A., Bhardwaj, M., Jha, A., Bajracharya, M. and Lamichhane, B. (2021). Adherence to anti- hypertensive medications among patients in selected health facilities of Nepal. *J. Nepal Health Res. Counc.* **19** (1), 83-86. [doi:10.33314/jnhrc.v19i1.1395]

Kokane, A. M., Joshi, R., Kotnis, A., Chatterjee, A., Yadav, K., Revadi, G., Joshi, A. and Pakhare, A. P. (2020). Descriptive profile of risk factors for cardiovascular diseases using WHO STEP wise approach in Madhya Pradesh. *Peer J*. **8**, e9568. [doi: 10.7717/peerj.9568].

Li, G., Wang, H., Wang, K., Wang, W., Dong, F., Qian, Y., Gong, H., Hui, C., Xu, G., Li, Y. and Pan, L. (2017). The association between smoking and blood pressure in men: a cross-sectional study. *BMC public health*. **17**, 1-6. [doi:10.1186/s12889-017-4802-x].

Liu, L., Qian, X., Chen, Z. and He, T. (2020). Health literacy and its effect on chronic disease prevention: evidence from China's data. *BMC public health*. **20**, 1-14. [doi:10.1186/s12889-020-08804-4].

Locher, J. L., Ritchie, C. S., Robinson, C. O., Roth, D. L., Smith West, D. and Burgio, K. L. (2008). A multidimensional approach to understanding under-eating in

homebound older adults: the importance of social factors. *Gerontol.* **48** (2), 223-234. [doi:10.1093/geront/48.2.223].

Lovell, A., Bulloch, R., Wall, C. R. and Grant, C. C. (2017). Quality of food-frequency questionnaire validation studies in the dietary assessment of children aged 12 to 36 months: a systematic literature review. *J. Nutr. Sci.* **6**, e16. [doi:10.1017/jns.2017.12].

Machaalani, M., Seifeddine, H., Ali, A., Bitar, H., Briman, O. and Chahine, M. N. (2022). Knowledge, attitude and practice toward hypertension among hypertensive patients residing in Lebanon. *vasc. Health Risk Manag.* **18**, 541-553. [doi:10.2147/VHRM.S367187].

Maharjan, N., Maharjan, N. and Li, R. (2020). Knowledge on diet among the hypertensive patients in a tertiary care center Nepal: a descriptive cross-sectional study. *J. Nepal Med. Assoc*. **58** (222), 98-101. [doi:10.31729/jnma.4815].

Maluwa, C., Kapira, S., Chuljerm, H., Parklak, W. and Kulprachakarn, K. (2025). Determinants of hypertension-related knowledge, attitude, and practices (KAP) among caregivers in Neno, rural Malawi: a cross-sectional study. *Heliyon*. **11** (1), e41546. [doi:10.1016/j.heliyon.2024.e41546].

Mancia, G., Kreutz, R., Brunstrom, M., Burnier, M., Grassi, G., Januszewicz, A., Muiesan, M. L., Tsioufis, K., Agabiti-Rosei, E., Algharably, E. A. E. and Azizi, M. (2023). 2023 ESH Guidelines for the management of arterial hypertension the task force for the management of arterial hypertension of the European Society of Hypertension endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). *J. Hypertens.* **41** (12), 1874-2071. [doi:10.1097/HJH.0000000000003480].

Maniero, C., Lopuszko, A., Papalois, K. B., Gupta, A., Kapil, V. and Khanji, M. Y. (2023). Non-pharmacological factors for hypertension management: a systematic review of international guidelines. *Eur. J. Prev. Cardiol.* **30** (1), 17-33. [doi:10.1093/eurjpc/zwac163].

Marakis, G., Marques Domingues, A., Crispo, A., Magriplis, E., Vasara, E., Kontopoulou, L., Triantafyllou, C., Skepastianos, P., Papadopoulou, S. K., Rodopaios, N. E. and Hassapidou, M. (2023). Pertinence of salt-related knowledge and reported behaviour on salt intake in adults: a cross-sectional study. *Nutr.* **15** (19), 4114. [doi:10.3390/nu15194114].

Marias, Y. F. and Glasauer, P. (2014). "Guidelines for assessing nutrition-related knowledge, attitudes and practices". Food and Agriculture Organization of the United Nations (FAO). Rome. [ISBN 978-92-5-106180-0].

Maris, S. A., Williams, J. S., Sun, B., Brown, S., Mitchell, G. F. and Conlin, P. R. (2019). Interactions of the DASH diet with the renin-angiotensin-aldosterone system. *Curr. Dev. Nutr.* **3** (9), nzz091. [doi:10.1093/cdn/nzz091].

Marketou, M. E., Maragkoudakis, S., Anastasiou, I., Nakou, H., Plataki, M., Vardas, P. E. and Parthenakis, F. I. (2019). Salt-induced effects on microvascular function: a critical factor in hypertension mediated organ damage. *J. Clin. Hypertens*. **21** (6), 749-757. [doi:10.1111/jch.13535].

Mehata, S., Shrestha, N., Mehta, R., Vaidya, A., Rawal, L. B., Bhattarai, N. and Mishra, S. R. (2018). Prevalence, awareness, treatment and control of hypertension in Nepal data from nationally representative population-based cross-sectional study. *J. Hypertens.* **36** (8), 1680-1688. [doi:10.1097/HJH.0000000000001745].

Meurer, W. J., Dinh, M., Kidwell, K. M., Flood, A., Champoux, E., Whitfield, C., Trimble, D., Cowdery, J., Borgialli, D., Montas, S. and Cunningham, R. (2020). Reach out behavioral intervention for hypertension initiated in the emergency department connecting multiple health systems: study protocol for a randomized control trial. *Trials* **21**, 1-16. [doi:10.1186/s13063-020-04340-z].

Mgbahurike, A. A. and Lelesi, T. N. (2022). Knowledge, Attitude and Perception of Hypertension among staff of a tertiary institution in Nigeria. *Univers. J. Pharm. Res.* **7** (1). [doi:10.22270/ujpr.v7i1.719.].

