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Dietary Assessment of Hypertensive Women

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Abstract

Introduction: Hypertension is quite prevalent and is regarded as a major public health concern in many nations. According to the World Health Organization, an estimated 600 million people worldwide have high blood pressure, leading to 13% of all deaths, 62% of stroke cases, and 49% of myocardial infarction cases.

Objective: The aim of the current study was to determine the dietary assessment in hypertensive women of all ages. A community based cross sectional study was conducted to evaluate the dietary assessment in hypertensive women of all ages.

Methodology: A sample of 200 women were recruited from Mardan Medical Complex and Dar ul Shifa hospitals Mardan. Data regarding Socio-demographic parameters, anthropometric and blood pressure measurements and dietary intake was collected. The data was analyzed through SPSS. A proper questionnaire was developed to carry out the study.

Results: The result of the study revealed the mean age of the participants was 12.591± 42.4, weight 71.43 ± 1.872, height 154. 42 ± 12.204 and BMI 29.24 ± 5.141. The study showed that the prevalence of hypertension among working women was 6 %, among housewives it was 94%, 36 percent among illiterates, 64 percent among literates, 17 percent among pregnant women and 65 percent among non-pregnant women. Moreover, most of the women with hypertension consumed salty foods high amount of sodium, fats and oil. Similarly, intake of fruits and vegetables among the hypertensive women was very low.

Conclusion: The study recommended that women should take heart-healthy diet, get regular physical exercise, maintain healthy weight and take proper medication.

Keywords: Adult Women, Body Mass Index, Dietary Intake

1. Introduction

One of the main risk factors for dementia, chronic renal disease, various cardiovascular illnesses, stroke, and ischemic heart disease is high blood pressure (Zhou *et al.* 2021) [19]. A vital sign of a healthy cardiovascular system is blood pressure. Premature mortality may result from hypertension, which is closely linked to several disorders (Popwczak *et al.* 2022) [10]. The force that the body's arteries, which are its main blood vessels, are subjected to as a result of blood flow is known as blood pressure. Blood pressure that is too high is referred to as hypertension. When blood pressure is tested twice, hypertension is diagnosed if the systolic and/or diastolic values on both occasions are both greater than 140 millimeters of mercury (WHO, 2021) [17]. Hypertension is the leading cause of "loss of health" worldwide (Gonzalez Vicente *et al.*, 2019) [4].

Blood pressure is the pressure caused by the body's arteries, which are its main blood vessels, as blood travels against their walls. Two numbers are used to indicate blood pressure. Systolic pressure, which is the first number, refers to the blood vessel pressure created when the heart contracts or beats. The pressure in the arteries between heartbeats is shown by the second number (diastolic). The risk of disorders of the heart, brain, kidneys, and other organs is increased significantly by hypertension, often known as excessive blood pressure. Specific systolic and diastolic blood pressure values or the usage of antihypertensive drugs are two ways to diagnose hypertension (WHO, 2021) [17].

Many hypertensives may not be aware of their condition because they may not experience any symptoms. Early morning headaches, nosebleeds, abnormal heart rhythms, visual abnormalities, and ear buzzing are other symptoms. Fatigue, nauseousness, vomiting, bewilderment, worry, chest pain, and trembling of the muscles may be signs of more severe types. Uncontrolled hypertension can lead to sudden death from heart attack, heart failure, heart attack, and persistent chest pain (also

known as angina). The phrase "silent killer" refers to hypertension. As it will not have any symptoms or warning indications, the majority of individuals with hypertension are unaware that they have a problem. It is crucial to regularly measure blood pressure for this. (WHO, 2021) [17].

Most hypertensives (> 70%) reported headaches, dizziness, confusion, palpitations, syncope, weakness, muscle cramps, visual abnormalities, and nausea/vomiting as possible presenting symptoms of hypertension, while normotensives only indicated headaches, dizziness, palpitation, and weakness (Zafar *et al.* 2008). By restricting or rupturing the arteries that carry blood and oxygen to the brain, hypertension can also result in strokes**.** It can also damage the kidneys, which can lead to renal failure. Unhealthy diets (excessive salt intake, diets heavy in saturated and trans fats, insufficient intake of fruits and vegetables), inactivity, use of tobacco and alcohol, and being overweight or obese are some of the risk factors that can be changed. Age over 65, a family history of hypertension, and co-existing conditions like diabetes are all non-modifiable risk factors. (WHO, 2021) [17].

