"BLOOD PRESSURE MONITORING IN NORMOTENSIVE TYPE – 2 DIABETICS USING 24HR BLOOD PRESSURE MONITORING DEVICE AND ITS RELATIONSHIP WITH ANTHROPOMETRIC MEASUREMENTS: A ONE YEAR HOSPITAL BASED CROSS SECTIONAL STUDY"

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LIST OF ABBREVIATIONS

GLOSSARY	ABBREVIATIONS
ABP	Ambulatory blood pressure
ABPM	Ambulatory blood pressure monitoring
ACC	American college of cardiology
ADA	American diabetes association
AHA	American heart association
AUC	Area under the curve
BMI	Body mass index
BP	Blood pressure
BRI	Body roundness index
CDC	Centres for disease control and prevention
CDC-NCHS	Centre for disease control and prevention -national centre for health statistics
CHD	Congenital heart defects
CT	Computed tomography
CV	Cardiovascular
CVD	Cardiovascular disease
DBP	Diastolic blood pressure
DEXA	Dual-energy x-ray absorptiometry
DM	Diabetes mellitus
ESC	European society of cardiology
ESH	European society of hypertension
FPG	Fasting plasma glucose
GLP-1	Glucagon-like peptide-1
HDL	High-density lipoprotein
HTN	Hypertension
ICMR-INDIAB	Indian council of medical research-India diabetes
K+	Potassium

LDL	Low-density lipoprotein
MBPS	Morning blood pressure surge
MRI	Magnetic resonance imaging
Na+	Natrium: sodium
NHANES	National health and nutritional examination survey
OGTT	Oral glucose tolerance test
OHT	Orthostatic hypertension
PG	Plasma glucose
RPG	Random plasma glucose
SBP	Systolic blood pressure
SHT	Systolic Hypertension
T2DM	Type 2 diabetes
TG	Triglyceride
TRLs	TG-rich lipoproteins
VLDL	Very low-density lipoprotein
WC	Waist circumference
WHO	World health organization
WHR	Waist hip ratio
WSR	Waist-to-stature ratio

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ABSTRACT

Background: Systemic Hypertension (HTN) is one of the most common co-morbidities in Diabetes Mellitus (DM). Because of the drawbacks of office blood pressure monitoring, it has been suggested that ambulatory blood pressure monitoring (ABPM) be used for hypertension assessment. The sensitivity of Clinic/Office monitoring of BP to predict hypertension-associated organ damage is less. Hence the present study was carried out to estimate the prevalence of hypertension in normotensive type 2 diabetic patients by using a 24-hour ambulatory blood pressure machine and also to assess the relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients.

Materials and methods: A cross-sectional hospital-based study was conducted on 162 people, attending a tertiary care institute over the age of 18, who had type 2 diabetes and a Body Mass Index (BMI) of 25 to 40 kg/m2 (Asian cut-off > 23 kg/m2). All subjects underwent a standardized medical examination, laboratory investigations and ABMP. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. P value <0.05 was considered statistically significant. The data were analysed by using SPSS software V.22.

Results: The mean age was 60.65 ± 11.46 years. Majority were males (62.35%). The mean BMI was 28.31 ± 2.15 kg/m^2. The mean all day SBP was 133.66 ± 13.53 mm/hg while the mean all day DBP was 76.45 ± 10.99 mm/hg. The prevalence of HTN as measured by all day SBP was 77.78% while it was 42.59% for all day DBP. Systolic non-dipping was seen in 93.39% of overweight and 90.24% of obese subjects as classified by BMI, respectively. Diastolic non-dipping was seen in 76.86% of overweight and 73.17% of obese subjects as classified by BMI, respectively. There was a statistically significant association between all-day SBP, all-day DBP, day SBP and day DBP with BMI (P Value<0.05) in males. But in females, there was a statistically significant association between only all day SBP, day SBP with BMI (P Value<0.05).

There was no statistically significant association between various ABPM parameters with other anthropometric parameters like waist to hip ratio and also waist to height/stature ratio respectively in both males and females.

Conclusion: The present study was one of the kinds in the study region as there was no report of ABPM parameters in the study population. Patients with T2DM can benefit from routine ABPM by early identification and management of Hypertension in Type 2 DM.

Keywords: Ambulatory Blood Pressure Monitoring (ABPM), systemic Hypertension, Diabetes Mellitus, Body Mass Index, Prevalence, Non dipping.

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INTRODUCTION

Systemic Hypertension (HTN) is one of the most common co-morbidities in Diabetes Mellitus (DM).[1] In diabetics Blood pressure (BP) management is one of the cornerstones in managing micro- and macro-vascular complications of diabetes, in addition to blood glucose control.[2-5] The two well-established guidelines for Arterial hypertension diagnosis and management are given by the American College of Cardiology (ACC)/American Heart Association (AHA) - 2017 guidelines[6], and European Society of Cardiology (ESC)/European Society of Hypertension (ESH) – 2018 guidelines.[7] Because of the drawbacks of office blood pressure monitoring, it has been suggested that ambulatory blood pressure monitoring (ABPM) be used for hypertension assessment.[8-10] ABPM has the ability to diagnose masked Hypertension, White coat hypertension besides giving information about 24-hour blood pressure rhythm and nocturnal blood pressure.[10-14] The most commonly used ABPM measurements for clinical purposes are 24-hour (All day) average BP, nocturnal dipping patterns, daytime BP, and night time BP.[7, 15] Hypertension was defined as a 24-hour ABP (Ambulatory Blood Pressure) of ≥125/75 mm Hg, according to the 2017 ACC/AHA guidelines. Then, according to the 2018 ESC/ESH guidelines, hypertension was recently defined as a 24-hour ABP (Ambulatory Blood Pressure) of ≥130/80 mm Hg.[6] Ambulatory BP monitoring has still not become routine in the clinical management of type 2 DM.

Increased Body Mass Index (BMI), decreased physical activity, and a sedentary lifestyle is all well-known modifiable risk factors for hypertension, are also commonly seen in Type II Diabetics.[16, 17] Worldwide, the prevalence of overweight and obesity has increased substantially. WHO defines the epidemic of obesity as ‘globosity’ which is currently on the rising trend? Since 1975, the prevalence of global obesity has tripled.[18] Worldwide, as per WHO 2016 study, 13% of adults were obese, and 39% were overweight.[18] In India, more than 135 million individuals have been affected by obesity.[19] According to an ICMR-INDIAB study done on the prevalence of obesity in India (2015), the rate of obesity was 11.8% to 31.3%, and that of central obesity was 16.9%–36.3%.[20] According to WHO, Overweight is defined as BMI ≥ 25 and Obesity as BMI ≥ 30.[21] WHO revised a lower cut-off for Asians for diagnosing overweight and obesity because of complications in Asians occurring at lower BMI.[22] The WHO Asian modification of BMI defines overweight as BMI >23 and obesity as BMI >25 kg/m^2.[21, 22] Anthropometric measurements such as increased Waist Circumference (WC), Body Mass Index (BMI), Waist Hip Ratio (WHR), and Waist height/stature ratio (WSR) are closely related to adverse cardiovascular outcomes and stratifies them as an at-risk population. Metabolic traits such as increased total cholesterol, triglycerides, and lipoproteins also have a detrimental effect on the development of cardiovascular disease.

In 2015, globally, 1 in 4 men had hypertension while 1 in 5 women had hypertension.[23] 2015-2016 United states CDC-NCHS (Centre for disease control and prevention -National Centre for health statistics) data found 29% of 18 years and above to be hypertensive.[24] Hypertension (both systolic and diastolic) is found more commonly in individuals who are overweight and obese on comparison with those with normal BMI.[25]

Besides Hypertension, obesity is a major independent and modifiable risk factor for type 2 diabetes mellitus, and there has been a progressive increase in the prevalence of type 2 diabetes mellitus with obesity.[26-28] Several measurements of obesity, including body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR), and waist-to-stature ratio (WSR), are significantly associated with type

2 diabetes mellitus. BMI cannot be used to distinguish between muscle and fat. Compared with BMI, central obesity indices, such as Waist Circumference, Waist to Hip Ratio, and Waist to stature ratio appear to be more strongly associated with adverse cardio vascular outcomes in type 2 diabetes mellitus.[29-31]

Type 2 DM involves multiple organs and exposes patients to HTN. In subjects with DM, around 35% to 75% of complications are due to HTN.[32] Subjects with DM tend to have higher nocturnal Blood Pressure and higher Morning Blood Pressure Surge (MBPS)[33], which cannot be diagnosed with routine Office measurement of Blood Pressure. Hence, diabetic patients, even though normotensive on office readings of BP, are indicated for ABPM. There is also a paucity of recommendations on the use of ABPM monitoring for subjects with DM. Hence the present study was done to determine the prevalence of abnormal ambulatory blood pressure patterns in Normotensive type 2 diabetic subjects and to determine its relationship with anthropometric measurements. Control of blood pressure 24 hours throughout the day does not stop with control of average daily BP. It also includes the control of diurnal and nocturnal variability in blood pressure.[34] Only Clinic based BP measurements are used to manage blood pressure in the majority of the hypertensive subjects, but their daily variability in BP is not available. It has been proven that ABPM is a better method for the assessment of blood pressure when compared to Office BP reading.[35] The sensitivity of Clinic/ Office monitoring of BP to predict hypertension-associated organ damage is less.[36, 37]

NEED OF THE STUDY:

Over the past decade, noninvasive ABPM has been developed that can reliably record changes in blood pressure over a period of 24 hours. There is an enormous variability of blood pressure in between individuals when measured for 24 hours. Ambulatory blood pressure monitoring allows the evaluation of distinct blood pressure parameters such as the 24-hour, day-time and night-time systolic and diastolic blood pressure, the nocturnal drop of blood pressure, besides identifying masked hypertension and white coat hypertesnion.[10, 12] The link between high blood pressure and obesity has long been known. The goal of this study is to determine the pattern of ambulatory blood pressure in overweight and/or obese type 2 diabetic patients using anthropometric measurements such as BMI and waist circumference (WC) and parameters derived from 24-hour ambulatory blood pressure monitoring. Non-dipping blood pressure and nocturnal hypertension are common in T2DM patients with or without a known history of hypertension and are not detected by office blood pressure measurements. Thus patients with T2DM are more likely to be benefitted by routine AMBP monitoring.[38] This variability in blood pressure is known to be influenced by genetics and, to a lesser extent, the subject's geographic location, according to which the body adjusts its circadian rhythm.[33] As a result, more research is needed into the importance of ABPM, particularly in high-risk groups like diabetic patients with normal blood pressure measured in the office. At the time of the study, no previous ABPM assessment had been reported in the current study population.

OBJECTIVE

Primary objective:

1. To study the prevalence of hypertension in normotensive type 2 diabetic patients by using a 24-hour ambulatory blood pressure machine.

Secondary objective:

1. To assess the relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients using a 24-hour ambulatory blood pressure monitoring device.

REVIEW OF LITERATURE

1. Type 2 Diabetes Mellitus

Type 2 DM is a metabolic disorder resulting in hyperglycaemia caused due to a combination of insulin resistance, inadequate insulin secretion, and/or inappropriate or excessive glucagon secretion.

1.1. Epidemiology: Diabetes Mellitus (DM) is a major public health issue that results in significant morbidity and mortality. Diabetes type 2 is the most common type of diabetes. Type 2 diabetes affects nearly 90% of people with diabetes worldwide.[39] According to the 9th edition of the IDF Diabetes Atlas, 463 million people worldwide have diabetes. This accounts for 9.3 percent of adults aged 20 to 79 years around the world. It also predicts that by 2030, 578 million adults will have diabetes, and by 2045, 700 million adults will have diabetes mellitus.[39] The global prevalence of DM is 10.8% in urban areas, while it is lower at 7.2% in rural areas. Around 11.3% of global deaths are due to diabetes, according to IDF. IDF had estimated that around 4.2 million adults will die in 2019 due to diabetes and its complications. It approximates to around one death every eight seconds.[39] The prevalence rate of Type 2 DM was estimated to be around 6,059 cases per 100,000 population by Global burden of disease and forecast trends.[40] During the last few years, India has seen the maximum increase in the prevalence of Type 2 diabetes mellitus. The prevalence in India is 2.4% in the rural population and 11.6% in the urban population.[41]

1.2. Diagnostic criteria: The diagnostic criteria given by the American Diabetes Association (ADA) are followed throughout the world.

TABLE 1: ADA criteria for the diagnosis of diabetes (2020).[42, 43]

"Fasting Plasma Glucose (FPG) ≥126 mg/dL (7.0 mmol/L)". * "Fasting is defined as no caloric intake for at least 8 h".
OR
"2-h Plasma Glucose (PG) ≥200 mg/dL (11.1 mmol/L) during Oral Glucose Tolerance Test (OGTT)". * "The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water".
OR
"HbA1C ≥ 6.5% (48 mmol/mol)". * "The test should be performed in a laboratory using a method that is NGSP certified and standardized to the Diabetes Control and Complications Trial (DCCT) assay."
OR
"In a patient with classic symptoms of hyperglycaemia or hyperglycaemic crisis, a Random Plasma Glucose (RPG) ≥ 200 mg/dL (11.1 mmol/L)".

* Diagnosis requires two abnormal test results from the same sample or in two separate test samples in the absence of unequivocal hyperglycaemia.

1.3. Etiology, Pathophysiology, and Complications: It can range from a major insulin secretory defect with relative insulin resistance to a predominantly insulin resistance defect with relative insulin deficiency.[43] This type of diabetes is likely caused by a variety of factors. Complex interactions between environmental and genetic factors appear to be involved in aetiology. Obesity, physical inactivity, excessive caloric intake, and insufficient energy expenditure, when combined with a susceptible genotype, can result in Type 2 DM. Despite the lack of specific etiologies, autoimmune destruction of -cells does not occur in type 2 diabetes. Insulin resistance causes decreased glucose transport into muscle cells, increased hepatic glucose production, and increased fat breakdown, which has been linked to elevated levels of free fatty acids and proinflammatory cytokines in plasma. Type 2 diabetes is an islet cell disorder in which the relationship between the glucagon-secreting alpha cell and the insulin-secreting beta-cell is disrupted, resulting in elevated glucagon levels and hyperglycaemia. The atrophy of the pancreas is found to be the cause of hyperglycaemia in long-term diabetics.[44] Obesity is common in people with type 2 diabetes, which contributes to insulin resistance. Some patients who do not meet the weight criteria for obesity may have abdominal obesity, in which fat is distributed primarily in the abdominal area, predisposing them to insulin resistance. Because hyperglycaemia develops gradually and does not lead to the development of classic diabetes symptoms at an early stage, it usually goes undetected for many years. However, these patients are at risk of developing diabetes-related macrovascular and microvascular complications.

1.4. Hypertension in Type 2 DM: Type 2 DM involves multiple organs and exposes patients to HTN, and it has been found that in diabetic patients, around 35% to 75% of complications are due to HTN.[32] Subjects with DM tend to have higher nocturnal Blood Pressure and higher Morning Blood Pressure Surge (MBPS).[33] Hence, even normotensive diabetic subjects are at risk of developing hypertension.

1.5. Dyslipidemia in Type 2 DM: Diabetic dyslipidaemia is characterized by elevated triglycerides levels, low HDL-cholesterol levels, elevated small dense LDL's. [45] These lipid changes predispose diabetics to be at increased risk of cardio vascular adverse events.[45] The underlying pathophysiology is only partially understood. Alterations of insulin-sensitive pathways, increased concentrations of free fatty acids, and low-grade inflammation all play a role and result in overproduction and decreased catabolism of triglyceride-rich lipoproteins of intestinal and hepatic origin.[46, 47] The observed changes in HDL and LDL are secondary to this mechanism.

Lifestyle modification and glucose control may improve the lipid profile, but statin therapy mediates the biggest benefit with respect to cardiovascular risk reduction. Therefore, most diabetic patients should receive statin therapy. The role of other lipid-lowering drugs, such as ezetimibe, fibrates, omega-3 fatty acids, niacin, and bile acid sequestrants, is less well defined as they are characterized by largely negative outcome trials.[45] Chandra KS et al.[48] (2014) gave a Consensus statement on the management of dyslipidaemia in Indian subjects. "The pattern of dyslipidaemia is different in Indians. The LDL-C levels are not very high, but there is a greater preponderance of more atherogenic small, dense LDL particles as compared to Caucasian subjects. In addition, the TG levels are usually elevated, and HDL-C levels are low. This pattern of dyslipidaemia is known as 'atherogenic dyslipidaemia'. The prevalence and the pattern of concomitant CV risk factors that modulate the impact of dyslipidaemia on CV risk (e.g., truncal obesity, metabolic syndrome and diabetes) are also different in Indians. Early age of onset of CVD in Indians renders the prediction of CV risk a challenging task. There are several cultural and socioeconomic differences that further complicate the situation. The Indian society is primarily "food-centric," with food being one of the most important elements of any celebration. Reheating of oils for deep frying foods is a common practice. This increases the levels of trans-fatty acids in the food, which have an incremental harmful effect on lipid levels. Sweets consumed in large quantities during celebrations and social gatherings are also rich in dairy fats.