Mills, K. T., Stefanescu, A. and He, J. (2020). The global epidemiology of hypertension. *HTN*. **16**, 223-237. [doi:10.1038/s41581-019-0244-2]

Ministry of Health and Population, N. E. a. I. (2022). "Nepal demographic health survey".

Misra, A. and Khurana, L. (2008). Obesity and the metabolic syndrome in developing countries *J. Clin. Endocrinol. Metab.* **93** (11), s9-s30. [doi:10.1210/jc.2008-1595].

Mitwalli, A. H., Harthi, A. A. L., Mitwalli, H., Juwayed, A. A. L. and Turaif, N. A. L. (2013). Awareness, attitude, and distribution of high blood pressure among health professionals. *J. Saudi Heart Assoc.* **25** (1), 19-24. [doi:10.1016/j.jsha.2012.10.002].

MoFAGA. (2017). Description of the local level website. Ministry of Federal Affairs and General Administration, Nepal. Retrieved from https://sthaniya.gov.np/gis/. [Accessed 11 May, 2024].

Mounica, B. (2015). Study of knowledge, attitude and practice of general population of Guntur towards silent killer diseases : hypertension and diabetes. *Value in Health*. **18** (7), A398.

Mozzafarian, D., Benjamin, E. J. and Go, A. S. (2015). Heart disease and stroke statistics-2015 Update : a report from the American Heart Association. *Circ.*, e29-322.

Ngwogu, K., Enwereuzor, O., kalu, N. and Chikwendu, J. (2021). The knowledge, attitude, and prevalence of hypertension among automobile workers in Aba, Abia State. **13** (1), 60-82.

Olaoluwa, O. B. and Amosu, A. (2021). Knowledge as a predictor of hypertension prevention practices among secondary school teachers in a selected local government area in Oyo State, Nigeria. *Int. J. Public Health Pharmacol.* **1** (1), 62-73. [doi:10.52589/IJPHP-P2V1L0J9]

Ostchega, Y., Fryar, C. D., Nwankwo, T. and Nguyen, D. T. (2020). "Hypertension Prevalence Among Adults Aged 18 and Over: United States, 2017–2018". Report No. NCHS Data Brief No. 364. U.S. Department of Health and Human Services (National Center for Health Statistics), Hyattsville, MD. p. 7. Retrieved from https://stacks.cdc.gov/view/cdc/87559. [Accessed April, 2020].

Paddon-Jones, D. and Leidy, H. (2014). Dietary protein and muscle in older persons. *Curr. Opin. Clin. Nutr Metab Care*. **17** (1), 5-11. [doi:10.1097/MCO.0000000000000011].

Pajak, A., Szafraniec, K., Kubinova, R., Malyutina, S., Peasey, A., Pikhart, H., Nikitin, Y., Marmot, M. and Bobak, M. (2013). Binge drinking and blood pressure: cross-sectional results of the HAPIEE study. *PLoS One*. **8** (6), e65856. [doi:10.1371/journal.pone.0065856].

Pallathadka, L. K., Pallathadka, H. and Devi, M. S. (2022). Consumer perception towards dairy products in India- an empirical study. *Integr. J. Res. Arts Humanities.* **2** (5), 175-181. [doi:10.55544/ijrah.2.5.27].

Partearroyo, T., Samaniego-Vaesken, M. D. L., Ruiz, E., Aranceta-Bartrina, J., Gil, A., González-Gross, M., Ortega, R. M., Serra-Majem, L. and Varela-Moreiras, G. (2019). Sodium intake from foods exceeds recommended limits in the Spanish population: The ANIBES Study. *Nutr.* **11** (10), 2451. [doi:10.3390/nu11102451].

Patel, P., Ordunez, P., Dipette, D., Escobar, M. C., Hassell, T., Wyss, F., Hennis, A., Asma, S. and Angel, S. (2016). Improved blood pressure control to reduce cardiovascular disease morbidity and mortality: the standardized hypertension treatment and

prevention project. *J. Clin. Hypertens. (Greenwich)*. 1284-1294. [doi:10.1111/jch.12861].

Patel, V., Saxena, S., Lund, C., Thornicroft, G., Baingana, F., Bolton, P., Chisholm, D., Collins, P. Y., Cooper, J. L. and Eaton, J. (2018). The lancet commission on global mental health and sustainable development. *The lancet*. **392** (10157), 1553-1598. [doi:10.1016/S0140-6736(18)31612-X].

Pickering, D. and Stevens, S. (2013). How to measure and record blood pressure. *Community Eye Health*. **26** (84), 76.

Pokharel, P., Jha, S. K., Adhikari, A., Katwal, S., Ghimire, S., Shrestha, A. B. and Poudel, N. (2023). Non-adherence to anti-hypertensive medications in a low-resource country Nepal: a systematic review and meta-analysis. *Ann. Med. Surg.* **85** (9), 4520-4530. [doi:10.1097/MS9.0000000000001088]

Polanska, K., Kaluzny, P., Aubert, A. M., Bernard, J. Y., Duijts, L., El Marroun, H., Hanke, W., Hebert, J. R., Heude, B. and Jankowska, A. (2021). Dietary quality and dietary inflammatory potential during pregnancy and offspring emotional and behavioral symptoms in childhood: an individual participant data meta-analysis of four European cohorts. *Biological Psychiatry*. **89** (6), 550-559. [doi:10.1016/j.biopsych.2020.10.008]

Pradhananga, S. (2017). Knowledge, attitude and practice about hypertension and dietary practices in hypertensive patients of Itahari. B.Sc in Nutrition and Dietetics Dissertation. Tribhuvan Univ., Nepal.

Prenissl, J., Manne-Goehler, J., Jaacks, L. M., Prabhakaran, D., Awasthi, A., Bischops, A. C., Atun, R., Barnighausen, T., Davies, J. I., Vollmer, S. and Geldsetzer, P. (2019a). Hypertension screening, awareness, treatment, and control in India: a nationally representative cross-sectional study among individuals aged 15 to 49 years. *PLoS Med*. **16** (5), e1002801. [doi:10.1371/journal.pmed.1002801].