One of the key risk factors for dementia, chronic kidney disease, ischemic heart disease, stroke, and other cardiovascular diseases (CVDs) is high blood pressure. In the majority of countries and regions of the world, high blood pressure is the number one preventable cause of CVD mortality and disease burden. According to the Framingham Heart Study 27, those with hypertension (defined as SBP 160 mm Hg or DBP 95 mm Hg) have a higher risk of developing coronary heart disease than those with SBP 80 mm Hg (Zhou *et al.,* 2021) [19].

The primary and most prominent risk factor for diseases such as cardiovascular, stroke, and kidney disease is hypertension (Zinat Motlagh *et al.* 2015). Prehypertension variables were age, sex, education, job position, overweight or obesity, current smoking, and family history of hypertension. (Yang *et al.* 2017) identified age, sex, ethnicity, job position, overweight or obesity, frequent drinking, diabetes, and hyperuricemia as hypertension risk factors (Yang *et al.,* 2017).

The most significant complication, comprising 44.4% of patients, also had the highest fatality rate (39.3%). (Ogah *et al.,* 2012) [8]. A significant risk factor for microvascular problems like retinopathy and nephropathy, as well as cardiovascular events like myocardial infarction and stroke, is hypertension. Diabetes' most severe complication, cardiovascular disease, accounts for 86 percent of deaths in diabetics I (Pacheco *et al.,* 2002).

Possessing hypertension is a significant medical condition that raises your chance of developing heart, brain, kidney, and other problems (WHO, 2O21) [17]. The heart may suffer severe damage from hypertension. The flow of blood and oxygen to the heart can be reduced by artery hardening brought on by excessive pressure. Chest pain, also known as angina, can be brought on by this increased pressure and reduced blood flow. Heart attack, which happens when the heart's blood supply is cut off and the heart muscle cells run out of oxygen. The longer the blood flow is restricted, the more harm the heart endures.

Heart failure is a condition when the heart becomes unable to appropriately pump blood and oxygen to the body's other vital organs. Abnormal heart rhythm, which may cause instant death (WHO, 2021) [17]. By controlling blood pressure with antihypertensive medications, target organ damage is reduced and cardiovascular disease outcomes are minimized. Hypertension is the most prevalent modifiable risk factor for cardiovascular illnesses and death (Oparail & Schmieder 2015) [9].

For reducing blood pressure in people with hypertension, low to moderate intensity training looks to be just as effective as higher intensity training, if not more so (Hagberg *et al.* 2012). Reducing and managing mental stress, frequently monitoring blood pressure, seeking health assistance, treating high blood pressure, and managing other medical disorders are all ways to manage hypertension. Improvements in diet and exercise, as well as quitting smoking and harmful alcohol consumption, can help alleviate the signs and risks of hypertension (WHO, 2021) [17].

Limiting salt intake (to less than 5g per day), increasing fruit and vegetable consumption, participating in physical activity, abstaining from tobacco use and alcohol consumption, limiting intake of foods high in saturated fats, and eliminating or reducing trans fats are some other ways to improve health. (WHO, 2021) [17].

According to numerous global studies of diseases, Hypertension is quite prevalent and is regarded as a major public health concern in many nations (Wolf-Maier *et al.* 2003) [18]. According to the World Health Organization, an estimated 600 million people worldwide have high blood pressure, which can cause myocardial infarction, stroke, or even death. Seven million deaths each year, or 13% of all deaths, are related to Hypertension, along with 62% of stroke cases and 49% of myocardial infarction cases (Faraji *et al.* 2015) [3]. According to the findings of prospective studies conducted in Asia with over 500,000 cases, there is a direct link between normal systolic and diastolic blood pressure levels and the risk of coronary heart disease and stroke in both white and Asian populations (Lawes *et al.*, 2003).

2. Materials and Methods

2.1 Study Location

This cross-sectional study was conducted in Government hospital Mardan Medical complex Dar ul - Shifa located in district Mardan under the strict supervision of medical superintendents of the respective hospitals.

2.2 Sample Size

Total of 200 women were recruited for the study aged 25-85. Data was collected from February 2022 to July 2022. Data regarding the dietary intake of women was collected.