2. Overweight and obesity - Epidemiology, Etiology, types, and criteria:

Overweight and obesity are characterized by abnormal/ excessive accumulation of fat in the body, posing a risk to the health of the subject. It was initially considered as a problem of high-income countries, but with urbanization, the prevalence of overweight and obesity has become high in low- and middle-income countries.

2.1. Epidemiology: As per WHO, globally, 13% of adults were suffering from obesity, and 39% of adults were overweight in 2016.[18] According to the ICMR-INDIAB study (2015), the prevalence rate of obesity was 11.8% to 31.3%.[20] The prevalence of central obesity was 16.9%–36.3%.[20]

2.2 Diagnostic **criteria:** For measuring obesity, the most accurate measures are Dual-Energy X-ray Absorptiometry (DEXA) scans, CT, MRI, underwater weighing but are practically not useful. Hence anthropometric measurements are used.

According to WHO, Overweight is defined as BMI ≥ 25 and Obesity as BMI ≥ 30.[21] WHO revised a lower cut-off for Asians because of complications in Asians occurring at lower BMI.[22] The WHO Asian modification of BMI defines obesity as BMI >25 kg/m^2 [21, 22] and overweight as BMI >23 kg/m^2. Obesity is also defined as the abnormal accumulation of ≥20% of body fat over the individual's ideal body weight. Other anthropometric measurements such as increased Waist Circumference (WC), Body Mass Index (BMI), Waist to Stature ratio (WSR), and Waist Hip Ratio (WHR) help to stratify the population at risk for adverse cardiovascular outcomes. Central Obesity is defined as Waist Circumference (WC) >40 inches (>102 cm) in males and >35 inches (>88 cm) in females.[49] Central obesity can also be defined by Waist circumference to Height ratio, also known as Waist stature ratio of more than 0.5.[50] In order to describe visceral fat stores, WC is a better predictor than BMI.[51]

Currently used anthropometric measures include:

1. BMI is calculated by dividing the body weight in kilograms (kg) by height in meters squared (m^2)
2. Waist Circumference (WC),

3. Waist-to-Hip ratio (WHR; the ratio of WC to HC),
4. Waist-to-Stature ratio (WSR; the ratio of WC to height)

BMI or WC is the most commonly used measure.[18, 52, 53]

Table 2: Criteria for obesity.[21, 22, 54]

CATEGORIES	BMI (kg/m^2)	CUT OFF FOR ASIANS
Underweight	< 18.5	< 18.5
Normal	18.5–24.9	18.5–22.9
Overweight	25.0–29.9	23–24.9
Obesity class I class II	≥30 30.0–34.9 35.0–39.9	≥25

Table 3: Anthropometric measures for obesity. [50, 55]

Anthropometric measurements	Criteria for obesity
Waist Circumference	>40 inches (>102 cm) in males and >35 inches (>88 cm) in females
Waist Hip Ratio	>1 in men and >0.85 in women – Caucasians 0.95 in men and 0.80 in women - Asians
Waist stature Ratio	> 0.5

*WC is measured at the level parallel to the floor, the midpoint between the top of the iliac crest and the lower margin of the last palpable rib in the mid-axillary line.

*Hip circumference is measured at a level parallel to the floor, at the largest circumference of the buttocks.

2.2. **Etiology, Pathophysiology, and Complications**: The fundamental etiology behind obesity and overweight is an energy imbalance created between calorie consumption and calorie expenditure. Worldwide, there has been an increased intake of energy-dense foods such as sugars and fats.[18] With modernization, there is a decrease in physical activity because of sedentary work, changing modes of transportation, and increasing urbanization. Increased BMI is a major risk factor for non-communicable diseases like Diabetes, Cardiovascular diseases, including Coronary Artery Disease, Hypertension, Stroke besides cancers such as endometrial, breast, colon cancer, and musculoskeletal disorders such as Osteoarthritis.[18]

2.4. Hypertension in obesity: Obesity increases the risk of the development of hypertension. The Renin-angiotensin system is mainly involved in the development of hypertension. Angiotensinogen production serves as a cause and effect of adipocyte hypertrophy and leads to elevation of blood pressure through the action of AngII, which induces systematic vasoconstriction, direct sodium and water retention, and increased aldosterone production.[56] High levels of plasma renin activity, plasma Angiotensin II and aldosterone values were observed in obese subjects.[57] Other mechanism includes raised Free-fatty acids, which cause dysfunction of Na^+, K^+ ATPase pump leading to increased vascular smooth muscle tone and resistance.[58]

3. Hypertension - Epidemiology, Etiology, criteria

3.1. **Epidemiology:** In 2015, globally, 1 in 4 men had hypertension while 1 in 5 women had hypertension.[23] 2015-2016 United states CDC-NCHS (Centre for disease control and prevention -National center for health statistics) data found 29% of 18 years and above to be hypertensive.[24] According to the Indian Guidelines on Hypertension IV (2019), the prevalence of hypertension in India is 33.8% in urban areas and 27.6% in rural areas. The overall prevalence is 29.8%.[59, 60]

3.2. Etiology and Association between Hypertension, Diabetes, and Obesity: Hypertension can be primary or secondary. In Primary hypertension, the etiology is usually unknown. It accounts for 90-95% of adult hypertension cases. Secondary hypertension can be due to various causes such as renal, vascular, or endocrine disorders and accounts for less than 10 % of adult hypertensive patients. The odds of Hypertension, both systolic and diastolic was higher in overweight/obese individuals than those with normal BMI. A significant positive correlation is present between them.[25] Increased body mass index (BMI), Decreased physical activity, and sedentary lifestyle are established modifiable risk factors for hypertension, are also commonly seen in Type II Diabetics.[16, 17] One of the most common co-morbidity in Diabetes Mellitus (DM) is Systemic Hypertension (HTN).[1] In subjects with DM, besides control of blood glucose, management of blood pressure (BP) is one of the cornerstones in managing micro-vascular and macro-vascular complications of diabetes.[2-5]

3.3. **Diagnostic criteria:** The two well-established guidelines for the management of Arterial hypertension are given by the American College of Cardiology (ACC)/American Heart Association (AHA) - 2017 guidelines[6] and European Society of Cardiology (ESC)/European Society of Hypertension (ESH) – 2018 guidelines.[7] In India, according to "Indian Guidelines on Hypertension IV," Hypertension is defined as Blood pressure of 140/90 and or more based on office/clinic recordings of BP.[59] According to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7), Prehypertension is defined as Systolic BP between 120-139 mm of Hg and Diastolic BP between 80-89 mm of Hg. Stage 1 Hypertension is Systolic BP between 140-159 mm of Hg and Diastolic BP between 90-99 mm Hg. Stage 2 Hypertension is Systolic BP between 160 mm of Hg or greater, Diastolic BP of 100 mm Hg or greater.[61, 62]

TABLE 4: Criteria for hypertension based on office/clinic recordings of BP

GUIDELINES	CRITERIA FOR HYPERTENSION
Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (**JNC 7).**[61, 62]	SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg
Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (**JNC 8).**[63]	**Age more than 60 years** To start pharmacological treatment if SBP ≥ 150 mm Hg and/or DBP ≥ 90 mm Hg **Age less than 60 years** To start pharmacological treatment if SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg
2017 American College of Cardiology **(ACC)** / American Heart Association **(AHA)** guidelines.[6]	SBP ≥ 130 mm Hg and/or DBP ≥ 80 mm Hg
European Society of Cardiology **(ESC)** / European Society of Hypertension **(ESH)** – 2018 guidelines.[7]	SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg
Indian Guidelines on Hypertension IV (IGH – IV, 2019).[59]	SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg

4. Ambulatory Blood Pressure Monitoring (ABPM):

ABPM is the measurement of blood pressure for a period of 24 hours by attaching a small blood pressure digital monitor to the cuff around the upper arm. It is attached in such a way so that the normal day-to-day activities of a person are not affected. ABPM has the ability to detect masked Hypertension, White coat hypertension besides giving information about 24-hour blood pressure rhythm and nocturnal blood pressure.[10-14] For clinical purposes, the most commonly used measurements with the help of ABPM are 24-hour (All Day) average BP, nocturnal dipping patterns, daytime BP and night-time BP. Multiple readings are averaged over the 24-hour time period. Changes in BP, heart rate, the distribution pattern of BP is calculated. The device is usually attached to a belt or strap in the body.

Table 5: Criteria for hypertension based on ABPM (systolic and/or diastolic BP).

GUIDELINES	CRITERIA FOR HYPERTENSION
2017 American College of Cardiology **(ACC) /** American Heart Association **(AHA)** guidelines.[6]	24-hour average ABP (Ambulatory BP) ≥125/75 mm of Hg Average daytime BP ≥ 130/80 Average night time BP ≥ 110/65
European Society of Cardiology **(ESC)** / European Society of Hypertension **(ESH)** – 2018 guidelines.[7]	24-hour average ABP ≥ 130/80 mm of Hg Average daytime BP ≥ 135/85 mm Hg Average night time BP ≥ 120/70 mm of Hg
Indian Guidelines on Hypertension IV (IGH – IV, 2019)[59]	24-hour average ABP ≥ 130/80 mm of Hg Average daytime BP ≥ 135/85 mm of Hg Average night time BP ≥ 120/70 mm of Hg
2020 International Society of Hypertension Global Hypertension Practice Guidelines[64]	24 hr average BP - ≥ 130/80 mm of Hg Average daytime (or awake) ≥ 135/85 mm of Hg Average night time (or asleep) ≥ 120/70 mm of Hg

Because of the pitfalls associated with office blood pressure monitoring, it has been recommended that ambulatory blood pressure monitoring (ABPM) should be used for the assessment of Hypertension.[8-10] According to the 2017 ACC/AHA guidelines, Hypertension was diagnosed as a 24 hour mean ABP (Ambulatory BP) of

≥125/75 mm of Hg.[6] According to the 2018 ESC/ESH guidelines, Hypertension was diagnosed as a 24 hour mean ABP (Ambulatory BP) of ≥130/80 mm of Hg.[7, 15]

1. The term white coat HTN refers to "Elevated BP in subjects who are not receiving anti-hypertension treatment and have elevated office BP but normal 24-h ABPM".[65]
2. Masked HTN is said to be present "when office BP levels are normal in an untreated subject, and ABPM levels are elevated." It is more common in diabetic patients. It is said to be present in 10 to 20% of subjects when measured on office basis.[66]
3. When the fall in BP is less than 10% during night-time, it is defined as non-dipping.[67] Physiologically, during sleep, BP falls by >10% during night time. Nocturnal non-dipping is linked to a higher risk of cardiovascular events, including death and end-organ damage. Non-dipping is common in diabetic patients and is present in approximately 30% of diabetic subjects.[8]

In clinical practice, a satisfactory ABPM recording should have ≥70% of expected measurements. This is influenced by various factors such as the duration set for daytime (awake) or night-time (asleep) periods and by the number of measurements selected for each period (usually at 30-minute intervals when awake and 60 min intervals when asleep). The ESH Guidelines recommended 14 measurements during the day and 7 measurements at night using a fixed time method for defining day- and night-time periods.[9]

Figure 1: Real-life ABPM report of BP Trend vs. Time from the present study.

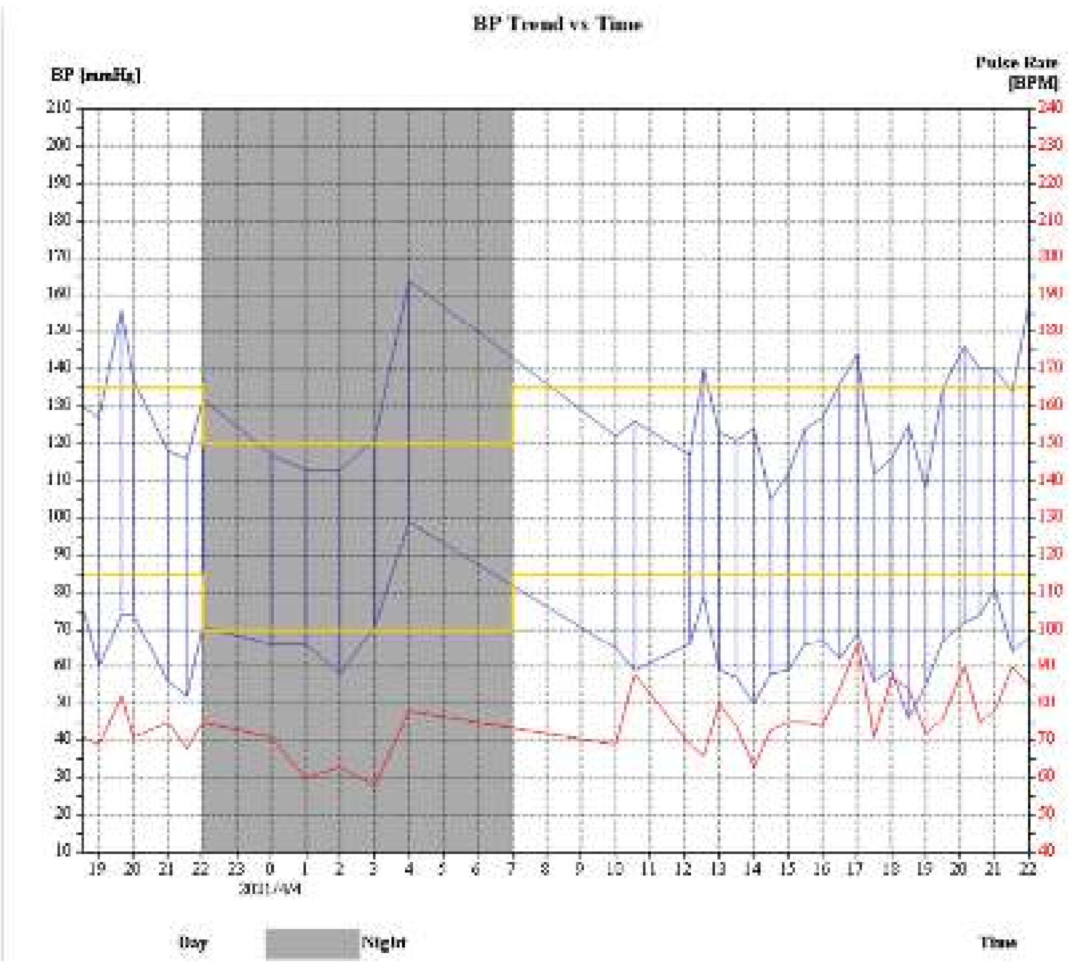


Figure 2: Real-life Pie chart report from the present ABPM study.

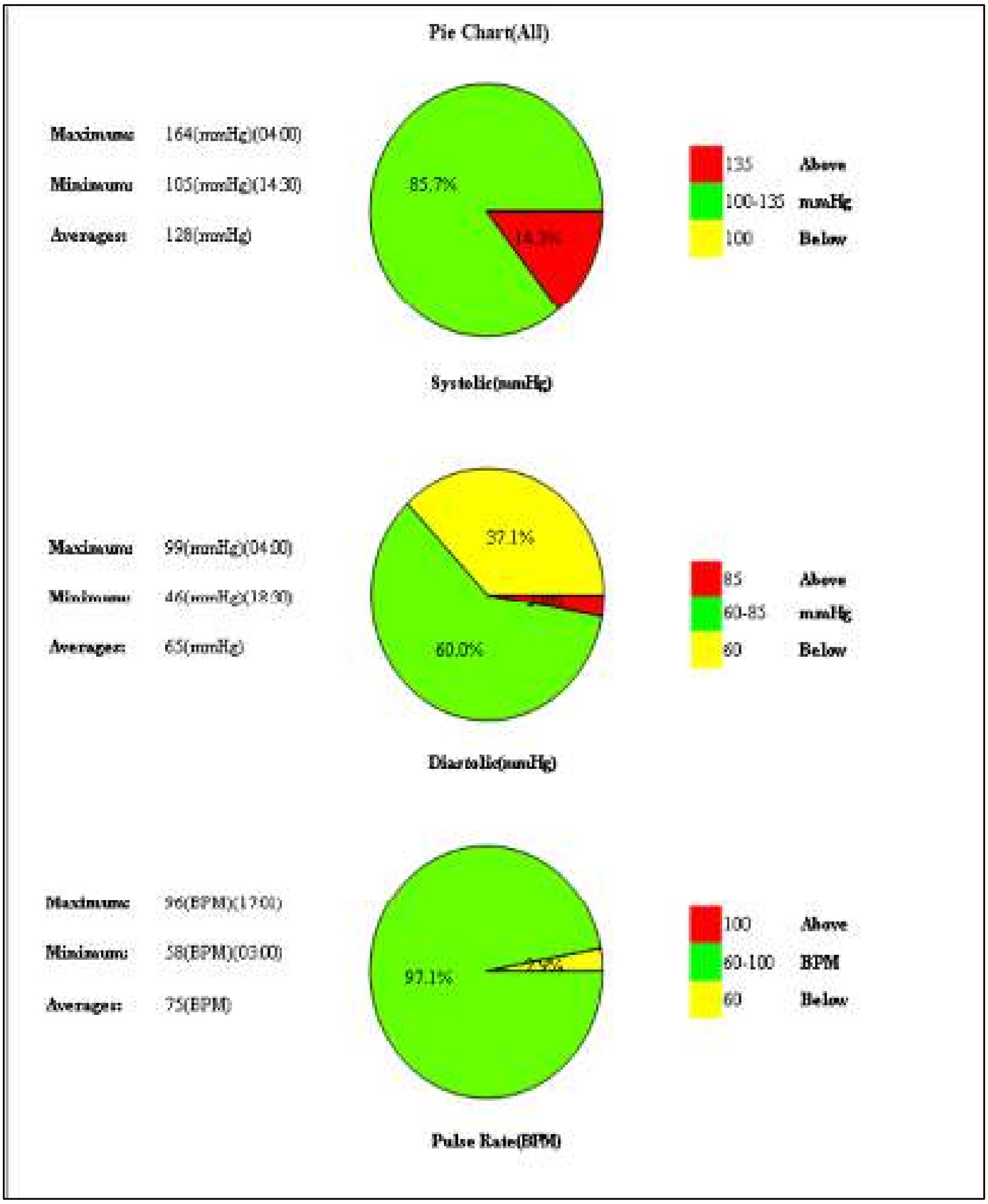

Pie Chart(All)
Maximum: 164(mmHg)(04:00)
Minimum: 105(mmHg)(14:30)
Averages: 128(mmHg)
85.7%
14.3%
135 Above
100-135 mmHg
100 Below
Systolic(mmHg)
Maximum: 99(mmHg)(04:00)
Minimum: 46(mmHg)(18:30)
Averages: 65(mmHg)
37.1%
60.0%
85 Above
60-85 mmHg
60 Below
Diastolic(mmHg)
Maximum: 96(BPM)(17:01)
Minimum: 58(BPM)(03:00)
Averages: 75(BPM)
97.1%
100 Above
60-100 BPM
60 Below
Pulse Rate(BPM)

Figure 3: Real-life Results from the present ABPM study.