Prenissl, J., Manne-Goehler, J., Jaacks, L. M., Prabhakaran, D., Awasthi, A., Bischops, A. C., Atun, R., Bärnighausen, T., Davies, J. I., Vollmer, S. and Geldsetzer, P. (2019b). Hypertension screening, awareness, treatment, and control in India: a nationally representative cross-sectional study among individuals aged 15 to 49 years. *PLoS Med*. **16** (5), e1002801. [doi:10.1371/journal.pmed.1002801].

Rajan, J., Sakthibalan, M., Gerard, M. R. and Mangaiarkkarasi, A. (2019). Knowledge, attitude and practice of hypertension among hypertensive patients in a tertiary care

teaching hospital. *Int. J. Basic Clin. Pharmacol.* **8** (5), 1013-1018. [doi:10.18203/2319-2003.ijbcp20191593].

Ralapanawa, U., Bopeththa, K., Wickramasurendra, N. and Tennakoon, S. (2020a). Hypertension knowledge, attitude, and practice in adult hypertensive patients at a tertiary care hospital in Sri Lanka. *Int. J. Hypertens*. **1**, 4642704. [doi:10.1155/2020/4642704].

Ralapanawa, U., Bopeththa, K., Wickramasurendra, N. and Tennakoon, S. (2020b). Hypertension knowledge, attitude, and practice in adult hypertensive patients at a tertiary care hospital in Sri Lanka. *Int. J. Hypertens*. [doi:10.1155/2020/4642704].

Rani, R., Mengi, V., Gupta, R. K. and Sharma, H. K. (2015). Hypertension and its risk factors- a cross sectional study in an urban population of a North Indian district. *Public Health Res.* **5** (3), 67-72.

Regmi, P. R., Sharma, S. K., Bhatt, Y. K. D., Malla, R., Maskey, A., Limbu, Y., Nepal, R., Karn, A. L., Dhungana, S. P., Gautam, M. P., Kafle, M. P., Maskey, R., Saurav, S., Mainali, U. K. and Sherpa, K. (2023). Screening for hypertension in asymptomatic individuals in Nepal: an expert consensus statement. *NHJ*. **20** (2), 43-49. [doi:10.3126/nhj.v20i2.59515].

Roka, T. and Ghimire, M. (2020). Medication adherence among hypertensive patients attending a tertiary care hospital in Nepal. *J. Nepal Health Res. Counc.* **17** (4), 521-527. [doi:10.33314/jnhrc.v17i4.2337].

Rust, P. and Ekmekcioglu, C. (2017). Impact of salt intake on the pathogenesis and treatment of hypertension. *Hypertension: from basic research to clinical practice* 61-84. [doi:10.1007/5584_2016_147].

Saco-Ledo, G., Valenzuela, P. L., Ramirez-Jimenez, M., Morales, J. S., Castillo-Garcia, A., Blumenthal, J. A. and Lucia, A. (2021). Acute aerobic exercise induces short-term reductions in ambulatory blood pressure in patients with hypertension: a systematic review and meta-analysis. *HTN*. **78** (6), 1844-1858. [doi:10.1161/HYPERTENSIONAHA.121.18099].

Sadeq, R. and Lafta, R. K. (2017). Knowledge, attitude and practice about hypertension in hypertensive patients attending hospitals in Baghdad, Iraq. *South East Asia J. Public Health*. **7** (1), 29-34. [doi:10.3329/seajph.v7i1.34676].

Sara, Y. S., Aziah, B., Azwany, Y., Nazri, S. M., Zahiruddin, W., Nabilah, A., Asma, H. S., Zaliha, I. and Fairuz, A. (2020). Seroprevalence of leptospirosis among army

personnel in Northeastern Malaysia. *Sci. Res.* **10** (1), 37-45. [doi:10.4236/aid.2020.101004].

Sarathy, H., Salman, L. A., Lee, C. and Cohen, J. B. (2022). Evaluation and management of secondary hypertension. *Med. Clin. North Am.* **106** (2), 269-283. [doi:10.1016/j.mcna.2021.11.004].

Sarkodie, E., Afriyie, D. K., Hutton-Nyameaye, A. and Amponsah, S. K. (2020). Adherence to drug therapy among hypertensive patients attending two district hospitals in Ghana. *Afr. Health Sci.* **20** (3), 1355-1367. [doi:10.4314/ahs.v20i3.42].

Schwingshackl, L., Schwedhelm, C., Hoffmann, G., Knuppel, S., Iqbal, K., Andriolo, V., Bechthold, A., Schlesinger, S. and Boeing, H. (2017). Food groups and risk of hypertension: a systematic review and dose-response meta-analysis of prospective studies. *Adv. Nutr.* **8** (6), 793-803. [doi:10.3945/an.117.017178].

Sen, A., Das, M., Basu, S. and Datta, G. (2015). Prevalence of hypertension and its associated risk factors among Kolkata-based policemen: a sociophysiological study. *J. Med. Sci. Public Health*. **4** (2). [doi:10.5455/ijmsph.2015.0610201444].

Shrestha, B., Ferdoush, Z., Rabbi, F. and Hossain, A. (2018). Adherence to medications among Nepali hypertensive population: a hospital-based cross-sectional study. *Biomed. Res. Clin. Prac. [Internet]*. **3** (1). [doi:10.26717/BJSTR.2018.03.000964].

Shrestha, D. B., Budhathoki, P., Sedhai, Y. R., Baniya, A., Lamichhane, S., Shahi, M., Karki, B. J., Baniya, R. and Patel, N. (2021). Prevalence, awareness, risk factors and control of hypertension in Nepal from 2000 to 2020: a systematic review and meta-analysis. *Public Health Pract*. **2**, 100119. [doi:10.1016/j.puhip.2021.100119].