2.3 Data Collection

The data for the study was collected using a validated 24 dietary recall (Annex- I) approved by the supervisor of the project. The questionnaire was designed to collect information about the patient's general data including age, sex, height, weight, BMI, occupation, Blood pressure measurements, marital status, educational status, income and pregnancy status**.** Similarly, BMI was calculated according to the criteria approved by WHO, which was calculated by taking weight in kilograms divided by height in meter square (kg/m2). The BMI of less than 18kg/m2 will be considered as underweight, BMI ranging from 18.5-24.9 kg/m2 was considered as normal while BMI ranging from 25.0-29.9 kg/m2 was considered as overweight. BMI of greater than 30kg/m2 was considered as obese. (WHO,

1998)

2.4 Blood Pressure

The heart supplies the organs and tissues of the body with blood. With every beat, it pumps blood into the large blood vessels of the circulatory system. As the blood moves around the body, it puts pressure on the walls of the vessels. Blood pressure readings are made up of two values: Systolic blood pressure is the pressure when the heart beats – while the heart muscle is contracting (squeezing) and pumping oxygen-rich blood into the blood vessels. Diastolic blood pressure is the pressure on the blood vessels when the heart muscle relaxes. The diastolic pressure is always lower than the systolic pressure. Blood pressure is measured in units of millimeters of mercury (mmHg). The readings are always given in pairs, with the upper (systolic) value first, and followed by the lower (diastolic) value. So, someone who has a reading of 132/88 mmHg (often spoken "132 over 88") has a systolic blood pressure of 132 mmHg, and a diastolic blood pressure of 88 mmHg. (Kasper *et al*., 2015)

Measuring Blood Pressure with a Sphygmomanometer

A sphygmomanometer has three parts: a cuff that can be inflated with air, a pressure meter (manometer) for measuring air pressure in the cuff, and a stethoscope for listening to the sound the blood makes as it flows through the brachial artery (the major artery found in your upper arm). The scale of the pressure meter ranges from 0 to 300 mmHg. The pressure meter has a rubber pump on it for inflating the cuff and a button for letting the air out. To measure blood pressure, the cuff is placed around the bare and stretched out upper arm, and inflated until no blood can flow through the brachial artery. Then the air is slowly let out of the cuff. As soon as the air pressure in the cuff falls below the systolic blood pressure in the brachial artery, blood will start to flow through the arm once again. This creates a pounding sound when the arteries close again and the walls of the vessels hit each other after a heartbeat. The sound can be heard by placing the stethoscope close to the elbow. Right when you start to hear this pounding for the first time you can read your systolic blood pressure off the pressure meter. The pounding sound stops when the air pressure in the cuff falls below the diastolic blood pressure in the brachial artery. Then the blood vessels remain open. Right when the pounding stops, you can read the diastolic blood pressure off the pressure meter.

Blood pressure category	Systolic blood pressure (mm Hg)	Diastolic blood pressure (mm Hg)
Normal	<120	<80
Prehypertension	120-139	80-89
Hypertension stage1	140-159	90-99
Hypertension stage 2	≥160	≥100

2.5 Anthropometric Data

Anthropometric data including weight and height was collected by using questionnaire (Annex –I).

2.5.1 Height

Height of an individual was measured by using an instrument known as stadiometer.

Stadiometer

A stadiometer is an instrument used to measure human height. It is constructed out of a ruler and a sliding horizontal headpiece which is adjusted to rest on the top of the head. The subject whose height is to be measured was asked to remove his/her shoes and socks, stand straight over the stadiometer and it was ensured that they are standing perfectly straight with their head and back forward and against the wall, directly under the drop-down measuring device. The nose and ears of the individual was parallel to the floor and after ensuring that the individual is all set for his/her height measurement the horizontal head piece was gently placed on the top of the head and height was measured. (WHO, 1998)

2.5.2 Weight

The weight of an individual was measured using a weighing scale or weight machine.

Weight Machine

Weight machine or weighing scale is an instrument used to measure weight or mass. It is also known as mass scale, balance scale or weight balance. The weight of an individual to be measure on the weighing scale was asked to remove any heavy extra clothing, shoes and accessories in order to avoid extra weight and then person the individual was asked to stand still on the weight machine and his/her weight was recorded in kgs. (WHO, 1998)

2.5.3 Body Mass Index (BMI)

BMI was calculated according to the criteria approved by WHO, which is calculated by taking weight in kilograms divided by height in meter square (kg/m2). The BMI of less than 18kg/m2 was considered as underweight, BMI ranging from 18.5-24.9 kg/m2 was considered as normal while BMI ranging from 25.0-29.9 kg/m2 was considered as overweight. BMI of greater than 30kg/m2 was considered as Obese. (WHO, 1998).