Examine Result

All BP Averages:	128/65mmHg	BP threshold:	130/40mmHg
Day BP Averages:	128/64mmHg	BP threshold:	135/85mmHg
Night BP Averages:	127/72mmHg	BP threshold:	120/70mmHg

Day BP Load Value:Nomal<40%	Night BP Load Value:Nomal<50%
SYS(>135mmHg) 31.0%	SYS(>120mmHg) 50.0%
DIA(>85mmHg) 0.0%	DIA(>70mmHg) 50.0%

Maximum SYS	164mmHg	Time	2021/4/4 04:00	Minimum SYS	105mmHg	Time	2021/4/4 14:30
Maximum DIA	99mmHg	Time	2021/4/4 04:00	Minimum DIA	46mmHg	Time	2021/4/4 18:30

Circadian rhythm of BP:SYS Night Dec. 1.2% DIA Night Dec. -12.6% Normal:10%-20%

BP CV:	All:SYS	11.0%	DIA	15.3%
	Day:SYS	10.3%	DIA	13.5%
	Night:SYS	14.1%	DIA	18.0%

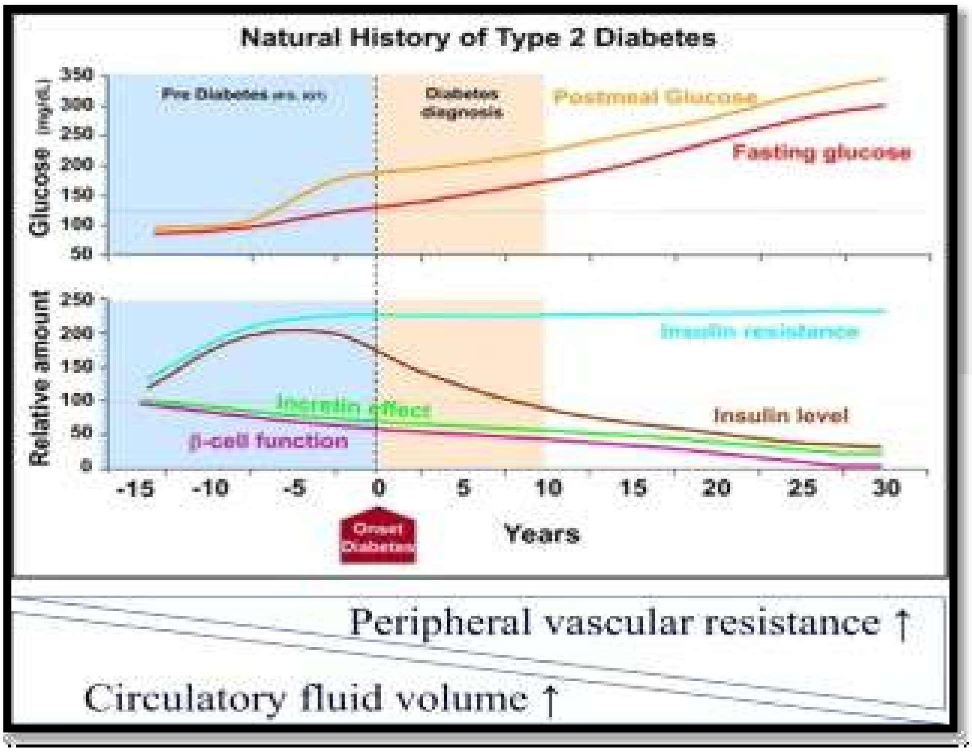
5. Prevalence of hypertension in normotensive type 2 diabetic patients by using 24-hour ambulatory blood pressure machine:

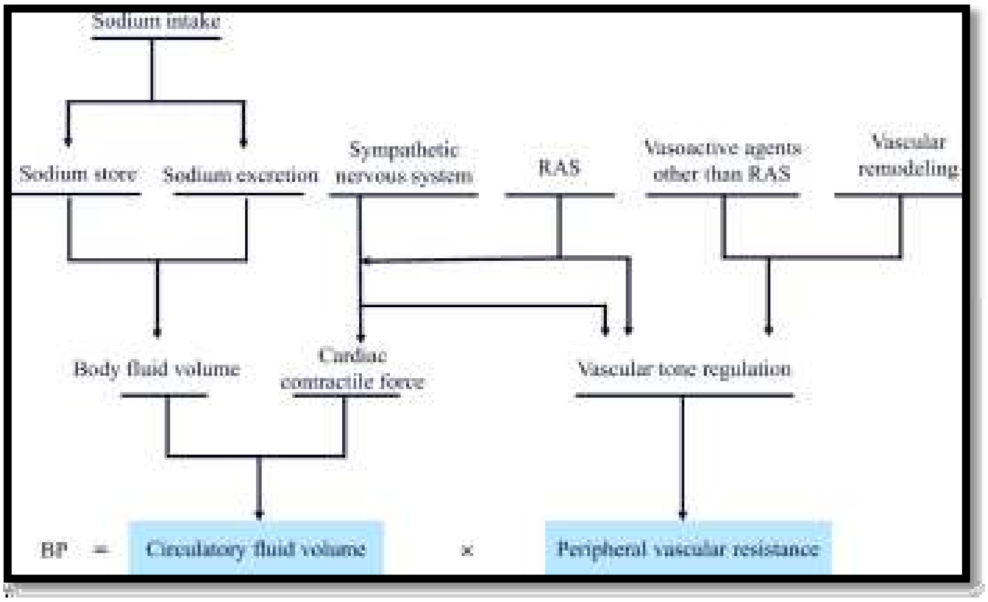
In subjects with DM, around 35% to 75% of complications are due to HTN.[32] 73.6% of individuals aged 18 years or more with diabetes, have hypertension according to the Centres for Disease Control and Prevention (CDC) and National Health and Nutritional Examination Survey (NHANES) database.[68] Increased intravascular volume, premature vascular aging, Autonomic nervous system dysregulation, and the RAAS play an important role in the pathophysiology of the development of Hypertension in Type 2 DM.[69]

On the other hand, elevated BP and its circadian variations in itself serve as a risk factor for type 2 diabetes. Elevated blood pressures in hypertensive patients are closely associated with fasting plasma insulin secretion.[70]

Figure 4: Pathophysiology of hypertension in diabetes mellitus

(from Ohishi M et al. [71])





Subjects with DM tend to have higher nocturnal Blood Pressure and higher Morning Blood Pressure Surge (MBPS).[33] Control of blood pressure 24 hours throughout the day does not stop with control of average daily BP. It also includes the control of diurnal and nocturnal variability in Blood Pressure.[34] Only Clinic based BP measurements are used to manage blood pressure in the majority of the hypertensive subjects but, it has been proven that estimation of 24-hour BP using ABPM is a better method.[35] The sensitivity of Clinic/ Office monitoring of BP to predict hypertension-associated organ damage is less.[36, 37] Hence, diabetic patients, even though normotensive on office readings of BP, are indicated for ABPM.

Over the past decade, noninvasive ABPM has been developed that can reliably record changes in blood pressure over 24 hours. There is an enormous intra individual variability of blood pressure of 24 hours. Ambulatory blood pressure monitoring allows the evaluation of distinct blood pressure parameters like "24-hour, day-time and night-time systolic and diastolic blood pressure, the nocturnal drop of blood pressure, morning blood pressure surge as well as the identification of white-coat and masked hypertension".[10, 12] Non-dipping, reverse dipping, nocturnal SHT, morning BP surge, and masked phenomenon are highly prevalent in patients with T2DM with or without a known history of hypertension.

Circadian BP patterns previously were divided into dipper (10% to 20%), extreme dipper (>20%), and non-dipper (<10%) based on the nocturnal fall of BP.[72] Non-dipper pattern of circadian BP is commonly present in patients with type 2 diabetes and is associated with a higher risk of adverse cardiovascular events.[73] Reverse dipper BP pattern defined by higher average night time BP than daytime BP has been associated with adverse cerebral-cardio-renal outcomes, which includes stroke and renal damage in hypertensive patients. In addition, fasting glucose has a negative correlation with the decline rate of nocturnal SBP ($r = -0.095$, $P = 0.029$). The reverse-dipper pattern of BP in ABPM may be independently associated with type 2 diabetes in patients with hypertension.[70] In subjects who are healthy, night BP that is during sleep is ten to twenty percentage lower on comparison with awake or waking BP.[74] Abnormal BP dipping patterns, like reduced nocturnal dipping (decrease in BP ranging from only 0%–10%) or exaggerated dipping (decrease in BP more than 20%) or increase in BP during sleep have been related with increased cardiovascular mortality and morbidity.[75]

6. Relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients using 24-hour ambulatory blood pressure monitoring device.

Obesity increases the risk of the development of hypertension. High body mass index (BMI), low physical activity, and low physical fitness are established modifiable risk factors for hypertension. Singh S et al.[76] observed that obesity even in non-hypertensive subjects resulted in the elevation of blood pressure. It has been found that systolic blood pressure measured by ambulatory BP monitoring is more closely related to adverse cardiovascular outcomes in overweight and obese individuals. Pre-hypertension, Stage I, and Stage II hypertension was more prevalent in overweight/obese individuals compared to normal subjects.[25] Mesquita P et al. [77], in their study, observed that mean BMI was higher in hypertensive patients compared to those without it. The odds of Hypertension were higher in overweight/obese individual than those with normal BMI. A significant positive correlation has been observed between BMI and Blood Pressure, both Systolic and Diastolic BP.[25] But Cassani RS et al.[78] observed that Waist circumference (WC) was the only independent anthropometric measurement related to hypertension. Hypertensive patients had higher anthropometric measurements than normotensives. Many Pathophysiological mechanisms exist for explaining the association between obesity and hypertension (detected by 24 ambulatory BP) in normotensive diabetic subjects (by office readings), such as activation of Renin-angiotensin system[57], leading to vasoconstriction, sodium and water retention, inhibition of Na K ATPase pump by free fatty acids which alter the vascular tone and increase resistance.[59] In the present study, the prevalence of hypertension detected by 24hr ambulatory blood pressure monitoring device and its relationship with anthropometric measurements are going to be explored in diabetic patients.

Most Relevant studies:

1. Prevalence of hypertension in T2DM (Normotensive) using 24-hour ambulatory blood pressure monitoring device:

Uma NM et al.[79] (2019) conducted a study on the prevalence of hypertension and its various risk factor in type 2 diabetes mellitus patients. They concluded that hypertension and its associated risk factor like obesity, dyslipidemia are important risk factors for the development of complications in diabetes patients.

Mesquita P et al[77] (2015) in their study of 97 patients, determined the prevalence of orthostatic hypertension (OHT) in elderly patients with type 2 diabetes and its relation to metabolic and echocardiographic parameters. "The prevalence of OHT was 20.6%. The mean body mass index was significantly higher in patients with OHT than in those without it (29.80 ± 4.10 versus 27.51 ± 3.98 kg/m (2); P = 0.026). There were no statistically significant differences between the two groups for other metabolic parameters."

Venugopal K et al.[80] (2014) studied the prevalence of hypertension in Type-2 diabetic patients and the association between hypertension and diabetic complications. A cross-sectional study of 250 diabetic patients was done in Vijayanagara Institute of Medical Sciences Hospital and College, Bellary was studied and evaluated for blood pressure (BP) and macrovascular and microvascular complication. Prevalence of hypertension was 64 (25.6%) patients. BP was normal in 55 (22%), 131 (52.4%) patients were prehypertensive, 45 (18%) patients were in stage-1 hypertension, and 19 (7.6%) had stage-2 hypertension. Macrovascular complications noted in 120 (48%) and microvascular complications noted in 60 (24%) patients.

Grossman E er al.[8] (2013) in a review article on diabetic patients, observed that "elevated ambulatory systolic BP" while awake and asleep predicts increased risk of cardiovascular disease more accurately than clinic BP. ABPM may help to diagnose white coat hypertension, masked HTN, and nocturnal HTN. The most recent recommendations from the National Institute for Health and Clinical Excellence on the management of HTN suggest using ABPM to confirm the diagnosis of HTN when clinic BP is ≥140/90 mmHg. This strategy is cost-effective.

Gorostidi M et al.[81] (2011) assessed ABPM patterns in patients having both hypertension and diabetes compared with non-diabetic having HTN. "They performed a cross-sectional analysis of a 68 045-patient database from the Spanish Society of Hypertension ABPM Registry. When compared with patients without diabetes, diabetic hypertensives exhibited elevated systolic SBP levels in every ABPM period (daytime 135.4 *vs*. 131.8, and night time 126.0 *vs*. 121.0 mm Hg, $P<0.001$ for both) despite they were receiving more antihypertensive drugs (mean number 1.71 *vs*. 1.23, $P<0.001$)." They concluded that ABPM should be considered widely in diabetic patients.

Parati G and Bilo G et al.[66] (2009) in their review article, observed that 24 hr ABPM is highly useful in the diagnosis and management of hypertension, but because of its limited availability in day-to-day clinical practice, application of ABPM to every diabetic patient may not be possible. Hence its use should be prioritized in subjects who may derive the most evident benefits.

Leitão CB et al.[82] **(2007)** in their review article, observed that ABPM has a better correlation with lesions of the target organs than the office BP measurements. The patients at risk of chronic complications of DM can be better stratified with ABPM.

2. **Diabetic Dyslipidemia:**

Stemmer K et al.[83] **(2020),** in their review article, observed that "Derangements in triglyceride and cholesterol metabolism (dyslipidaemia) are major risk factors for the development of cardiovascular diseases in obese and type-2 diabetic patients. Glucagon-like peptide-1(GLP-1) analogs and next-generation peptide dual-agonists such as GLP-1/glucagon or GLP-1/GIP could provide effective therapeutic options for treatment of dyslipidaemia in diabetic patients."

Hirano T et al.[47] **(2018)** in a review article on Pathophysiology of Diabetic Dyslipidaemia observed that "there is an accumulating clinical evidence that serum triglyceride (TG) is a leading predictor of atherosclerotic cardiovascular disease, comparable to low-density lipoprotein (LDL)-cholesterol (C) in populations with type 2 diabetes, which exceeds the predictive power of hemoglobinA1c."

Mithal A et al.[84] **(2014)** in their study, assessed dyslipidaemia control in the Indian diabetic population using lipid-lowering drugs. This observational study was done on 5400 adult T2DM subjects with dyslipidaemia and concluded that there was poor control of dyslipidaemia in Indian diabetics.

Mukhopadhyay J et al.[85] **(2010)** in their review article, observed that Diabetic Dyslipidemia in India is one of the main culprits for CAD in Diabetics.

Chahil TJ et al.[85] (2006) in their review article, observed that Type 2 diabetes mellitus is associated with a markedly increased risk of cardiovascular disease. Complex dyslipidaemia, which is an integral part of the underlying insulin resistance in this group, is a key to this increased risk. Increased secretion of VLDL from the liver is a central feature of dyslipidaemia and is linked significantly to the low HDL levels and abnormal LDL levels that are also present. A number of physiologic and pharmacologic approaches are available and should be used aggressively to treat diabetic dyslipidaemia.