Shrestha, S., Adhikari, B., Poudel, R. S., Thapaliya, K., Kharal, T., Bastakoli, M. and Bhatta, N. K. (2019). Knowledge, attitude and practice on hypertension among antihypertensive medication users. *J. Nepal Med. Assoc.* **55** (2), 86-92.

Shrestha, S., Adhikari, B., Poudel, R. S., Thapaliya, K., Kharal, T., Bastakoti, M. and Bhatta, N. K. (2016). Knowledge, attitude and practice on hypertension among antihypertensive medication users. *J. Nepal Med. Assoc*. **55** (204), 86-92. [doi:10.31729/jnma.2848].

Singer, P., Cohen, H. and Alderman, M. (2015). Assessing the associations of sodium intake with long-term all-cause and cardiovascular mortality in a hypertensive cohort. *AHA*. **28** (3), 335-342. [doi:10.1093/ajh/hpu141].

Sitaula, D., Shrestha, N., Timalsina, S., Pokharel, B., Sapkota, S., Acharya, S., Thapa, R., Dhakal, A. and Dhakal, S. (2022). Knowledge, attitude and practice regarding diabetes and hypertension among school students of Nepal: a rural vs. urban study. *Plos One*. **17** (8), e0270186. [doi:10.1371/journal.pone.0270186].

Sobotka, O., Ticha, M., Kubickova, M., Adamek, P., Polakova, L., Mezera, V. and Sobotka, L. (2023). Should carbohydrate intake be more liberal during oral and enteral nutrition in type 2 diabetic patients? *Nutr.* **15** (2), 439. [doi:10.3390/nu15020439].

Sood, M., Shende, R., Saha, S. and Eruva, V. (2024). Study of risk factors for hypertension. *Eur. J. Cardiovasc. Med.* **14** (6).

Staruschenko, A. (2018). Beneficial effects of high potassium: contribution of renal basolateral K+ channels. *HTN*. **71** (6), 1015-1022. [doi:10.1161/HYPERTENSIONAHA.118.10267].

Stice, E., Borcyk, A. and Menke, K. (2016). Heritability of hyperresponsivity of brain reward regions to high-calorie food. *Am. J. Clin. Nutr.* **103** (2), 299-300. [doi:10.3945/ajcn.115.128017].

Tannor, E. K., Nyarko, O. O., Adu-Boakye, Y., Owusu Konadu, S., Opoku, G., Ankobea-Kokroe, F., Opare-Addo, M., Appiah, L. T., Amuzu, E. X., Ansah, G. J., Appiah-Boateng, K., Ofori, E. and Ansong, D. (2022). Prevalence of hypertension in Ghana: analysis of an awareness and screening campaign in 2019. *Clin. Med. Insights: Cardiol.* **16**. [doi:10.1177/11795468221120].

Thirunavukkarasu, A., Naser Abdullah Alshahrani, A., Mazen Abdel-Salam, D., Homoud Al-Hazmi, A., Farhan ALruwaili, B., Awad Alsaidan, A., Narapureddy, B. R., Muteb AL-Ruwaili, A., Ghuwayli aljabri, F., Khalaf Albalawi, R. and Alanazi, K. A. F. (2022). Medication adherence among hypertensive patients attending different primary health centers in Abha, Saudi Arabia: a cross-sectional study. *Patient Prefer Adherence*. **16**, 2835-2844. [doi:10.2147/PPA.S388365].

Thomas, S. M., Varghese, S. and Raj, B. (2021). Assessment of knowledge, attitude and practice among hypertensive patients in a teaching hospital. *J. Young Pharm.* **13** (3), 279-284. [doi:10.5530/jyp.2021.13.57].

Thompson, F. E. and Subar, A. F. (2017). Dietary assessment methodology. *Nutrition in the Prevention and Treatment of Disease*. 5-48.

Tighe, P., Duthie, G., Vaughan, N., Brittenden, J., Simpson, W. G., Duthie, S., Mutch, W., Wahle, K., Horgan, G. and Thies, F. (2010). Effect of increased consumption of whole-grain foods on blood pressure and other cardiovascular risk markers in healthy middle-aged persons: a randomized controlled trial. *Am. J. Clin. Nutr.* **92** (4), 733-740. [doi:10.3945/ajcn.2010.29417].

Tsai, Y. W., Tsai, T. I., Yang, C. L. and Kuo, K. N. (2008). Gender differences in smoking behaviors in an Asian population. *J. Womens Health*. **17** (6), 971-978. [doi:10.1089/jwh.2007.0621].

Tung, H. T., Al-Samhari, G. A., Al-Mushiki, G. M., Alromaima, A., Al-Shaebi, F., Al-Nahari, S. A., Dinh, T. V. and Jiang, Y. (2023). The association between nutritional factors and hypertension. *Prev. Med.* **32** (9), 7-17. [doi:10.51403/0868-2836/2022/918].

Tuwilika, P. T., Amkongo, M., Mojiminiyi, F., Namene, J., Niiteta, K., Ottilie, K. H., Tunelago, E. N., Nelongo, J., Moneni, L. S. and Mkandla, Z. (2024). Knowledge, attitudes and practices on hypertension among the health science faculty and students at the University of Namibia: a cross-sectional study. *Med*. **103** (49), e40596. [doi:10.1097/MD.0000000000040596].

Uchmanowicz, B., Jankowska, E. A., Uchmanowicz, I. and Morisky, D. E. (2019). Self-reported medication adherence measured with morisky medication adherence scales and its determinants in hypertensive patients aged ≥60 years: a systematic review and meta-analysis. *Front. Pharmacol.* **10**, 168. [doi:10.3389/FPHAR.2019.00168].

Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., Ramirez, A., Schlaich, M., Stergiou, G. S., Tomaszewski, M. and Wainford, R. D. (2020). International society of hypertension global hypertension practice guidelines. *Hypertens*. **75** (6), 1334-1357. [doi:10.1161/HYPERTENSIONAHA.120.15026].