Table 1: BMI Groups by (WHO, 1998)

Categories	BMI Groups
Underweight	< 18kg/m2
Normal	18.5-24.9kg/m2
Over weight	25.0-29.9kg/m2
Obese	>30kg/m2

2.5.4 Dietary Data

Information about dietary consumption was assessed with the help of 24 hours dietary recall method (annexure-II).

24 Hours Dietary Recall

A 24hour dietary recall is a structure interview intended to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours most commonly from midnight to midnight the previous day. The purpose of 24-hour dietary recall to obtained detail information about all foods and beverages consumed on a given day. A 24-hour dietary recall requires 20-60 minutes for completion and are administered by a trained interviewer. 24-hour dietary recall helps to determine the mean usual intakes with a single administration for example collecting a recall for at least two non-consecutive days allows application of statistical techniques to estimate usual dietary distributions for a group. It is also used to determine the relationship between diet, health, and other variables.

3. Result

The current chapter states the result of the analysis of study

of hypertension in women. The result of the study is mentioned below in detail.

Table 2 shows mean and standard deviation of age, weight, height and BMI of all patients. These findings showed mean age of subjects was 42.4±12.591. Mean weight of the participants was 71.43 ±1.872 kg, whereas mean height was 154.12 ± 12.024 and mean BMI was 29.24 ± 5.141 standard deviation.

Table 2: Anthropometric measurements of the subjects

Variables	Mean	Standard Deviation
Age	42.4	12.591
Weight	71.43	1.872
height	154.12	12.204
BMI	29.24	5.141

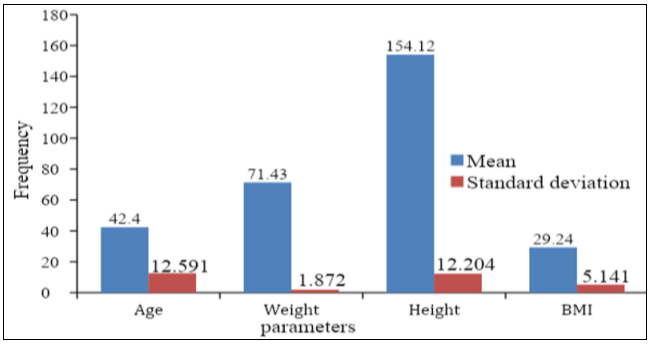

Fig 1: Mean & Standard derivation Anthropometric measurements of the subject

The table below 3 shows percentages of socio-demographic data of hypertensive patient i.e. Almost 94% (n=188) were housewives, 36% (n=72) illiterate followed by 64% (n=128) were illiterate. All 100% (n=200) respondents were married among these 17% (n=34) women were found pregnant. Income status shows that more than half 58.5% (n=117) of the subjects has monthly earning of 50,000 Pakistani rupees.

Table 3: Socio-demographic data of hypertension respondents

Variables	Categories	Frequency (n)	Percentage (%)
Occupation	House wife	188	94
	Working women	12	6
Education	Illiterate	72	36
	literate	128	64
Marital status	married	200	100
Pregnancy status	Pregnant	34	17
	Non-pregnant	130	65
Income	30000	3	1.5
	40000	16	8.0
	50000	117	58.5
	60000	64	32.0