Goldberg IJ et al.[46] (2001), in a review article, observed that there was an increased occurrence of cardiovascular disease in diabetes. "A characteristic pattern termed diabetic dyslipidemia consists of low high-density lipoprotein (HDL), increased triglycerides, and postprandial lipemia" commonly seen in type 2 DM and can be a target for management of cardiovascular disease occurring in future.

3. Relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients using 24-hour ambulatory blood pressure monitoring device:

Singh S et al.[96] (2019) conducted a study to evaluate 24 hour ABPM in 95 subjects in a tertiary care center. "They compared it between 50 overweight, 20 normal and 25 obese subjects. Based on both BMI and WC, significant proportion of overweight and obese subjects had higher 24-hr SBP (p-value <0.001) and 24-hr DBP (p-value = 0.001); higher day-time SBP (p-value <0.001); higher night-time SBP (p-value <0.001); and widening of 24-hr pulse pressure (> 50 mmHg) (p-value <0.001) as compared to normal subjects. BMI appeared to be a better anthropometric parameter than WC". They concluded that obesity in apparently non-hypertensive subjects leads to a rise in blood pressure and found the systolic component of blood pressure to be a better predictor of cardiovascular morbidity in overweight and obese subjects.

Wang S et al.[86] (2016) investigated the prevalence of type 2 diabetes mellitus and the proportion of subjects with undiagnosed type 2 diabetes mellitus. In addition, they compared the associations between different obesity indices and type 2 diabetes mellitus for middle-aged and elderly people from six communities in Jinan, China. They concluded that among adults aged ≥50 years in Jinan, China, the best indicator of the relationship between obesity and type 2 diabetes mellitus is WSR for men and body mass index for women, respectively.

Shikha D et al.[87] (2015) did their study on 100 African-Caribbean subjects (45 males/55 females) with mean ages 14.4-15.2 years (range 11.8-18.5 years) and Tanner stage 4.2-4.8 with obesity (Ob) or type 2 diabetes (T2DM) of relatively short duration. They used 24-hour ambulatory blood pressure as a surrogate measure of cardiovascular function evaluation. “Mean 24-hour, daytime and night time systolic blood pressure was significantly higher in Obese and T2DM compared with lean subjects (mean 24-hour 117 and 120 vs. 109 mm Hg; daytime 121 and 123 vs. 113 mm Hg; and night time 109 and 115 vs. 101 mm Hg; $p < 0.01$ for all time periods)”. They concluded that Adolescent Obese and T2DM groups share adverse risk factors, which may be harbingers of adult cardiovascular events.

Brar SK and Badaruddoza et al.[88] (2013) conducted a study to determine the anthropometric indicators to predict elevated blood pressure in north Indian Punjabi adolescents. The study considered anthropometric indicators such as body mass index, waist circumference, and waist to height ratio. The study suggested that waist circumference is the better predictor of cardiovascular risk factors in adolescent boys as compared to girls.

Gupta S and Kapoor S et al.[89] (2012) conducted a study to determine the cutoffs of anthropometric markers for detecting hypertension in an endogamous North Indian population. Individual body weight, height, waist circumference (WC), hip circumference, blood pressure was assessed. The risk of having hypertension was highest with respect to increased body mass index, and they concluded that body mass index was the best predictor of having hypertension.

Badaruddoza et al.[90] (2011) conducted a study to estimate the prevalence and association of cardiovascular diseases with respect to obesity and metabolic risk factors clustering among urban and rural Punjabi males aged 20-55 years. It was observed that males of the rural population were at a higher risk to develop cardiovascular diseases compared to their urban counterparts. SBP and DBP had a positive association with waist-to-hip ratio, body mass index, waist circumference, skinfolds, pulse pressure, alcohol consumptions, food habit, HDL, and triglyceride.

De Pergola G et al.[91] (2011) in their study, addressed to identify parameters predictive of 24-h mean systolic and/or diastolic blood pressure levels in obesity on 180 euthyroid overweight and obese patients. They observed that Diastolic BP has a negative and independent association with BMI in normotensive subjects or in obese and overweight subjects with recently detected HTN.

Cassani RS et al.[78] (2009) conducted a cross-sectional study to evaluate the relationship between anthropometry and HTN in Brazilian men. Obesity was identified in participants, out of which 11.1% were smokers, and hypertension was detected in 29.2% of the participants. Waist circumference (WC) was the only independent anthropometric measurement related to hypertension. Hypertensive patients had higher anthropometric measurements than normotensives.

Stabouli S et al.[92] (2007) in their review article, observed that the prevalence of hypertension in children and adolescents is rising in association with the increasing rate of childhood obesity, and it is associated with early target organ damage. Accumulating evidence suggests that ambulatory blood pressure monitoring is a more accurate method for diagnosis, and it is more closely associated with target organ damage.

4. Relationship Dyslipidemia and anthropometric measurements in overweight and obese type 2 diabetic patients:

Zaid M et al.[93] (2017) in their study, assessed the significance of various anthropometric factors in the clinical assessment of dyslipidaemia. "Recently described body indices, A body shape index (ABSI) and body roundness index (BRI) were assessed. Analysis revealed that all the tested variables gave the highest area under the curve (AUC) values for predicting hypertriglyceridemia in comparison to other plasma lipid abnormalities". They concluded that BRI has the capacity to predict dyslipidaemia similar to classical obesity indicators but is not superior to them. ABSI failed to detect dyslipidaemia.

Choi S et al.[94] (2011) did their study on Anthropometric measures and lipid coronary heart disease risk factors in 143 Korean immigrants with type 2 diabetes. They concluded that WC and WHR are better indicators than BMI for the assessment of lipid-related CHD risk factors in T2DM.

LACUNAE OF LITERATURE:

When blood pressure is measured over a 24-hour period, there is a lot of variation. Parameters such as 24-hour, day-time, and night-time systolic and diastolic blood pressures, as well as the nocturnal drop in blood pressure and the identification of white-coat and masked hypertension, can all be evaluated using ABPM. Non-dipping, reverse dipping, nocturnal SHT, and masked phenomenon are common in patients with T2DM, irrespective of their hypertensive status, which cannot be detected by routine office BP measurements. Therefore, patients with T2DM are likely to benefit from ABPM testing on a regular basis. There had been no previous report of ABPM assessment in the current population at the time of this study. Although there is a link between obesity and hypertension that can be detected by office BP measurements, there is a paucity of research on the prevalence of hypertension in normotensive diabetics using 24-hour ABPM and its correlation with anthropometric measurements.

MATERIALS AND METHODS

Study site: The present study was done in the Department of General Medicine at Jawaharlal Nehru Medical College K.L.E. University, Belgaum

Study population: All the eligible Patients admitted in the wards in the Department of General Medicine at KLES Dr. Prabhakar Kore Hospital were considered as the study population.

Study design: The current study was a hospital-based cross-sectional study

Sample size: 162

As this is a cross-sectional study, Sample size formula Sample size was calculated assuming the proportion of Hypertension in Type II diabetes mellitus subjects as 12.5% as per the study by Venugopal et al.[80] The other parameters considered for sample size calculation were 5% absolute precision and 95% confidence level. The following formula was used for sample size as per the study by Daniel WW et al.[95]

$$N = \frac{Z^2 P(1 - P)}{d^2}$$

Where *n* = Sample size

Z= Z statistic for a level of confidence level= 1.960

P = Expected prevalence/proportion of outcome= 0.125

d = Precision= 0.05

The required minimum sample size as per the above-mentioned calculation was 162.

Sampling method: All the eligible subjects were recruited consecutively using convenient sampling till the achievement of sample size.

Study duration: The collection of data was done for a period of one year, between January 2020 to December 2020.

Inclusion Criteria:

- Patients of age > 18 years with type 2 diabetes mellitus having BMI of >25(Asian criteria >23) to <40 Kg/m2. (WHO 2018).

Exclusion criteria:

- Patients with established hypertension
- Pregnant and lactating mothers
- Medications which cause elevation of blood pressure such as amphetamines, cocaine, corticosteroids, erythropoietin, tricyclic antidepressants, antimigraine medication like sumatriptan, estrogens (including Birth control pills), long term intake of cough/cold medication like ephedrine and pseudoephedrine, tranylcypromine.
- Patients with a history of endocrine disorders such as acromegaly, Cushing's syndrome, thyroid disorders.
- Excessive snoring, excessive daytime sleep, and fatigue with a significant level of night sleep disturbance, headache, nocturia, frequent heart burn, and morbid obesity (BMI >40 Kg/m2).

Ethical considerations: The institutional human ethics committee approved the study. The participants were included in the study only after getting informed written consent. All the risks involved and the benefits of the study were explained in detail to all the study participants. It was also made clear that their participation was voluntary, and they had the right to withdraw at any time during the study. Their confidentiality was maintained throughout the study.

Data collection tools: A structured study proforma was used to document all the study parameters.

Methodology:

Patients were given a detailed explanation of the study, and written informed consent was obtained. Patients were enrolled as per inclusion/exclusion criteria.

After an overnight fast of at least 12 hours, all subjects were undergone a standardized medical examination that included anthropometric measurements, clinical laboratory tests, and 24 hours ambulatory BP monitoring.

History of the patient, including their diabetic history, which includes their current list of medications, habits, and relevant family history, was taken.

History of other co- morbidities such as cardiac illness, liver disorders, and renal disorders was also taken.

Anthropometric measurements:

Anthropometric tools included a "mechanical weighing machine, stretch-resistant measuring tape, and stadiometer which were calibrated." Weight was measured with subjects lightly clothed and without footwear. Height was measured with subjects standing still without shoes.

1. Body mass index (Kg/m2) was estimated by dividing the weight measured in kg and height measured in m^2.

Based on Body mass index, patients were divided into

- Normal (18.5-24.9 Kg/m2),
- Overweight (25-29.9 Kg/m2), and
- Obese class (BMI ≥30 Kg/m2) according to W.H.O. 2018 guidelines

Asian criteria as per WHO 2018

- Normal (18.5 – 22.9 Kg/m2)
- Overweight (23-24.9 Kg/m2)
- Obese (> 25 Kg/m2)

2. Waist circumference (WC) in cm was measured in between the lower margin of the last palpable rib and top of the iliac crest in the mid-axillary line, with subjects standing and measuring tape kept at a level parallel to the floor. Based on Waist Circumference, subjects were considered at risk for adverse cardiovascular outcomes, if WC was >94 cm (men) and >80 cm (women) according to W.H.O 2008 guidelines
3. The hip circumference measurement was taken at the maximal gluteal protrusion and was calculated in cm.
4. Waist to hip ratio (WHR) was calculated as Waist circumference (WC) divided by hip circumference.

   Subjects were considered at risk for adverse cardiovascular outcomes if the ratio was >0.95 in men and >0.85 in women as per WHO.
5. The waist to height/stature ratio (WSR) was calculated by dividing waist circumference by height (both in m).

   Subjects were considered at risk for adverse cardiovascular outcomes if the ratio was >0.5 as per WHO.

Ambulatory Blood pressure monitoring:

Non-invasive 24-h ambulatory Blood pressure monitoring was performed using an oscillometric recorder satisfying the validation requirements. Patients already hospitalized were chosen for the study. This allowed a better standardization of recording conditions in particular with regard to physical activity.

Patients were explained regarding automatic and periodical inflation and deflation of cuff over a period of 24 hours. They were told to wear loose garments that can best accommodate the cuff and strap which was used to support the monitor. They were told not wet the device and were advised to continue with their normal daily activities.

The parameters measured include All day SBP/DBP (24 hrs), Day SBP and DBP (Blood pressure measured from 11 pm to 7 am), Night SBP and DBP (Blood pressure measured from 7 am to 11 pm), and finally, night-time dipping (ND). On the basis of Night Dipping, three blood pressure patterns were studied: dipper (a positive day-night ratio 10% to 20%), non-dipper (< 10% ratio), and inverse dipper (a negative ratio).

Blood pressure categories were defined based on 2017 American Heart Association guidelines.

Twenty-four-hour Ambulatory blood pressure monitoring hypertension was defined as “All day SBP ≥125 mm Hg or All day DBP ≥75 mm Hg”. Daytime and night-time hypertension was defined as “daytime SBP ≥130 mm Hg or DBP ≥80 mm Hg and night-time SBP ≥110 mm Hg or DBP ≥65 mm Hg”.

Blood investigations:

The following blood investigations were done after an overnight 8 hours fast;

Fasting blood sugar, Post Prandial blood sugar, Fasting lipid profile-Total cholesterol; Triglycerides; High-density lipoprotein levels and -Low-density lipoprotein levels and HbA1C.

STATISTICAL METHODS:

Lipid profile and Hypertension were considered as primary outcome variables. BMI (Overweight v/s Obese) was considered as an explanatory variable. Descriptive analysis was carried out by frequency and proportion for categorical variables. Categorical outcomes were compared between study groups using the Chi-square test /Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used. Data was also represented using pie charts, bar charts, and clustered bar charts. P-value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

RESULTS

A total of 162 participants were included in the final analysis.

Table 6: Descriptive analysis of baseline parameters in the study population (N=162)

Parameter	Mean ± SD	Median	Minimum	Maximum
Age (in years)	60.65 ± 11.46	61.0	29.0	85.0
Height (in cm)	166.6 ± 11.67	170.0	140.0	178.0
Weight (in kg)	78.40 ± 13.32	81.0	50.0	94.0
BMI (kg/m^2)	28.31 ± 2.15	28.80	25	32.0
Waist Circumference (in cm)	89.92 ± 5.88	89.0	77.0	105.0
Hip circumference (in cm)	90.04 ± 5.56	89.5	77.0	105.0
Waist to Hip Ratio	1 ± 0.07	1.0	0.8	1.2
Waist to height Ratio	0.54 ± 0.05	0.5	0.5	0.7

The mean age in the study population was 60.65 ± 11.46 years, ranged from 29 years to 85 years. The mean height in the study population was 166.6 ± 11.67 cm, mean weight was 78.40 ± 13.32 kg, and mean BMI was 28.31 ± 2.15 kg/m$^{2.}$ The mean height waist circumference was 89.92 ± 5.88 cm, and the mean hip circumference was 90.04 ± 5.56 cm. The mean waist to hip ratio was 1 ± 0.07, ranged from 0.8 to 1.2. The mean waist-to-height ratio was 0.54 ± 0.05, ranged from 0.5 to 0.7. (Table 6)

Table 7: Descriptive analysis of gender in the study population (N=162)

Gender	Number of subjects	Percentages
Female	61	37.65%
Male	101	62.35%

There were 61 (37.65%) females and 101 (62.35%) males in the study population. (Table 7 & Figure 5)

Figure 5: Pie chart for gender (N=162)

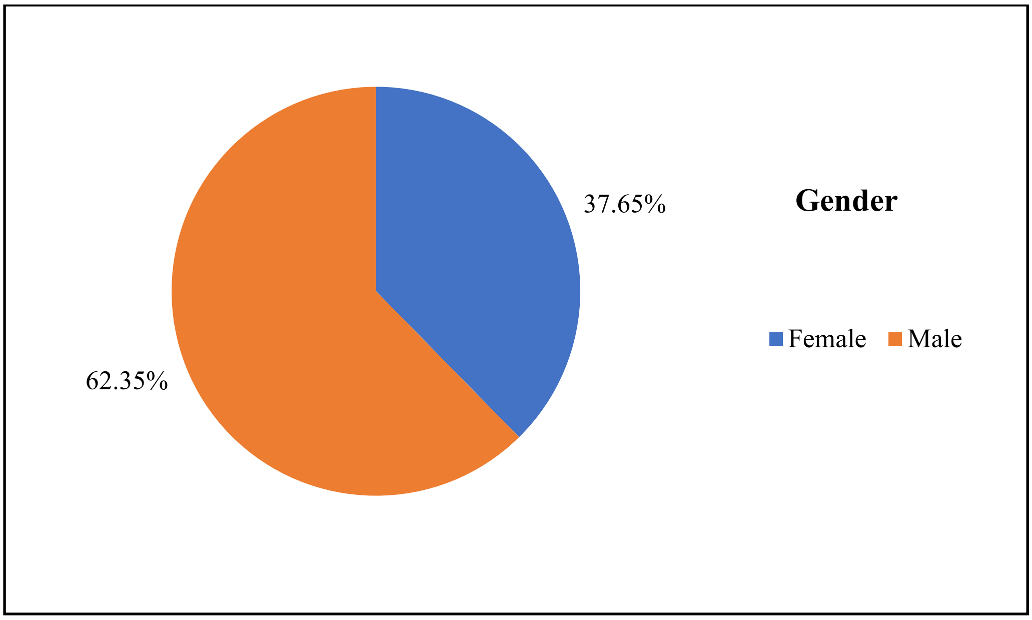


Table 8: Descriptive analysis of Hba1c levels in the study population (N=162)

Parameter	Mean ± SD	Median	Minimum	Maximum
Hba1c levels	9.69 ± 2.81	8.9	5.1	18.0

The mean Hba1c level in the study population was 9.69 ± 2.81, ranged from 5.1 to 18. (Table 8)