Vaidya, A., Pathak, R. P. and Pandey, M. R. (2012). Prevalence of hypertension in Nepalese community triples in 25 years: a repeat cross-sectional study in rural Kathmandu. *Indian Heart J.* **64** (2), 128-131. [doi:10.1016/S0019-4832(12)60045-5].

Valenzuela, P. L., Carrera-Bastos, P., Gálvez, B. G., Ruiz-Hurtado, G., Ordovas, J. M., Ruilope, L. M. and Lucia, A. (2021). Lifestyle interventions for the prevention and treatment of hypertension. *Nat. Rev. Cardiol.* **18** (4), 251-275. [doi:10.1038/s41569-020-00437-9].

Vallee, A. (2023). Associations between smoking and alcohol consumption with blood pressure in a middle-aged population. *Tob. Induc. Dis.* **21** (61). [doi:10.18332/tid/162440].

Venkatraman, S., Murugan, S. and Jacob, S. (2024). Knowledge, attitude and practices regarding risk factors, prevention and treatment of hypertension among urban dwellers in Chennai: a cross-sectional study. *Hypertens. J.* **10** (1), 7-12. [doi:10.61081/htnj/24v10i103].

Vidal, E. J., Alvarez, D., Martinez-Velarde, D., Vidal-Damas, L., Yuncar-Rojas, K. A., Julca-Malca, A. and Bernabe-Ortiz, A. (2018). Perceived stress and high fat intake: a study in a sample of undergraduate students. *Plos one*. **13** (3), e0192827. [doi:10.1371/journal.pone.0192827].

Vieira, B. A., Luft, V. C., Schmidt, M. I., Chambless, L. E., Chor, D., Barreto, S. M. and Duncan, B. B. (2016). Timing and type of alcohol consumption and the metabolic syndrome-ELSA-Brasil. *Plos One*. **11** (9), e0163044s. [doi:10.1371/journal.pone.0163044].

Villa-Etchegoyen, C., Lombarte, M., Matamoros, N., Belizan, J. M. and Cormick, G. (2019). Mechanisms involved in the relationship between low calcium intake and high blood pressure. *Nutr.* **11** (5), 1112. [doi:10.3390/nu11051112].

Virdis, A., Giannarelli, C., Fritsch Neves, M., Taddei, S. and Ghiadoni, L. (2010). Cigarette smoking and hypertension. *Curr. Pharm. Des.* **16** (23), 2518-2525.

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Dennison Himmelfarb, C., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P. and Ovbiagele, B. (2017). ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. *J. Am. Coll. Cardiol.* **71** (6), 68-74. [doi: 10.1161/HYP.0000000000000076].

WHO. (2010). A healthy lifestyle - WHO recommendations. Retrieved from https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who recommendations. (Last update 6 May, 2010). [Accessed 11 April, 2024].

Wicker, P. and Frick, B. (2015). The relationship between intensity and duration of physical activity and subjective well-being. *Eur. J. Public Health*. **25** (5), 868-872. [doi:10.1093/eurpub/ckv131].

Wieczorek, M., Meier, C., Vilpert, S., Reinecke, R., Borrat-Besson, C., Maurer, J. and Kliegel, M. (2023). Association between multiple chronic conditions and insufficient health literacy: cross-sectional evidence from a population-based sample of older adults living in Switzerland. *BMC public health*. **23** (1), 253. [doi:10.1186/s12889-023-15136-6].

Williams, B., Mancia, G., Spiering, W. E. A. R., Azizi, M., Burnier, M., Clement, D. L., Coca, A., De Simone, G. and Dominiczak, A. (2018). 2018 ESC/ESH Guidelines for the management of arterial hypertension: the task force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH) *Eur. Heart J.* **39** (33), 3021-3104. [doi:10.1093/eurheartj/ehy339].

Wu, L., Sun, D. and He, Y. (2016). Fruit and vegetables consumption and incident hypertension: dose–response meta-analysis of prospective cohort studies. *J. Hum. Hypertens.* **30** (10), 573-580. [doi:10.1038/jhh.2016.44].

Yazdanpanah, L., Shahbazian, H., Shahbazian, H. and Latifi, S. M. (2015). Prevalence, awareness and risk factors of hypertension in southwest of Iran. *J. Ren. Inj. Prev.* **4** (2), 51-56. [doi:10.12861/jrip.2015.11].

Yusof, A. M. M., Rahman, N. A. and Haque, M. (2018). Knowledge, attitude and practice toward food poisoning among food handlers and dietetic students in a public University in Malaysia. *J. Pharm. Bioallied Sci.* **10** (4), 232-239. [doi:10.4103/JPBS.JPBS_141_18].

Zamani, B., Daneshzad, E., Siassi, F., Guilani, B., Bellissimo, N. and Azadbakht, L. (2020). Association of plant-based dietary patterns with psychological profile and obesity in Iranian women. *Clin. Nutr*. **39** (6), 1799-1808. [doi:10.1016/j.clnu.2019.07.019].

Appendices

Appendix A: Consent letter from Dharan Sub-Metropolitan, City

"शिक्षा स्वास्थ्य पर्यटन र व्यापारिक पूर्वाधार; बहुसाँस्कृतिक आवासीय समृद्ध सहर"