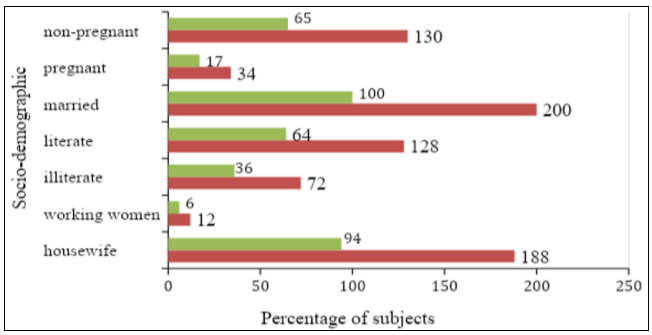

Fig 2: Socio-demographic data of hypertension respondents

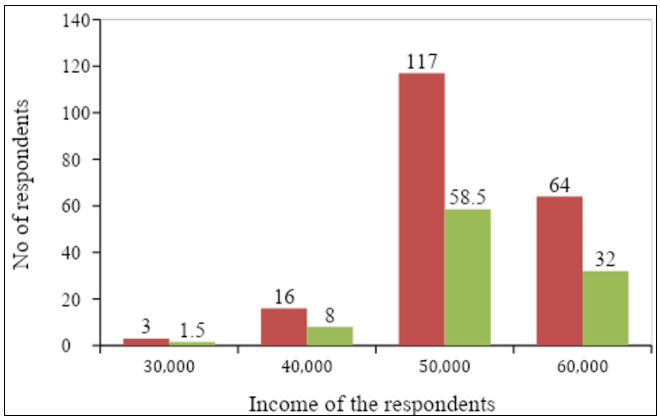

Fig 3: Income distribution of the respondents

The table below 4 shows that women with 86 % are taking medication while 14.4 % of women are not taking any medication for hypertension.

Table 4: Medication usage of study subjects

Medication	Frequency (n)	Percentages (%)
Yes	86	86
No	28	14.4

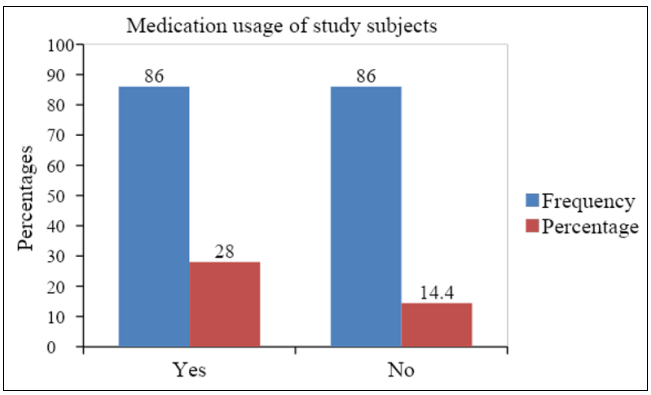

Fig 4: Medication usage of study subjects

The table below 5 shows that respondents with 5.5 % have 60-70 diastolic blood pressure, 58 % have 80-85 and 35 % respondents have 90-100 diastolic blood pressure.

Table 5: Diastolic blood pressure of the study

Diastolic blood pressure	Frequency (n)	Percentage (%)
60-70	11	5.5
80-85	116	58
90-100	70	35

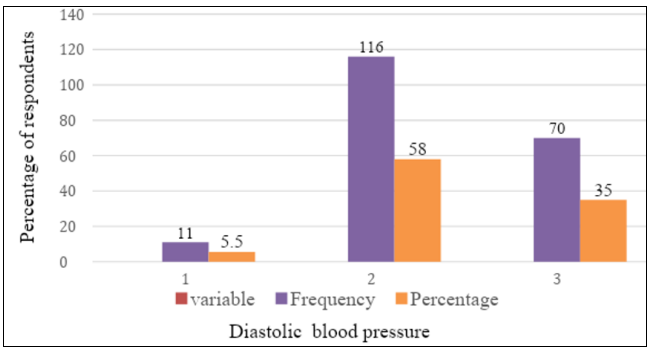

Fig 5: Diastolic blood pressure of subjects

The table below 6 shows that respondents with 21 % have 110-120 systolic blood pressure, 53.5 % have 130-140 systolic blood pressure,17 % have 150-10 and 8.5 % of respondents have 170-180 systolic blood pressure.