Table 9: Descriptive analysis of mean Lipid profile in the study population (N=162)

Lipid Profile	Mean ± SD	Median	Minimum	Maximum
Cholesterol (mg/dl)	127.74 ± 47.44	124.5	19.0	256.0
LDL (mg/dl)	66.43 ± 42.95	62.5	1.0	338.0
HDL (mg/dl)	35.34 ± 42.25	31.0	5.0	538.0
TG (mg/dl)	166.52 ± 131.3	134.0	35.0	1053.0

The mean Cholesterol in the study population was 127.74 ± 47.44 mg/dl, ranged from 19 mg/dl to 256 mg/dl. The mean LDL in the study population was 66.43 ± 42.95 mg/dl, ranged from 1 mg/dl to 338 mg/dl· The mean HDL in the study population was 35.34 ± 42.25 mg/dl, ranged from 5 mg/dl to 538 mg/dl· The mean TG was 166.52 ± 131.3 mg/dl, ranged from 35 mg/dl to 1053 mg/dl. (Table 9 & Figure 6)

Figure 6: Bar chart for mean lipid profile (N=162)

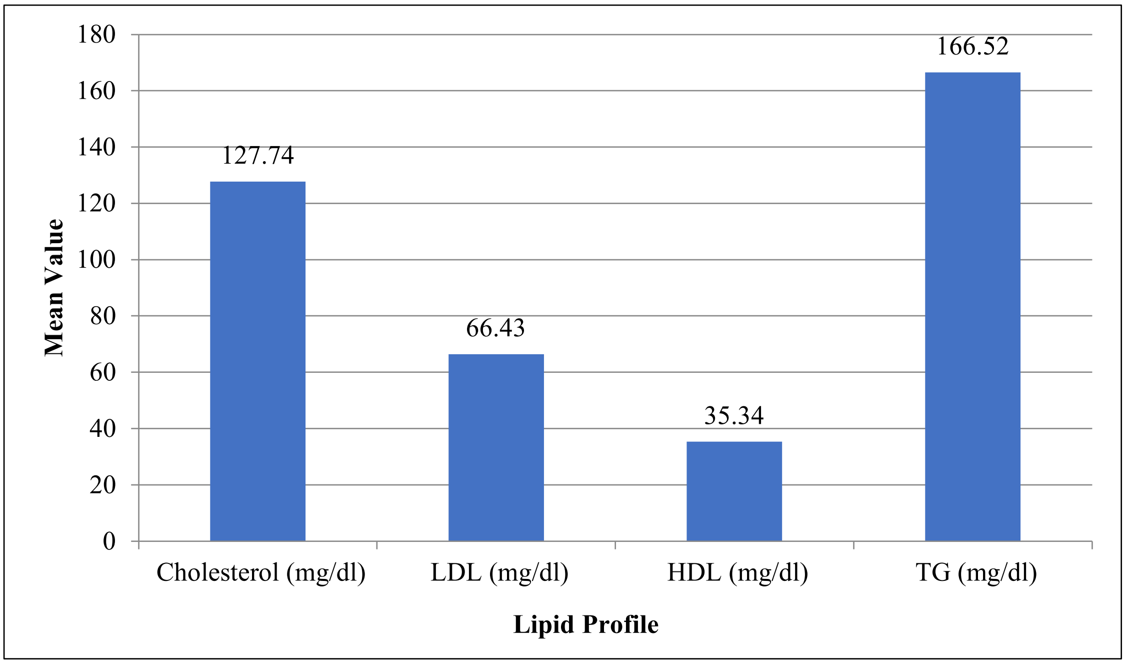


Table 10: Descriptive analysis of lipid profile in the study population (N=162)

Parameters	Number of subjects	Percentages
Cholesterol levels		
Desirable	148	91.36%
Borderline	12	7.41%
High	2	1.23%
LDL		
Normal	138	85.19%
Abnormal	24	14.81%
HDL		
Normal	155	95.68%
Abnormal	7	4.32%
TG		
<150	99	61.1%
Borderline high	25	15.4%
High	32	19.8%
Very high	6	3.7%

Among the study population, the cholesterol level was desirable for 148 (91.36%) participants, borderline for 12 (7.41%) participants, and high for 2 (1.23%) participants. The LDL was normal for 138 (85.19%) participants and abnormal for 24 (14.81%) participants, HDL was normal for 155 (95.68%) participants and abnormal for 7 (4.32%) participants. The TG level was <150 for 99 (61.1%) participants, borderline high for 25 (15.4%) participants, high for 32 (19.8%) participants and very high for 6 (3.7%) participants. (Table 10 & Figure 7 to 10)

Figure 7: Pie chart for cholesterol levels (N=162)

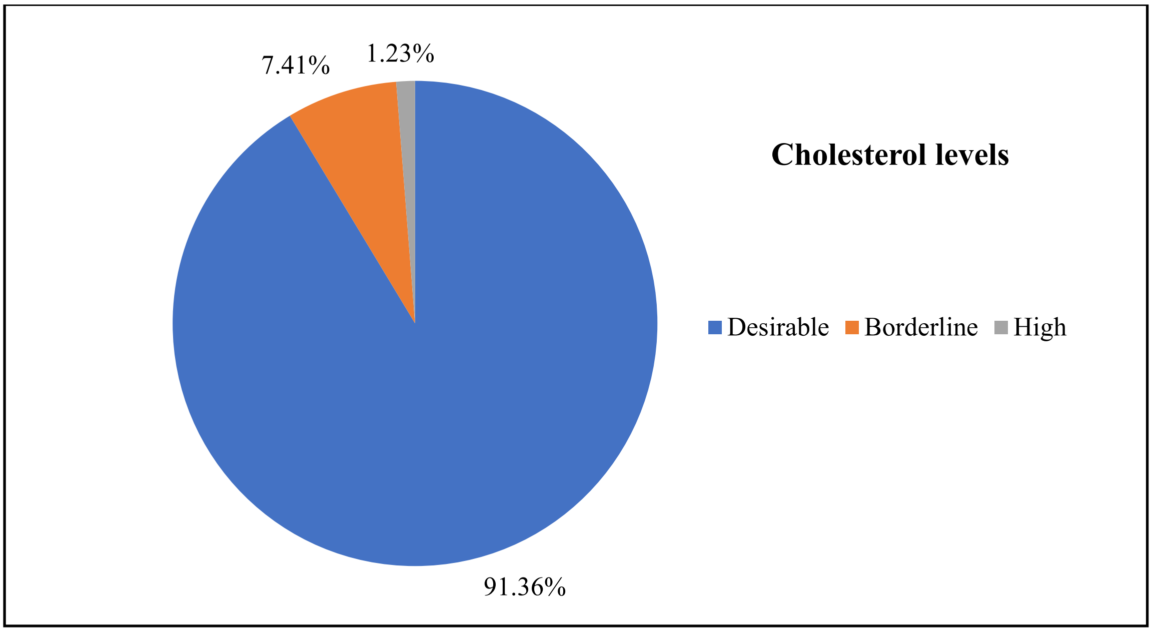


Figure 8: Bar chart for LDL (N=162)

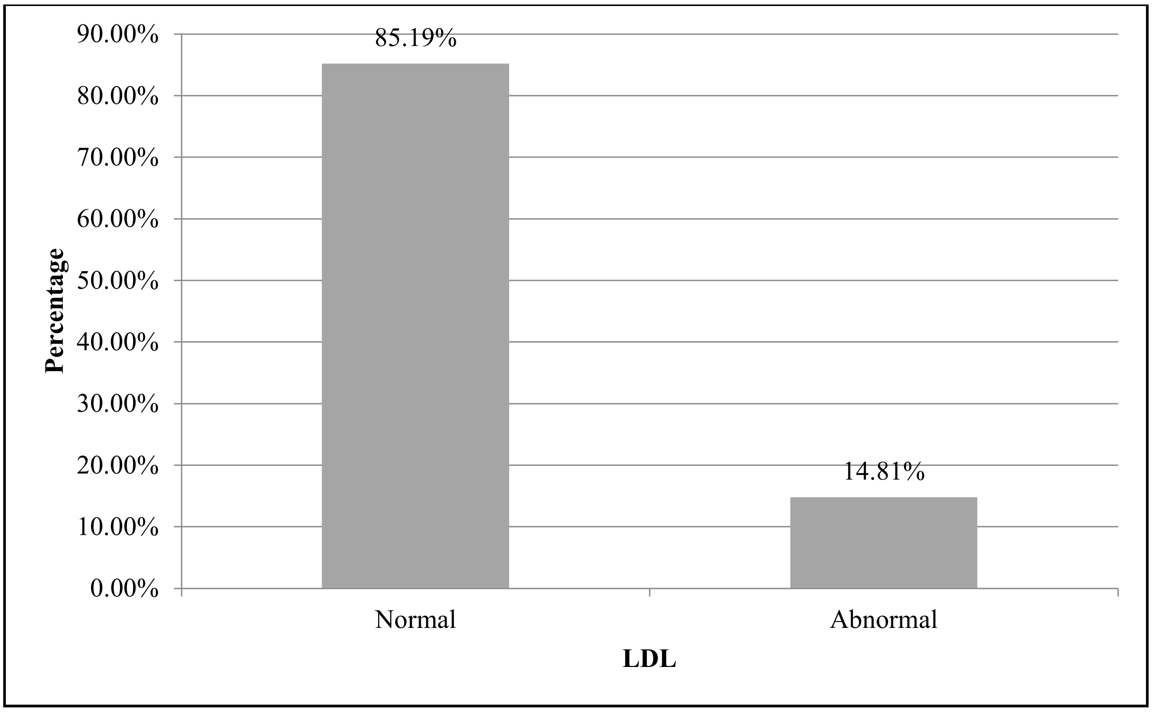


Figure 9: Bar chart for HDL (N=162)

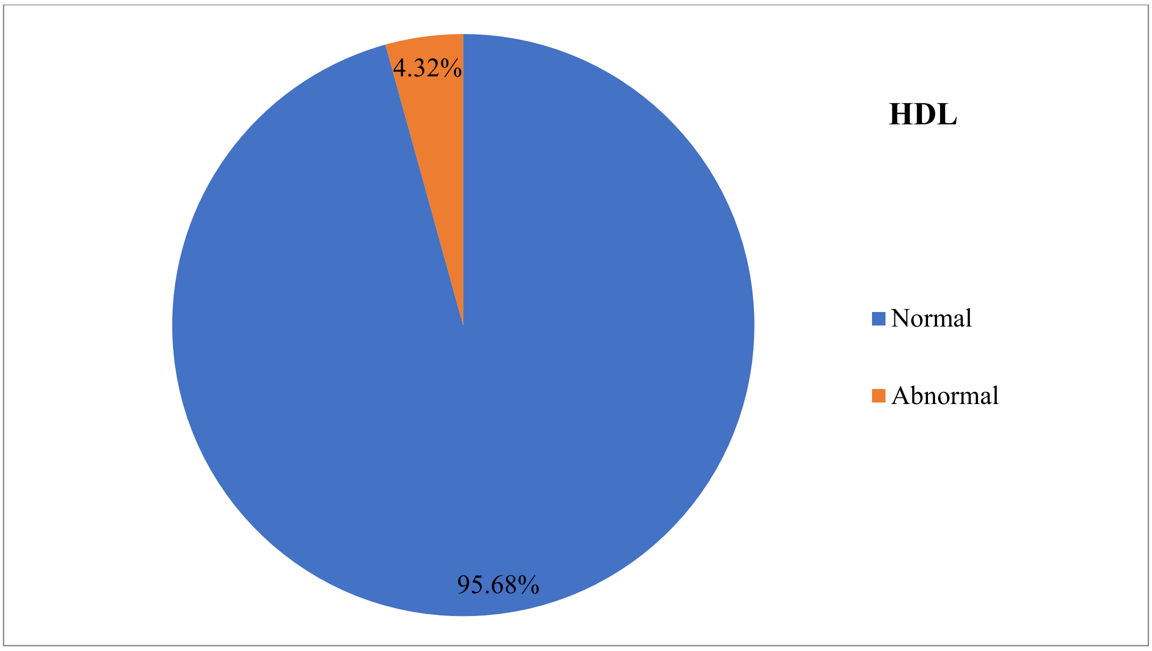


Figure 10: Bar chart for triglycerides (N=162)

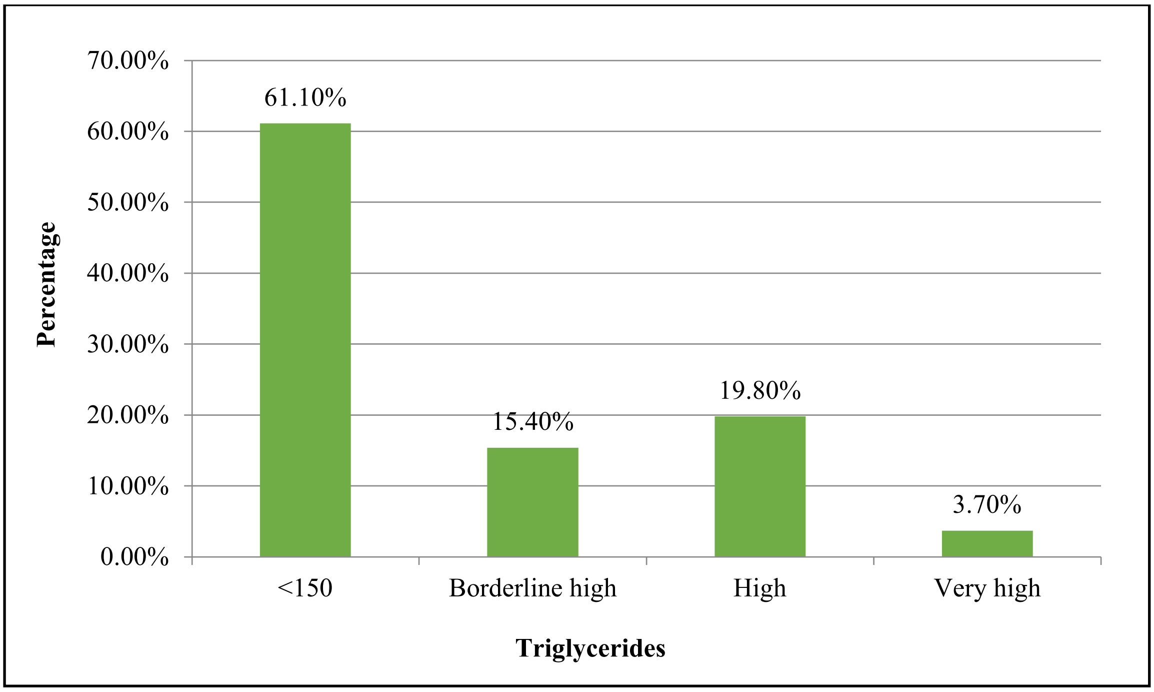


Table 11: Descriptive analysis of mean 24 hours(all day) BP in the study population (N=162)

Parameter	Mean ± SD	Median	Minimum	Maximum
All day SBP (mm/hg)	133.66 ± 13.53	132.0	113.0	159.0
All day DBP (mm/hg)	76.45 ± 10.99	74.0	60.0	103.0

The mean all-day SBP in the study population was 133.66 ± 13.53 mm/hg, ranged from 113 mm/hg to 159 mm/hg, and all-day DBP in the study population was 76.45 ± 10.99 mm/hg, ranged from 60 mm/hg to 103 mm/hg. (Table 11)

Table 12: Descriptive analysis of 24 hoursall day (SBP/DBP) in the study population (N=162)

Parameters	Number of subjects	Percentages
All day SBP		
HTN	126	77.78%
No HTN	36	22.22%
All day DBP		
HTN	69	42.59%
No HTN	93	57.41%

Among the study population, the HTN in all-day SBP was present for 126 (77.78%) participants, and the HTN in all-day DBP was present for 69 (42.59%) participants. (Table 12 & Figure 11, 12)

Figure 11: Bar chart for all-day SBP (N=162)

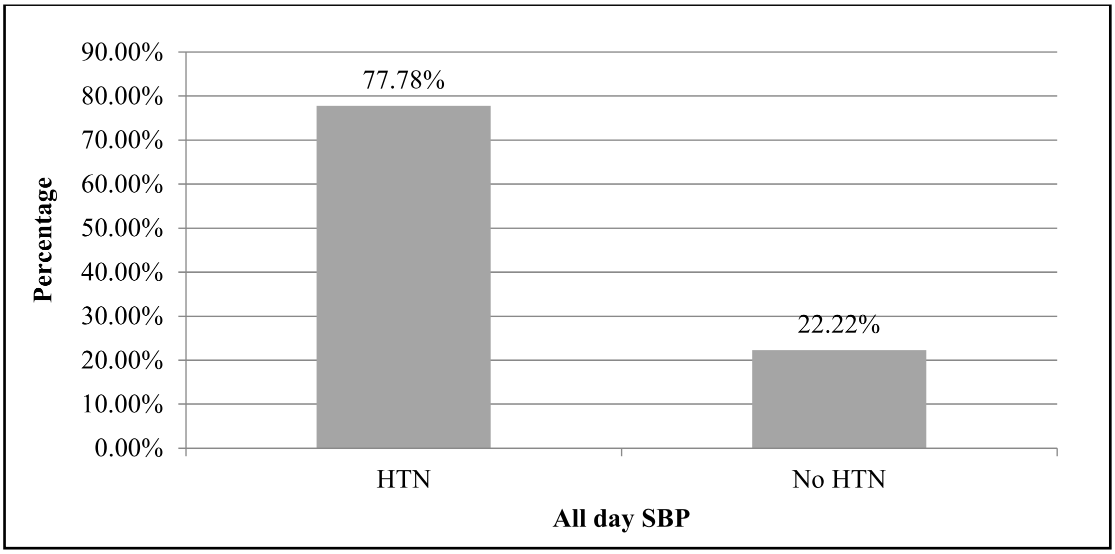


Figure 12: Bar chart for all-day DBP (N=162)