धरान उपमहानगरपालिका

DHARAN SUB-METROPOLITAN CITY

नगर कार्यपालिकाको कार्यालय

OFFICE OF THE MUNICIPAL EXECUTIVE

धरान, सुनसरी

Dharan, Sunsari

प.सं./०८१/०८२

च.नं. ६४८२

मितिः २०८१/१२/१३

नेपाल सम्वतः ११४५

सुश्री निकिता कार्की

धरान-१५।

विषयः अनुमति दिइएको सम्बन्धमा।

उपर्युक्त सम्बन्धमा त्रिभुवन विश्वविद्यालय, केन्द्रिय प्रविधि क्याम्पस, धरान-१४ को च.नं. ८४८ मिति २०८१/१२/१२ गतेको प्राप्त पत्रानुसार सो क्याम्पसमा वि.एस्सी.न्यूट्रिसन एण्ड डाइटेटिक्स विषयको पाठयक्रममा बमोजिम चौथो वर्षमा गर्नुपर्ने शोध कार्य (थेसिस वर्ग) का लागि तपाईलाई Knowledge Attitude and practice About Hypertension and Dietary practices Among Anti-Hypertensive Medication Users of Dharan Sub metropolitan City शिर्षकमा शोध कार्यमा धरान स्थित रहेको विभिन्न वडाहरुमा डाटा कलेक्सनका लागि अनुमति तथा सहयोग गरिदिनहुन माग भए बमोजिम तपाई सुश्री निकिता कार्की लाई धरान नगर क्षेत्र भित्रका वडा नं. ३, ८, १४, १५ मा डाटा कलेक्सन तथा अन्य आवश्यक विभिन्न कार्य गर्नका लागि अनुमति दिइएको व्यहोरा जानकारी गराईन्छ।

बोधार्थ

श्री वडा कार्यालय (३, ८, १४, १५), धउमनपा।

श्री त्रिभुवन विश्वविद्यालय, केन्द्रिय प्रविधि क्याम्पस, धरान-१४

२०८१/१२/१३

नेत्रप्रसाद सापकोटा

प्रशासन महाशाखा प्रमुख

Appendix B: Consent form

Date: …….

Namaste! I Ms. Nikita Karki undergraduate student in Department of Nutrition and Dietetics conducting a dissertation work for award of bachelor's degree in Nutrition and Dietetics. The topic for the study **"knowledge, attitude and practice about hypertension and dietary practices among antihypertensive medication users of Dharan."**

I have been told in a language that I understand about the study. I have been told that this is for a dissertation procedure, that my and my participation is voluntary and he/she reserve the full right to withdraw from the study at my own initiative at any time without having to give reason and that refresh to participate or withdraw from the study at any stage will not prejudice my/his/her rights and welfare. Confidentiality will be maintained and only be shared for academic purposes. This consent form being signed voluntarily indicates your participation in the study.

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.

Signature _____

The study procedures will be explained in the detail and I hope all questions will fully and clearly be answered.

Investigator's sign _____

Date: _____

Appendix C: Questionnaire

सहभागी नं: .....

क) सामान्य जानकारी

१. उमेर:	**२. लिङ्ग:** महिला ☐ पुरुष ☐
३. जाती: **५. Height:** **Weight:** **६. BMI:**	**४. धर्म**: हिन्दु ☐ बौद्ध ☐ क्रिस्चियन ☐ मुस्लिम ☐ अन्य (खुलाउनुहोस्): …….. **७. खानाको प्राथमिकता**: भेज ☐ नन् भेज ☐

ख) सामाजिक र जनसंख्याबारे जानकारी

१. परिवारको प्रकार : क. एकल ख. संयुक्त

२. शिक्षाको स्तर: क. अनपढ ख. सामान्य लेखपढ गर्न सक्ने ग. प्राथमिक तह

घ. माध्यमिक तह ङ उच्च शिक्षा

३. पेशा -व्यवसाय: क. सरकारी ख. गैर-सरकारी ग. स्वरोजगा घ. विद्यार्थी

ङ.बेरोजगार च.अन्य(खुलाउनुहोस्): ……

४. वैवाहिक स्थिति: क. अविवाहित ख.विवाहित ग. सम्बन्ध बिच्छेद भएको

घ. अन्य (खुलाउनुहोस्): ……

५. उच्च रक्तचापको पारिवारिक इतिहास : क. छ ख. छैन

६. उच्च रक्तचापको देखिएको अवधि: क. ६ महिना -१ वर्ष ख. १-२ वर्ष ग. २ वर्ष भन्दा धेरै

७. मुटूको समस्या: क. छ ख. छैन

८. मृगौलाको समस्या: क. छ ख. छैन

९. चिनीरोग (sugar / diabetes): क. छ ख. छैन

१०. आफ्नो वर्तमान रक्तचाप: _____ सिस्टोलिक _____डायस्टोलिक

११. के तपाईंलाई व्याकुलता वा डर त्रास (anxiety) छ? क. छ ख. छैन

१२. तपाईं रातमा कति निदाउनुहुन्छ ? क. ५ घण्टा वा सो भन्दा कम

ख. ६-८ घण्टा

ग. ८ घण्टा भन्दा बढी

ग) ज्ञान (knowledge) बारे प्रश्नहरु

१. के तपाईंलाई सामान्य रक्तचाप कति हुनुपर्छ, थाहा छ? क. थाहा छ ख. थाहा छैन

२. उच्च रक्तचाप भनेको के होला?

क. रक्तचाप सामान्य भन्दा बढी हुनु ख. रक्तचाप सामान्य भन्दा कम हुनु

ग. रक्तचाप सामान्य भन्दा बढी या कम हुनु घ. मलाई थाहा छैन

३. के तपाईंलाई उच्च रक्तचाप हुने कारणहरु थाहा छ? क. थाहा छ ख. थाहा छैन

४. के तपाईंलाई उच्च रक्तचापको लक्षणहरु थाहा छ? क. थाहा छ ख. थाहा छैन

५. के तपाईंलाई कम रक्तचापको लक्षणहरु थाहा छ? क. थाहा छ ख. थाहा छैन

६. के उच्च रक्तचाप वंशानुगत हुन्छ होला? क. हुन्छ ख. हुदैन ग. थाहा छैन

७. के उच्च रक्तचाप निको हुन सक्ने रोग हो ? क. हो ख. होइन ग. थाहा छैन

८. यदि उच्च रक्तचापलाई सामान्य अवस्थामा ल्याइएन भने यसले यस्ता रोगहरु निम्त्याउन सक्छ?

क. मुटुरोग ख. चिनीरोग

ग. आखाँको रोग घ. मृगौलाको रोग

ङ. माथिको सबै च. थाहा छैन

९. के उच्च रक्तचापको औषधिले कहिलेकाहीँ रक्तचाप कम गर्न सक्छ ?