Table 6: Systolic blood pressure of study subjects

Systolic blood pressure	Frequency (n)	Percentage (%)
110-120	42	21
130-140	107	53.5
150-160	34	17
170-180	17	8.5

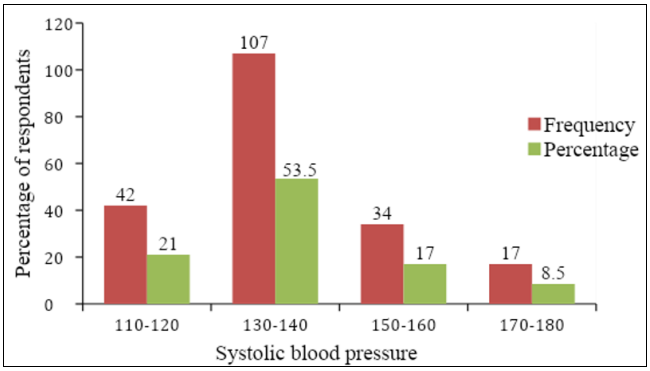

Fig 6: Systolic blood pressure of study subjects

This Table 7 states the variation in breakfast of all patients. The patients take tea with (n=11) having 5.5 %, tea-paratha with (n=111) having 55.5 % and tea-paratha-eggs/salan with (n= 78) having 39.0%.

Table 7: Breakfast of the subjects

Food intake	Frequency (n)	Percentage (%)
Tea	11	5.5
Tea, paratha	111	55.5
Tea, paratha, egg/salan	78	39.0

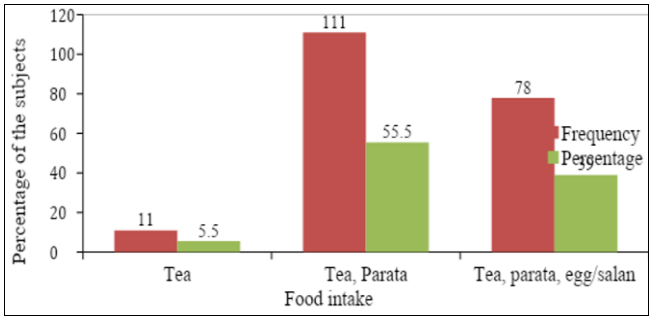

Fig 7: Breakfast of the subjects

The table below 8 shows variation in lunch of patients. The patients skip meal with (n= 8) having 4.0%, take starchy vegetables with (n= 63) having 31.5%, red meat with (n=95) having 47.5 %, pulses with (n= 19) having 9.5% and cereal with (n=15) having 7.5%.

Table 8: Lunch of the subjects

Food groups	Frequency (n)	Percentage (%)
Skip meal	8	4.0
Starchy vegetables	63	31.5
Red meat	95	47.5
Pulses	19	9.5
Cereal	15	7.5

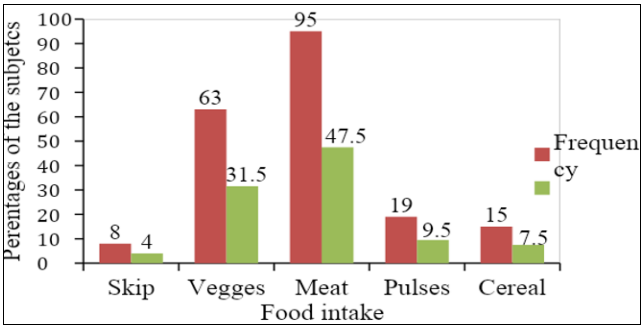

Fig 8: Lunch of the subjects

The table below 9 shows variation in dinner of all patients. Patients with (n= 4) having 2.0 % skip meal, take starchy vegetables with (n=68) having 34.0%, meat with (n=95) having 46.0 % and pulses with (n=10) having 5.0%.

Table 9: Dinner of the subjects

Food groups	Frequency (n)	Percentage (%)
Skip meal	4	2.0
Starchy vegetables	68	34.5
Red meat	95	46.0
Pulses	10	5.0
Cereals	26	13.0

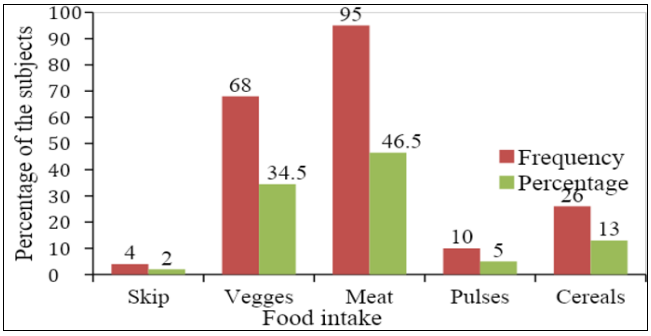

Fig 9: Dinner of the subjects

The table below 10 shows macronutrient calories of patients i.e. the mean data of total calories is 922.66 with 239.239 standard deviation, mean data of CHO gram is 165.828 with 37.5043, mean data of fats gram is 40.700 with 32.8407 standard derivation and data mean of protein gram is 69.53 with standard derivation of 37.919.