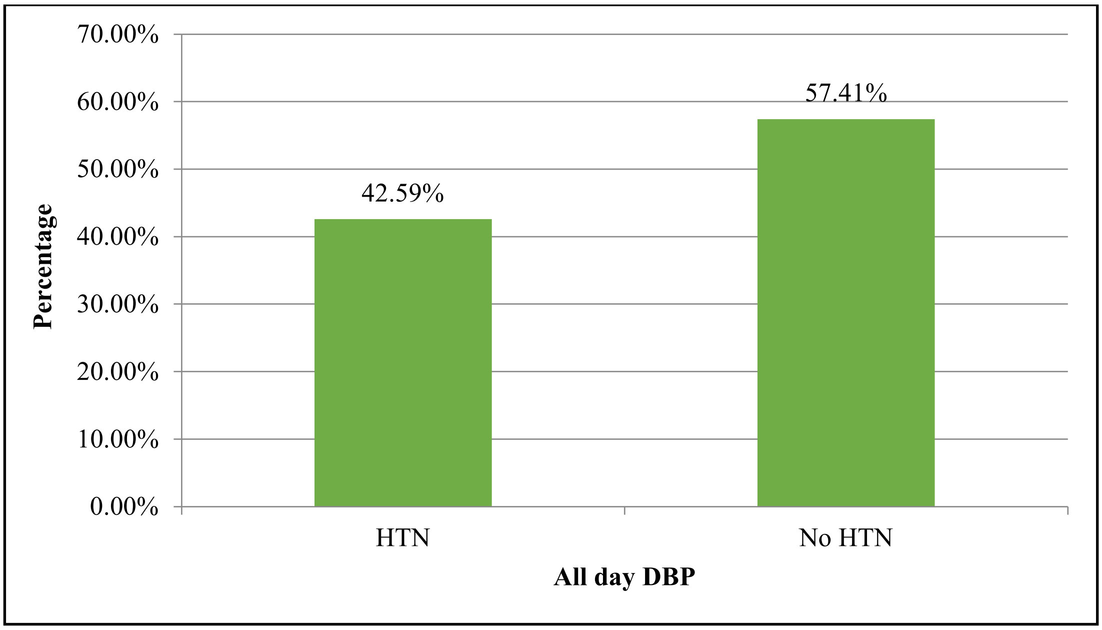


Table 13: Descriptive analysis of mean day BP in the study population (N=162)

Parameter	Mean ± SD	Median	Minimum	Maximum
Day SBP (mm/hg)	134.76 ± 13.51	133.0	113.0	160.0
Day DBP (mm/hg)	77.12 ± 11.43	74.0	62.0	104.0

The mean day SBP in study population was 134.76 ± 13.51 mm/hg, ranged from 113 mm/hg to 160 mm/hg and day DBP in study population was 77.12 ± 11.43 mm/hg, ranged from 62 mm/hg to 104 mm/hg. (Table 13)

Table 14: Descriptive analysis of day (SBP/DBP) in the study population (N=162)

Parameters	Number of subjects	Percentages
Day SBP		
HTN	96	59.26%
No HTN	66	40.74%
Day DBP		
HTN	69	42.6%
No HTN	93	57.4%

Among the study population, the HTN in day SBP was present for 96 (59.26%) participants, and the HTN in day DBP was present for 69 (42.6%) participants. (Table 14 & Figure 13, 14)

Figure 13: Pie chart for day SBP (N=162)

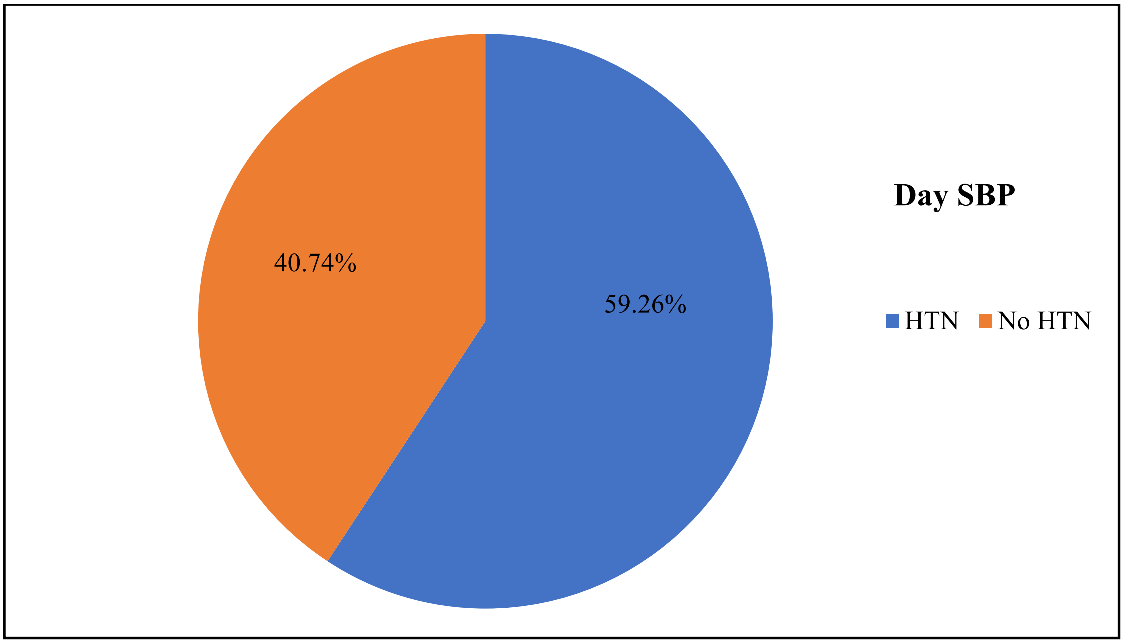


Figure 14: Pie chart for day DBP (N=162)

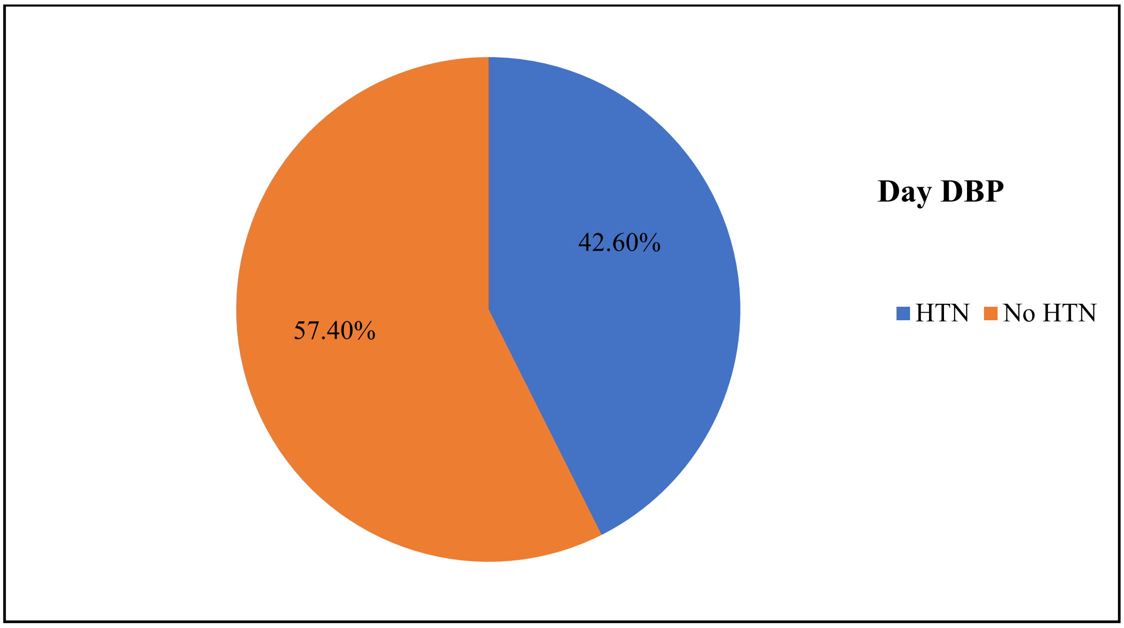


Table 15: Descriptive analysis of mean night BP in the study population (N=162)

Parameter	Mean ± SD	Median	Minimum	Maximum
Night SBP (mm/hg)	128.95 ± 15.59	127.0	103.0	163.0
Night DBP (mm/hg)	72.95 ± 10.4	72.0	53.0	101.0

The mean night SBP in study population was 128.95 ± 15.59 mm/hg, ranged from 103 mm/hg to 163 mm/hg and mean night DBP in study population was 72.95 ± 10.4 mm/hg, ranged from 53 mm/hg to 101 mm/hg. (Table 15)

Table 16: Descriptive analysis of night (SBP/DBP) in the study population (N=162)

Parameters	Number of subjects	Percentages
Night SBP		
HTN	147	90.7%
No HTN	15	9.3%
Night DBP		
HTN	124	76.5%
No HTN	38	23.5%

Among the study population, the HTN in night SBP was present for 147 (90.7%) participants, and the HTN in night DBP was present for 124 (76.50%) participants. (Table 16 & Figure 15, 16)

Figure 15: Bar chart for night SBP (N=162)

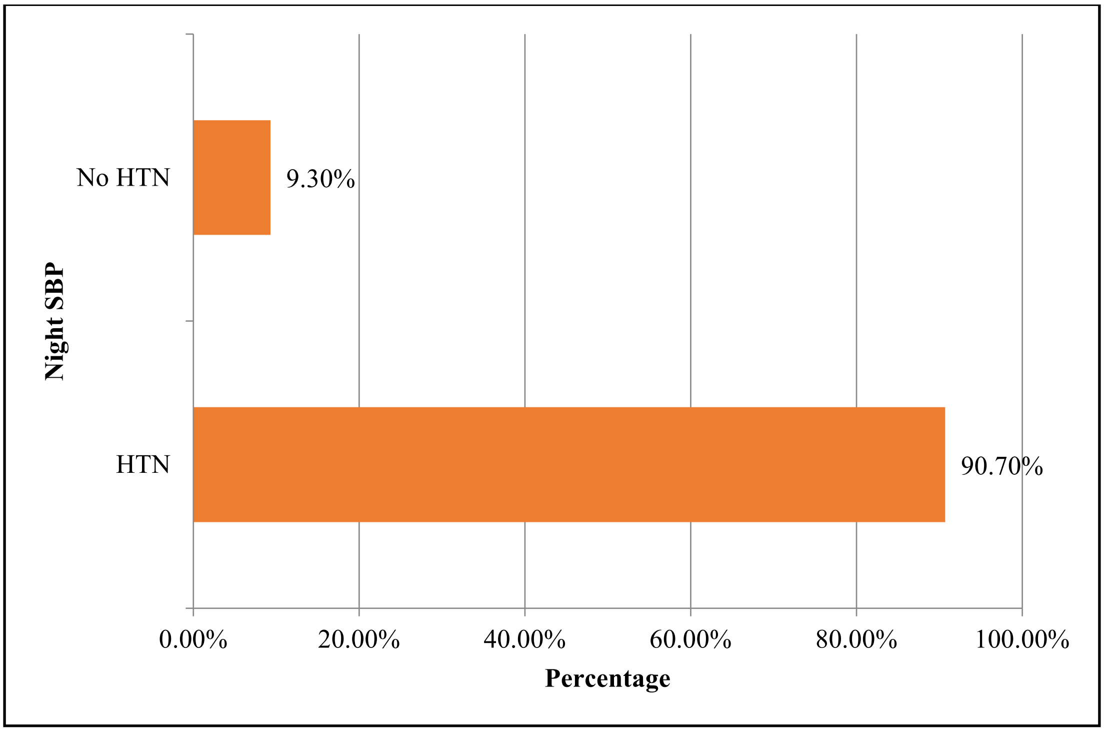


Figure 16: Bar chart for night DBP (N=162)

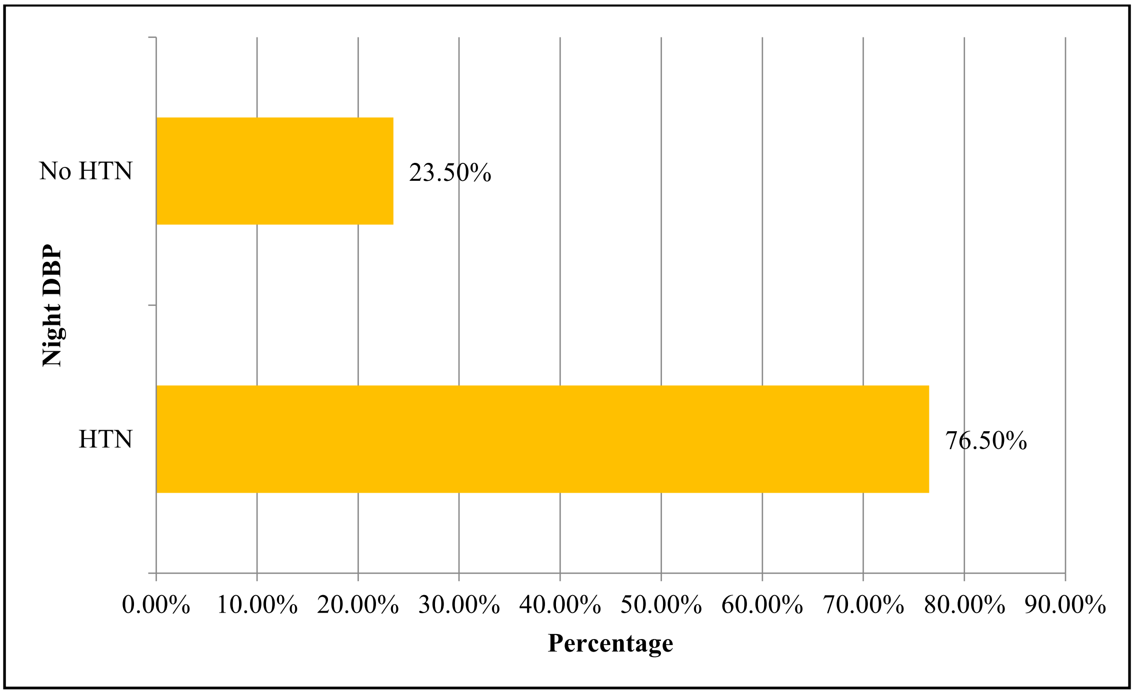


Table 17: Descriptive analysis of BMI in the study population (N=162)

BMI	Number of subjects	Percentages
In males (N=101)		
Overweight	98	97.03%
Obese	13	12.87%
In females (N=61)		
Overweight	9	14.75%
Obese	52	85.25%

Among the males in the study population, 98 (97.03%) participants were overweight, and 13 (12.87%) participants were obese. Among the females in the study population, 9 (14.75%) participants were overweight, and 52 (85.25%) participants were obese. (Table 17 & Figure 17)

Figure 17: Bar chart for BMI in males and females (N=162)

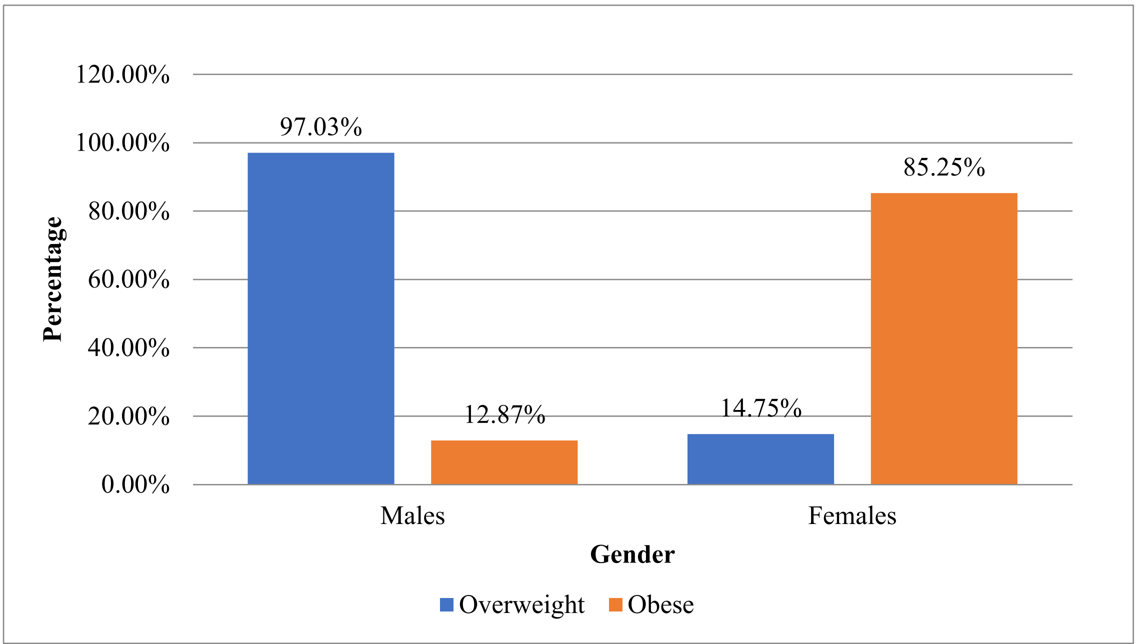


Table 18: Comparison of blood pressure between BMI in males (N=101)