क. सक्छ ख. सक्दैन ग. थाहा छैन

१०. के अत्यधिक नुनको सेवन गर्नाले उच्च रक्तचापको जोखिम बढाउछ?

क. बढाउछ ख. बढाउदैन ग. थाहा छैन

११. के अत्यधिक जाडरक्सीको सेवनले उच्च रक्तचापको जोखिम बढाउछ ?

क. बढाउछ ख. बढाउदैन ग. थाहा छैन

१२. के धेरै मोटो हुनु भनेको पनि उच्च रक्तचापको जोखिम बढाउनु हो ?

क. हो ख. होइन ग. थाहा छैन

१३. के उच्च रक्तचापमा नियमित BP (रक्तचाप) को जाँच जरुरी छ ?

क. छ ख. छैन ग. थाहा छैन

१४. के उच्च रक्तचापको औषधि जिन्दगीभरि खानु पर्छ ?

क. पर्छ ख. पर्दैन ग. थाहा छैन

१५. कुन जीवनशैलीको परिवर्तनले उच्च रक्तचापको उपचार र रोकथाम हुन सक्छ?

क. रगतमा चिनीको मात्रालाई नियन्त्रण गर्नाले

ख. धुम्रपान र मद्यपानको सेवनलाई कम गर्नाले

ग. आफ्नो तौललाई सन्तुलनमा राख्नाले

घ. नुनको सेवनलाई नियन्त्रण गर्नाले

ङ. माथिको सबै

च. थाहा छैन

घ) अभिवृत्ति (attitude) बारे प्रश्नहरु

१. के हामीले उच्च रक्तचापको रोकथाम गर्न नुनको सेवनलाई कम गर्नु पर्छ?

क. पर्छ ख. पर्दैन

२. तपाईंको बिचारमा नियमित BP (रक्तचाप) जाँच जरुरी छ ?

क. छ ख. छैन

३. के उच्च रक्तचापको औषधि नियमित खानु जरुरी छ ?

क. छ ख. छैन

४. के डाक्टरसँग नियमित भेटघाट र चेकजाँच जरुरी छ ?

क. छ ख. छैन

५. स्वस्थ जीवनको लागि के नियमित व्यायाम गर्नु आवश्यक छ ?

क. छ ख.छैन

ङ) अभ्यास (practice) बारे प्रश्नहरु

१. तपाईं आफ्नो BP (रक्तचाप) कत्तिको जाँच गर्नुहुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै गर्दिन

२. तपाई नुनलाई कत्तिको नियन्त्रण खानु हुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै गर्दिन

३. तपाईं बोसोयुक्त खानेकुराबाट कत्तिको टाढा बस्नुहुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै बस्दिन

४. तपाईँ कसरत वा अन्य शारीरिक व्यायाम कतिको गर्नुहुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै गर्दिन

५. तपाईं आफ्नो तौल कत्तिको लिनुहुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै लिदिन

६. तपाईं आफ्नो BP को औषधि खान कत्तिको बिर्सिनु हुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै बिर्सिन्न

७. तपाईं आफ्नो BP बारे डाक्टरसँग कत्तिको परामर्श लिनुहुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै लिदिन

८. तपाईं आफ्नो रगतको बोसोको जाँच कत्तिको गर्नुहुन्छ?

क. प्रायजसो ख. कहिलेकाहिँ ग. कहिल्यै गर्दिन

९. तपाईं धुम्रपान कत्तिको गर्नुहुन्छ?

क. दैनिक ख. हप्तामा केहि पटक ग. बिरलै घ. कहिल्यै गर्दिन

१०. तपाईं जाडरक्सी कत्तिको खानुहुन्छ?

क. दैनिक ख. हप्तामा केहि पटक ग. बिरलै घ. कहिल्यै गर्दिन

च) खाना (diet) बारे प्रश्नहरु

१. के तपाईं आफ्नो खानामा नियमित रुपमा सलाद राख्नुहुन्छ ?

क. राख्छु ख. राख्दिन

२. तपाईं दिनमा कति पटक खाना वा खाजा खानुहुन्छ ?

क. २ पटक ख. ३ पटक ग. ३ पटक भन्दा बढी

३. तपाईं दिनमा कति नुन खानुहुन्छ?

क. १ चिया चम्चा (५ ग्राम) ख. १ चिया चम्चा भन्दा बढी

४. के घरमा तपाईंका लागि खाना छुट्टै बन्छ?

क. बन्छ ख. बन्दै

५. तपाईंको भान्सामा कस्तो तेलको प्रयोग हुन्छ? _____

६. तपाईं रातो मासु (जस्तै: खसी, राँगा, सुँगुर) कत्तिको खानुहुन्छ ?

क. हप्तामा १ पटक भन्दा बढी ख. साप्ताहिक ग. बिरलै घ. कहिल्यै खाँदिन

७. तपाईं घरदेखि बाहिर कत्तिको खाना खानुहुन्छ ?

क. हप्तामा १ पटक भन्दा बढी ख. साप्ताहिक ग. बिरलै घ. कहिल्यै खाँदिन

छ) पछिल्लो २४ घण्टामा आफुले खाएको खानाको स्मरण गर्नुहोस् ।

Meal	Description
बिहानको खाजा	
बिहानको खाना	
दिउसोको खाजा (यदि १ पटक भन्दा बढी भए खुलाउनुहोस्)	
रातिको खाना (यदि सुत्ने बेलामा केहि खाएको भए)	

ज) खाना आवृत्ति तालिका

खाना		दैनिक	हप्तामा ३-४ पटक	हप्तामा १ पटक वा कम	मासिक	कहिल्यै खाँदिन
अन्न	भात (धान)					
	गहुँ					
	मकै/ जौं					
	कोदो /फापर					
गेडागुडी	दाल					
	चना /मटर र अन्य गेडागुडी					
हरियो सागपात						
अन्य तरकारीहरु						
जरा तथा कन्दमुल						

ताजा फलफूल						
डेरी उत्पादन	दूध					
	दही/ मही					
	घ्यू					
	पनिर / चीज					
चिसो पेय पदार्थ						
प्याकेटका खानेकुराहरु						
माछा मासु	अन्डा					
	कुखुरा					
	माछा					

झ) शारीरिक क्रियाकलाप

१. तपाईं घरको शारीरिक काममा कत्तिको सक्रिय हुनुन्छ?