Table 10: Total calories and macronutrients in grams consumed by the subjects

Variables	Scale	Mean	Standard deviation
Total calories	kcal	922.66	239.239
CHO	gram	165.828	37.5043
Fats	gram	40.700	32.8407
Protein	gram	69.53	37.919

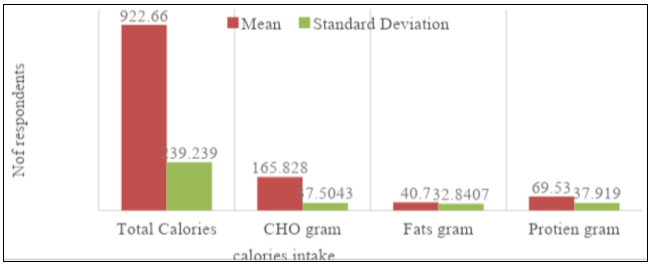

Fig 10: Total calories and macronutrients in grams consumed by the subjects

4. Discussion

The current study showed that hypertension was more prevalent among women who were overweight. According to the study conducted by Huang *et al*. (1998) [5] that most of the women with hypertension were overweight among which women with younger age were more prevalent.

The current study showed that most of the women with hypertension had a BMI greater than 25kg/m2. According to the study conducted by Forman *et al*. (2009) [2] determined the dietary and lifestyle factors associated with increased incidence of hypertension. Results of their study showed that a BMI range of greater than 25kg/m2 was associated with increased incidence of hypertension.

The current study showed that most of the adults above age 40 were suffering from hypertension as this range was mostly observed in housewives. According to the study conducted by Saleem, *et al*. (2010) a scenario was observed by Pakistan National Health Survey that hypertension affects 18% of adults and 33% of adults above 45 years old. In another report it was shown that 18% of people in Pakistan suffer from hypertension with every third person over the age of 40.

The current study showed that most of the pregnant women were hypertensive. Similar study was conducted by kiltiraki *et al*. (2015) [7] that Pregnancy rises up hypertension complications in 6-10% of pregnancies.

The current study showed that most of the hypertensive women belonged to low-income families. Similar study conducted by Ahmad & Oparil. (2017) [1] that Women in middle /low-income countries across all age groups, had a higher prevalence of hypertension compared with high with high income countries. Awareness rates were higher in women than men in both high-income countries 72 percent women and the middle /low-income countries 45percent.

The current study showed that 86 % of women were taking hypertensive medicines. According to the study conducted by Ahmad & Oparil. (2017) [1] on the prevalence of hypertension, the study found that women in both high and middle/low-income countries reported a higher use of antihypertensive medications.

The current study indicated that red meat consumption was positively associated with hypertensive women. Similar study conducted by Tzoulaki *et al*. (2008) that associations between red meat and blood pressure were unaffected by controlling for heam iron or animal protein intake (models 4g and 4h). Only 5% of red meat intake among participants from China was beef compared with 33% in Japan, 40% in the United Kingdom, and 66% in the United States. When beef was analyzed separately, associations with blood pressure were positive but mostly smaller higher beef intake by 2 SD (75 g/24 h) was associated with 0.90 mm Hg higher systolic blood pressure and 0.50 mm Hg higher diastolic blood pressure. The current study indicated that red meat consumption was positively associated with hypertensive women.

The current study showed that meat consumption among the participants was positivity associated with a high incidence of hypertension. Similar study conducted by lajous *et al.* (2014) that women who consumed more servings of meat had a higher rate of hypertension as compared to women who consumed less servings of meat.

The current study indicated that mostly hypertensive women are associated with consumption of excessive fried foods. Similar study conducted by Kang *et al*. (2015) most of the women with hypertension consumed fried foods.

5. Conclusion

The study concluded that majority of women are suffering from hypertension due to their improper ingestion of food and negligence to regular physical exercise. It shows that hypertension stage 2 was very common in older adults. Mostly women are hypertensive because of their life style, dietary intake, and due to the fact that most of them were obese due to high intake of carbohydrates and salt in their diet. Moreover, most of the subjects were getting their daily energy from carbohydrates. But changing of life style can help control and manage high blood pressure.