Parameter	BMI (in males)		Chi-square	P-value
	Overweight	Obese		
All days SBP				
No HTN (N=19)	7 (36.84%)	12 (63.16%)	52.769	<0.001
HTN (N=82)	81 (98.78%)	1 (1.22%)		
All-day DBP				
No HTN (N=53)	42 (79.25%)	11 (20.75%)	6.180	0.013
HTN (N=48)	46 (95.83%)	2 (4.17%)		
Day SBP				
No HTN (N=38)	26 (68.42%)	12 (31.58%)	19.012	<0.001
HTN (N=63)	62 (98.41%)	1 (1.59%)		
Day DBP				
No HTN (N=54)	43 (79.63%)	11 (20.37%)	5.819	0.016
HTN (N=47)	45 (95.74%)	2 (4.26%)		
Night SBP				
No HTN (N=8)	5 (62.5%)	3 (37.5%)	4.699	0.064
HTN (N=93)	83 (89.25%)	10 (10.75%)		
Night DBP				
No HTN (N=20)	18 (90%)	2 (10%)	0.183	1.000
HTN (N=81)	70 (86.42%)	11 (13.58%)		

*Fisher's exact test was used

Out of 82 male participants with HTN in all day SBP, the BMI was overweight for 81 (98.78%) participants and obese for 1 (1.22%) participant. Out of 48 male participants with HTN in all-day DBP, the BMI was overweight for 46 (95.83%) participants and obese for 2 (4.17%) participants. Out of 63 male participants with HTN in day SBP, the BMI was overweight for 62 (98.41%) participants and obese for 1 (1.59%) participant. Out of 47 male participants with HTN in day DBP, the BMI was overweight for 45 (95.74%) participants and obese for 2 (4.26%) participants. Out of 93 male participants with HTN in night SBP, the BMI was overweight for 83 (89.25%) participants and obese for 10 (10.75%) participants. Out of 81 male participants with HTN in night SBP, the BMI was overweight for 70 (86.42%) participants and obese for 11 (13.58%) participants. There was a statistically significant relationship among males in all-day SBP, all-day DBP, day SBP, and day DBP between the BMI (P Value<0.05). No statistically significant relationship was observed among males in night SBP and night DBP between the BMI (P Value>0.05). (Table 18 & Figure 18 to 21)

Figure 18: Clustered bar chart for comparison of all-day SBP between BMI in males (N=101)

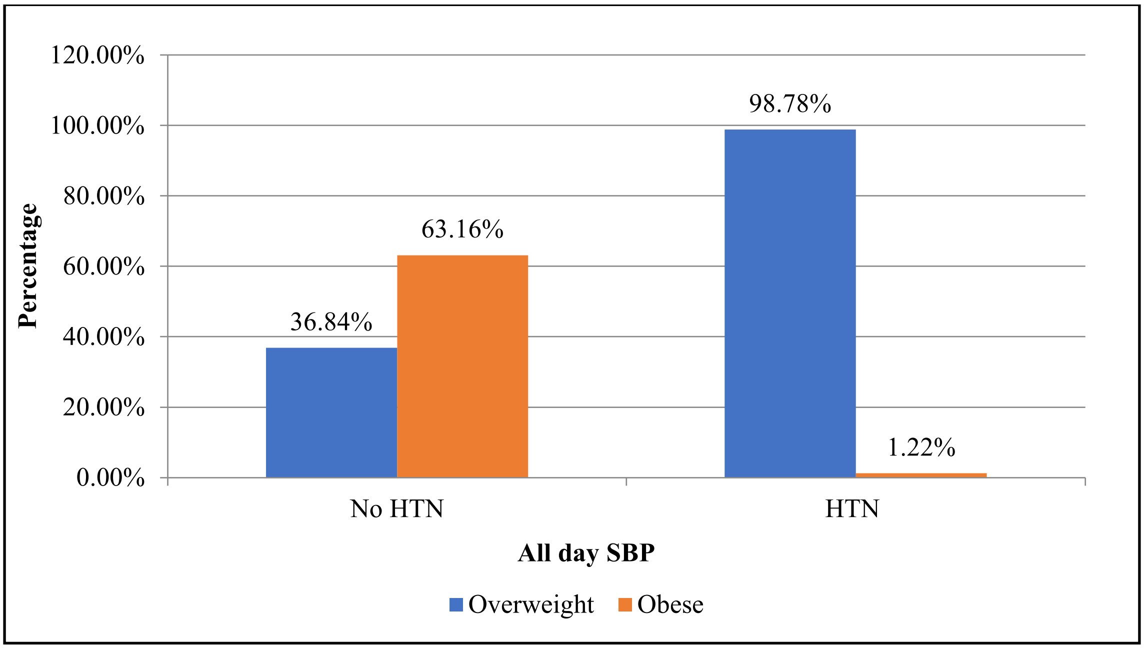


Figure 19: Clustered bar chart for comparison of all-day DBP between BMI in males (N=101)

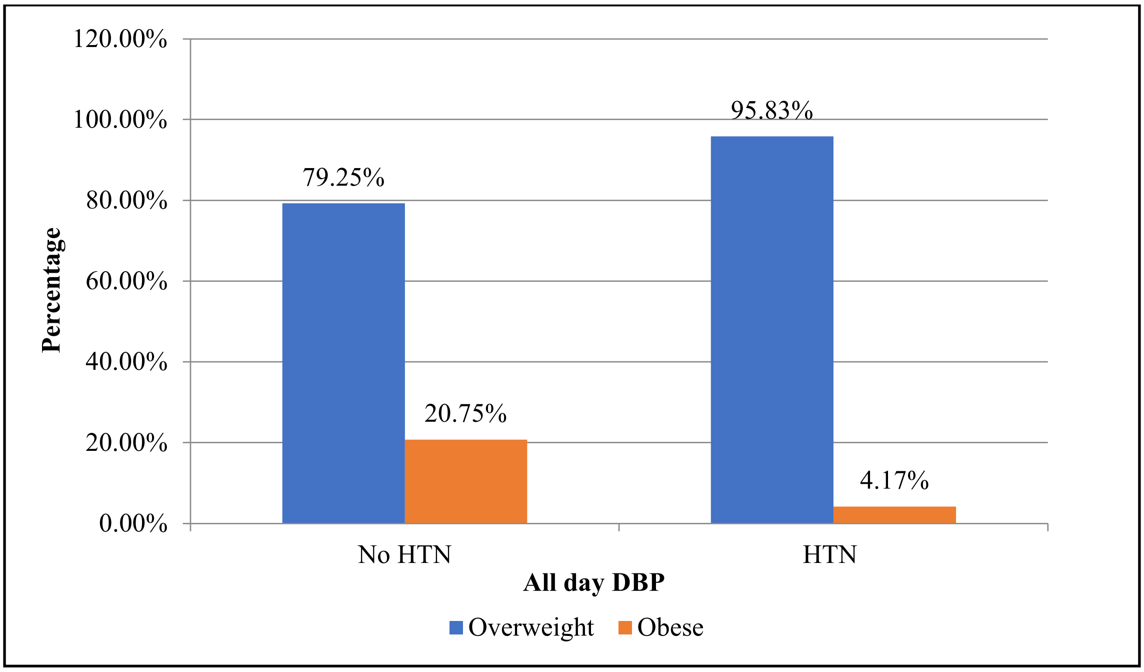


Figure 20: Clustered bar chart for comparison of day SBP between BMI in males (N=101)

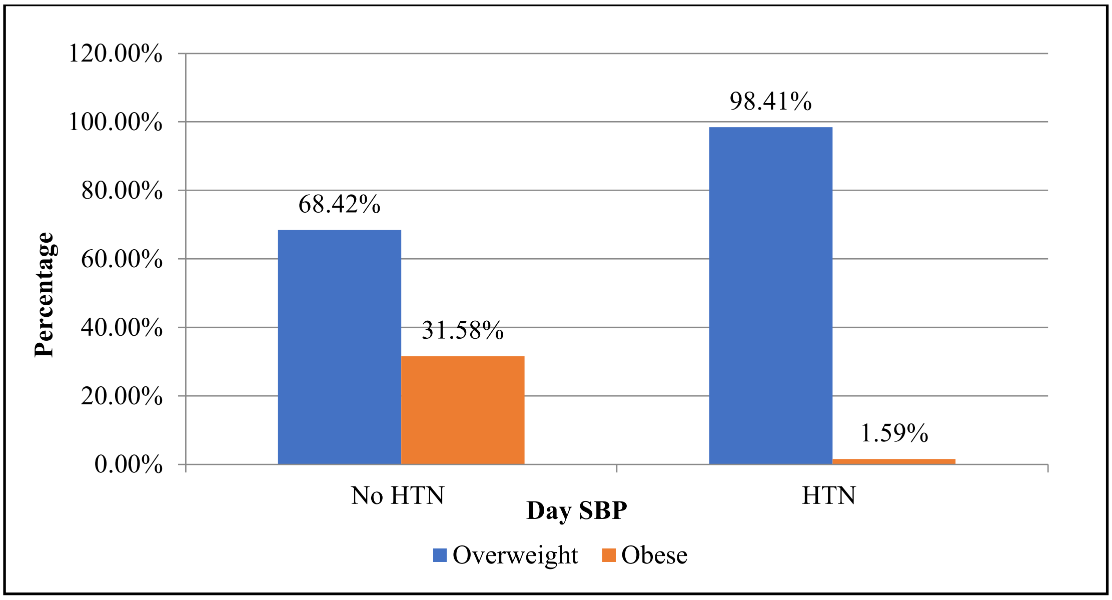


Figure 21: Clustered bar chart for comparison of day DBP between BMI in males (N=101)

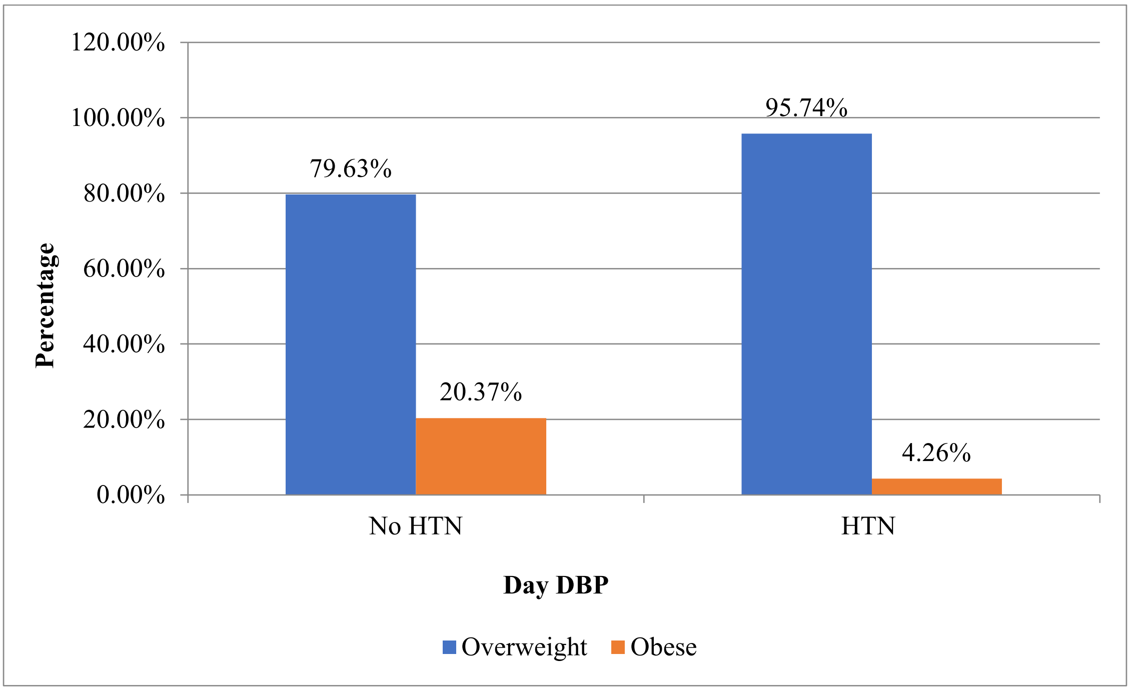


Table 19: Comparison of blood pressure between BMI in females (N=61)

Parameter	BMI		Chi-square	P value
	Obese	Overweight		
All-day SBP				
No HTN (N=17)	8 (47.06%)	9 (52.94%)	19.556	<0.001
HTN (N=44)	1 (2.27%)	43 (97.73%)		
All-day DBP				
No HTN (N=40)	9 (22.5%)	31 (77.5%)	*	*
HTN (N=21)	0 (0%)	21 (100%)		
Day SBP				
No HTN (N=28)	8 (28.57%)	20 (71.43%)	7.857	0.009
HTN (N=33)	1 (3.03%)	32 (96.97%)		
Day DBP				
No HTN (N=39)	8 (20.51%)	31 (79.49%)	2.851	0.138
HTN (N=22)	1 (4.55%)	21 (95.45%)		
Night SBP				
No HTN (N=7)	1 (14.29%)	6 (85.71%)	0.001	1.000
HTN (N=54)	8 (14.81%)	46 (85.19%)		
Night DBP				
No HTN (N=18)	0 (0%)	18 (100%)	*	*
HTN (N=43)	9 (20.93%)	34 (79.07%)		

*No statistical test was applied due to 0-subjects in one of the cells.

Out of 44 female participants with HTN in all day SBP, the BMI was overweight for 43 (97.73%) participants and obese for 1 (1.27%) participant. Out of 21 female participants with HTN in all-day DBP, the BMI was overweight for 21 (100%) participants and obese for no participant. Out of 33 female participants with HTN in day SBP, the BMI was overweight for 32 (96.97%) participants and obese for 1 (3.03%) participant. Out of 22 female participants with HTN in day DBP, the BMI was overweight for 21 (95.45%) participants and obese for 1 (4.55%) participant. Out of 54 female participants with HTN in night SBP, the BMI was overweight for 46 (85.19%) participants and obese for 8 (14.81%) participants. Out of 43 female participants with HTN in night SBP, the BMI was overweight for 34 (79.07%) participants and obese for 9 (20.93%) participants. There was a statistically significant relationship among females in all-day SBP and day SBP between the BMI (P Value<0.05). No statistically significant relationship was observed among females in night SBP and day DBP between the BMI (P Value>0.05) (Table 19 & Figure 22, 23)

Figure 22: Clustered bar chart for comparison of all-day SBP between BMI in females (N=61)

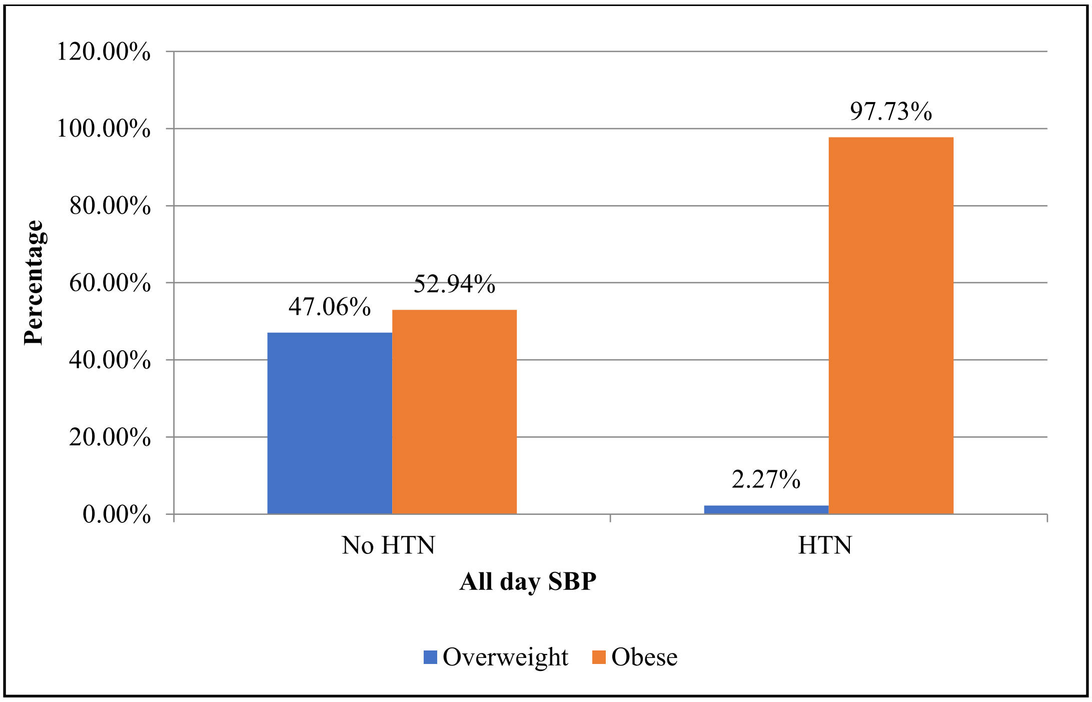


Figure 23: Clustered bar chart for comparison of all-day SBP between BMI in female (N=61)