क. एकदम धेरै ख. धेरै ग. अलिअलि घ. खासै छैन

२. तपाईं बिहान वा बेलुका कत्तिको हिडडुल गर्नुहुन्छ?

क. दैनिक ख. हप्तामा केहि पटक ग. कहिलेकाहीँ घ. कहिल्यै हिड्दिन

यदि हिड्नुहुन्छ भने दिनमा कति समय हिड्नु हुन्छ ? _____घण्टा _____ मिनेट

३. तपाईं सासको गति बढाउने खेल वा कार्य कत्तिको गर्नुहुन्छ ?

क. दैनिक ख. हप्तामा केहि पटक ग. कहिलेकाहीँ घ. कहिल्यै हिड्दिन

यदि गर्नुहुन्छ भने दिनमा कति समय गर्नु हुन्छ? _____घण्टा _____मिनेट

४. तपाईं दिनमा कति समय बसेर वा ढल्केर बिताउनुहुन्छ? _____घण्टा _____मिनेट

ञ) औषधि पालन मापदण्ड

	Variable (चर)	कहिल्यै	कहिलेकाहीं	धेरैजसो समय	सधैं
१.	तपाईं आफ्नो रक्तचाप नियन्त्रण गर्ने औषधि खान कति पटक बिर्सिनुहुन्छ?				
२.	तपाईं कति पटक आफ्नो औषधि नखाने सोच बनाउन सक्नु हुन्छ?				
३.	के तपाईं चिकित्सकको सल्लाह बिना औषधिको मात्रा वा ट्याब्लेटको संख्या परिवर्तन गर्नुहुन्छ?				
४.	के तपाईँ सहज महसुस भएको दिन औषधि खान छोड्नुहुन्छ?				
५.	के तपाईँलाई औषधिले असर गरेको जस्तो लागेर डाक्टरलाई नभनी औषधि खान छोड्नु भएको छ?				
६.	तपाईं कति पटक बिर्सने बानीले औषधि खान बिर्सिनुहुन्छ?				
७.	तपाईंको रक्तचाप नियन्त्रणमा आएपछि कति पटक औषधि खान छोड्नु भएको छ?				
८.	फ्लू जस्ता अन्य तीव्र रोगहरूले बिरामी हुँदा तपाईंले कति पटक रक्तचापको औषधि खान छोड्नुभएको छ?				
९.	के तपाईँ दैनिक औषधि सेवनमा अन्य बिरामीको कारण थप औषधि सेवनमा दिक्क हुनु भएको छ?				
१०.	रक्तचापको औषधि सकिनुअघि तपाईं कति पटक पहिले नै थप भर्नुहुन्छ?				

Note: ……
……..
……..

"तपाईको अमूल्य समयको लागि मुरीमुरी धन्यवाद !!!"

Appendix D: Photo gallery

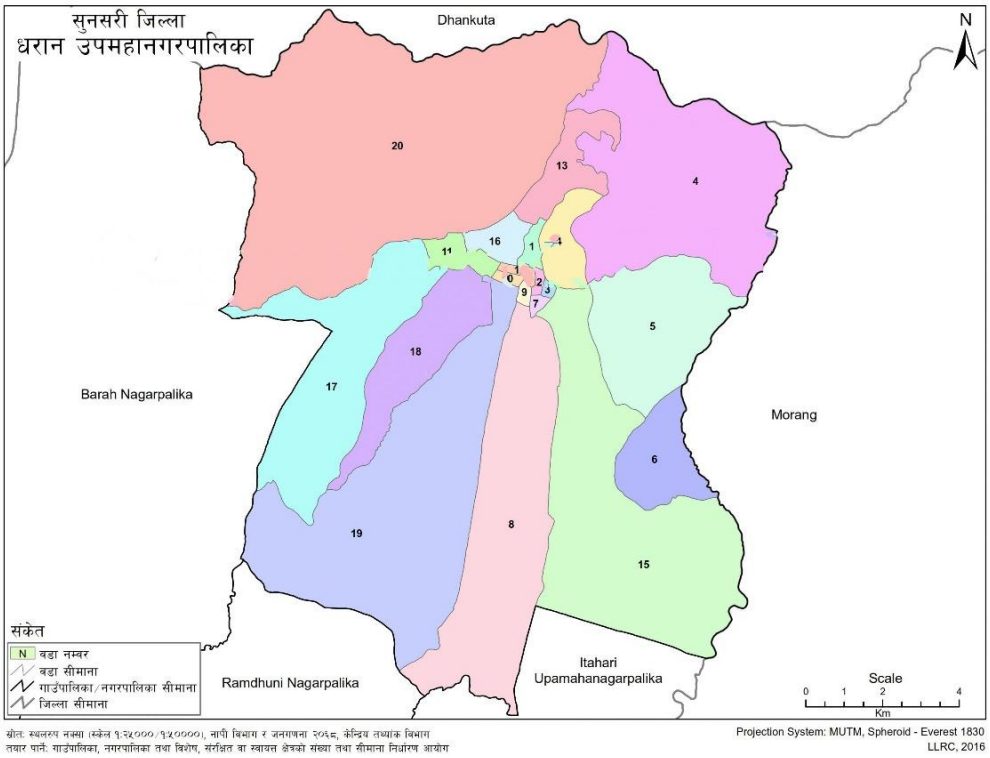
a) Filling up questionnaire

b) Measuring BP

c) Measuring weight

d) Measuring height

Appendix E: Study Site



Source: MoFAGA (2017)