6. Recommendations

Based on the findings, the current study has several recommendations that are mentioned below:

Over consumption of fast and oily foods should be limited., Keep healthy body weight is highly recommended for each and every individual., More fruits and vegetables should be consumed daily., Physical exercise should be part of daily routine., They should avoid unhealthy food which cause hypertension, Salt intake should be limited, They should lose weight if they are over-weight or obese, They should take proper medication, They should eat food with lower fats, calories and salt, Richly colored green, oranges, and red items are high in potassium and minerals that lower blood pressure should be used.

7. References

1. Ahmad A, Oparil S. Hypertension in Women: Recent Advances and Lingering Questions. Hypertension. 2017; 70(1):19-26.
2. Forman JP, Stampfer MJ, Curhan GC. Diet and lifestyle risk factors associated with incident hypertension in women. JAMA - Journal of the American Medical Association. 2009; 302(4):401-411. Doi: https://doi.org/10.1001/jama.2009.1060
3. Faraji O, Etemad K, Sari AA, Ravaghi H. Policies and programs for prevention and control of diabetes in Iran: a document analysis. Global Journal of Health Science. 2015; 7(6):187.
4. Gonzalez-Vicente A, Saez F, Monzon CM, Asirwatham J, Garvin JL. Thick ascending limb sodium transport in the pathogenesis of hypertension. Physiological Reviews. 2019; 99(1):235-309. Doi: https://doi.org/10.1152/physrev.00055.2017
5. Huang Z, Willett WC, Manson JE. Obesity increases the risk for hypertension, but the effects of modest long-term weight changes have not been precisely quantified. January, 1998.
6. Knowledge on hpt 7.pdf p. 2008; 58(12).
7. Kiltiraki Daniel Knowledge, treatment, control, and risk factors for hypertension among adults Southern Iran. International Journal of Hypertension, 2015.
8. Ogah OS. Blood pressure, prevalence of hypertension and hypertension related complications in Nigerian Africans: A review. World Journal of Cardiology. 2012; 4(12):327.
9. Oparil S, Schmieder RE. New Approaches in the Treatment of Hypertension. Circulation Research. 2015; 116(6):1074-1095. Doi: https://doi.org/10.1161/CIRCRESAHA.116.303603
10. Popowczak M, Rokita A, Koźlenia D, Domaradzki J.

The high-intensity interval training introduced in physical education lessons decrease systole in high blood pressure adolescents. Scientific Reports. 2022; 12(1):1-7. Doi: https://doi.org/10.1038/s41598-022-06017-w
11. Shah N, Shah Q, Shah AJ. The burden and high prevalence of hypertension in Pakistani adolescents: A meta-analysis of the published studies. Archives of public health. 2018; 76(1):1-10.
12. Shafi ST, Shafi T. A survey of hypertension prevalence, awareness, treatment, and control. Hypertension. 2017; 1:8.
13. Sachdev B. Community based study on incidence of type 2 diabetes and hypertension among nomad tribal population of Rajasthan, India. Int J Sci Nat. 2011; 2(2):296-301.
14. Shen Y, Chang C, Zhang J, Jiang Y, Ni B, Wang Y. Prevalence and risk factors associated with hypertension and prehypertension in a working population at high altitude in China: A cross-sectional study. Environmental Health and Preventive Medicine. 2017; 22(1). Doi: https://doi.org/10.1186/s12199-017-0634-7
15. Webb R. Incapacity certification. British Journal of General Practice. 2010; 60(575):450. Doi: /doi.10.3399/bjgp10X502191
16. Wheeler l, jones mb. Pregnancy-Induced Hypertension. Journal of Obstetric, Gynecologic, Neonatal Nursing. 1981; 10(3):212-232.
17. WHO Prevalance of hypertension and pre hypertension among adolescents. J pediatr. 2021; 150(644.e1):640-644.
18. Wolf-Maier K, Cooper RS, Banegas JR, Giampaoli S, Hense HW, Joffres M, *et al*. Hypertension prevalence and blood pressure levels in 6 European countries, Canada, and the United States. Jama. 2003; 289(18):2363-2369.
19. Zhou B, Perel P, Mensah GA, Ezzati M. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. Nature Reviews Cardiology. 2021; 18(11):785-788.