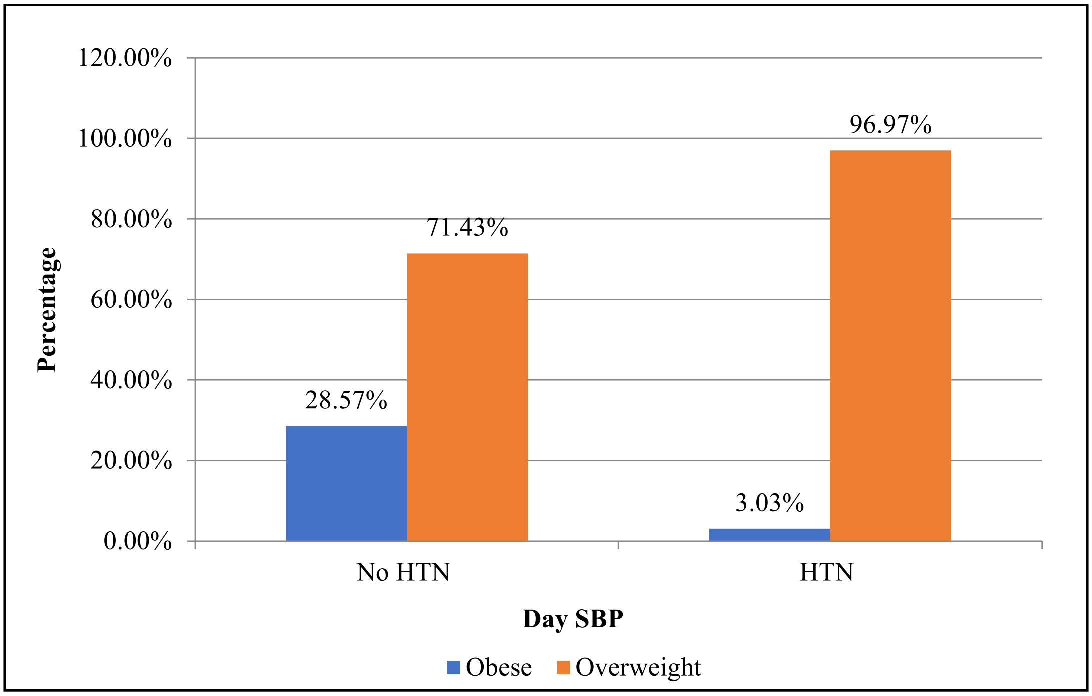


Table 20: Comparison of BMI and systolic dipping (N=162)

BMI	Systolic Dipping		Fisher exact P-value
	Present	Absent	
Overweight (N=121)	8 (6.61%)	113 (93.39%)	0.501
Obese (N=41)	4 (9.76%)	37 (90.24%)	

Out of 121 overweight patients, the systolic dipping was absent in 113 (93.39%) participants, and among 41 obese patients, 37 (90.24%) participants had an absence of systolic dipping. (Table 20 & Figure 24)

Figure 24: Clustered bar chart for comparison of BMI between systolic dipping (N=162)

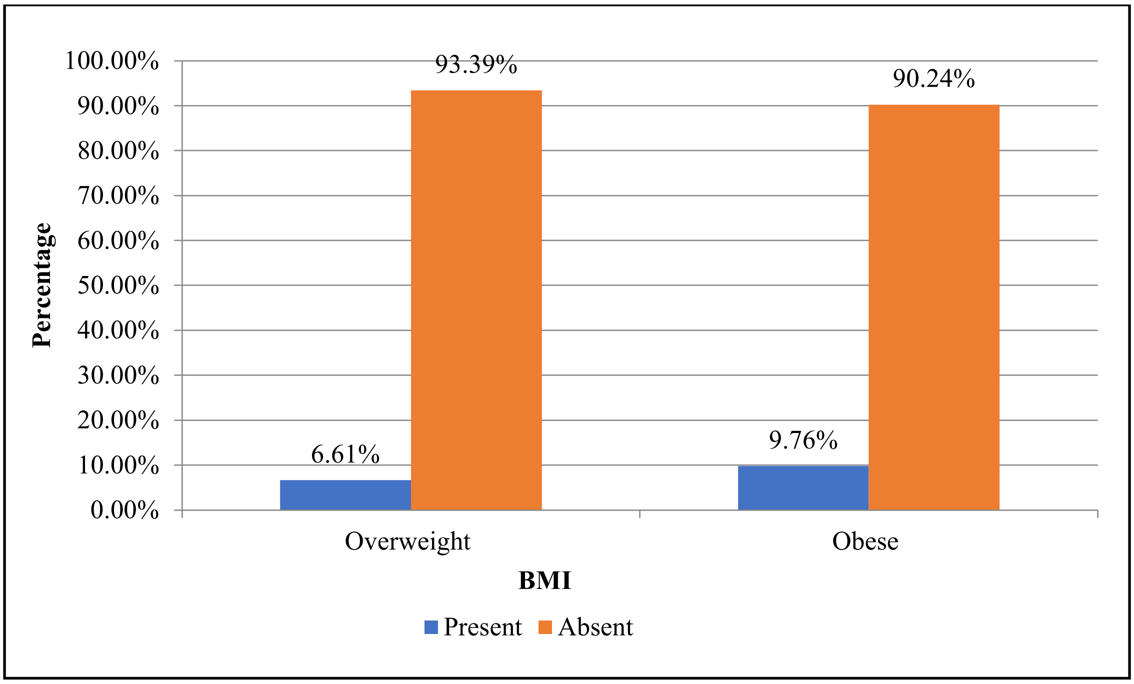


Table 21: Comparison of BMI and diastolic dipping (N=162)

BMI	Diastolic Dipping		Chi-square	P-value
	Present	Absent		
Overweight (N=121)	28 (23.14%)	93 (76.86%)	0.228	0.633
Obese (N=41)	11 (26.83%)	30 (73.17%)		

Out of 121 overweight patients, the diastolic dipping was absent in 93 (76.86%) participants, and amongst 41 obese patients, 30 (73.17%) participants had an absence of diastolic dipping. (Table 21 & Figure 25)

Figure 25: Clustered bar chart for comparison of BMI between diastolic dipping (N=162)

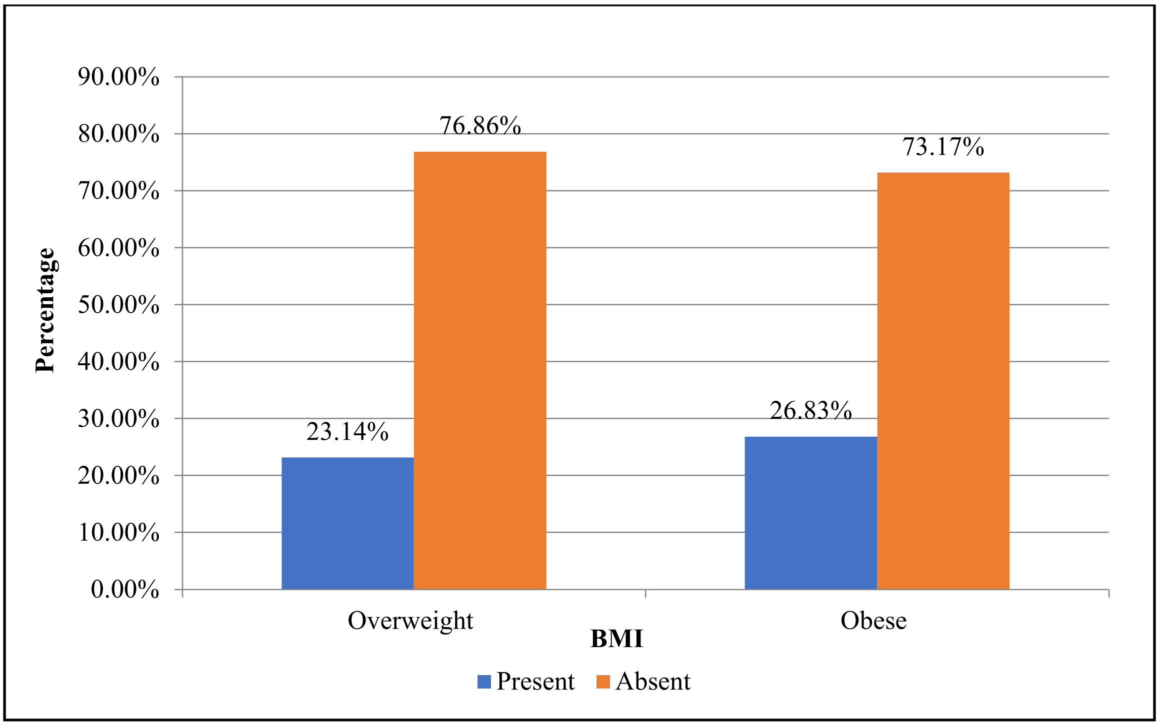


Table 22: Descriptive analysis of waist circumference in the study population (N=162)

Waist circumference	Frequency	Percentages
In males (N=101)		
No risk	77	76.24%
At risk	24	23.76%
In females (N=61)		
No risk	6	9.80%
At-risk	55	90.20%

Among the males in the study population, 24 (23.76%) participants were at risk for adverse cardio vascular events as per waist circumference, and among the females in the study population, 55 (90.20%) participants were at risk for adverse cardio vascular events as per waist circumference. (Table 22 & Figure 26)

Figure 26: Bar chart for waist circumference in males and females (N=162)

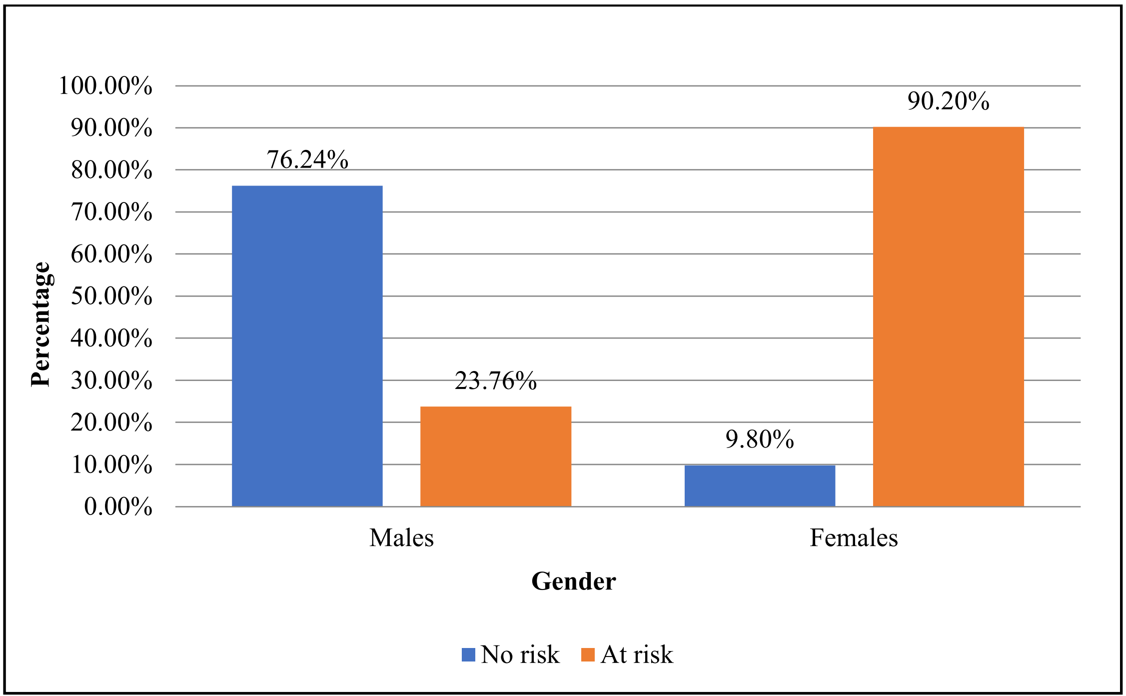


Table 23: Comparison of blood pressure between waist circumference in males (N=101)

BP	Waist Circumference (Males)		Chi-square	P-value
	No-Risk	At-Risk		
All-day SBP				
No HTN (N=19)	4 (21.05%)	15 (78.95%)	0.095	1.000
HTN (N=82)	20 (24.39%)	62 (75.61%)		
All-day DBP				
No HTN (N=53)	12 (22.64%)	41 (77.36%)	0.077	0.781
HTN (N=48)	12 (25%)	36 (75%)		
Day SBP				
No HTN (N=38)	10 (26.32%)	28 (73.68%)	0.219	0.640
HTN (N=63)	14 (22.22%)	49 (77.78%)		
Day DBP				
No HTN (N=54)	14 (25.93%)	40 (74.07%)	0.300	0.584
HTN (N=47)	10 (21.28%)	37 (78.72%)		
Night SBP				
No HTN (N=8)	0 (0%)	8 (100%)	*	*
HTN (N=93)	24 (25.81%)	69 (74.19%)		
Night DBP				
No HTN (N=20)	3 (15%)	17 (85%)	1.057	0.389
HTN (N=81)	21 (25.93%)	60 (74.07%)		

**No statistical test was applied due to 0-subjects in one of the cells.*

Out of 82 male participants with HTN in all-day SBP, the waist circumference was not at risk for 20 (24.39%) participants and at risk for 62 (75.61%) participants. Out of 48 male participants with HTN in all-day DBP, the waist circumference was not at risk for 12 (25%) participants and at risk for 36 (75%) participants. Out of 63 male participants with HTN in day SBP, the waist circumference was not at risk for 14

(22.22%) participants and at risk for 49 (77.78%) participants. Out of 47 male participants with HTN in day DBP, the waist circumference was not at risk for 10 (21.28%) participants and at risk for 37 (78.82%) participants. Out of 93 male participants with HTN in night SBP, the waist circumference was not at risk for 24 (25.81%) participants and at risk for 69 (74.19%) participants. Out of 81 male participants with HTN in night DBP, the waist circumference was not at risk for 21 (25.93%)) participants and at risk for 60 (74.07%) participants. No statistically significant relationship was observed among males in all day SBP, all day DBP, day SBP, day DBP and night DBP between the waist circumference (P Value>0.05) (Table 23)

Table 24: Comparison of blood pressure between waist circumference in females (N=61)

BP	Waist Circumference (Females)		Chi-square	P value
	No-Risk	At-Risk		
All-day SBP				
No HTN (N=17)	15 (88.24%)	2 (11.76%)	0.099	1.000
HTN (N=44)	40 (90.91%)	4 (9.09%)		
All-day DBP				
No HTN (N=40)	36 (90%)	4 (10%)	0.004	1.000
HTN (N=21)	19 (90.48%)	2 (9.52%)		
Day SBP				
No HTN (N=28)	26 (92.86%)	2 (7.14%)	0.423	0.678
HTN (N=33)	29 (87.88%)	4 (12.12%)		
Day DBP				
No HTN (N=39)	35 (89.74%)	4 (10.26%)	0.022	1.000
HTN (N=22)	20 (90.91%)	2 (9.09%)		
Night SBP				
No HTN (N=7)	6 (85.71%)	1 (14.29%)	0.177	0.535
HTN (N=54)	49 (90.74%)	5 (9.26%)		
Night DBP				
No HTN (N=18)	16 (88.89%)	2 (11.11%)	0.047	1.000
HTN (N=43)	39 (90.7%)	4 (9.3%)		

Out of 44 female participants with HTN in all-day SBP, the waist circumference was not at risk for 40 (90.91%) participants and at risk for 4 (9.09%) participants. Out of 21 female participants with HTN in all-day DBP, the waist circumference was not at risk for 19 (90.48%) participants and at risk for 2 (9.52%) participants. Out of 33 female participants with HTN in day SBP, the waist circumference was not at risk for 29 (87.88%) participants and at risk for 4 (12.12%) participants. Out of 22 female participants with HTN in day DBP, the waist circumference was not at risk for 20 (90.91%) participants and at risk for 2 (9.09%) participants. Out of 54 female participants with HTN in night SBP, the waist circumference was not at risk for 49 (90.74%) participants and at risk for 5 (9.26%) participants. Out of 43 female participants with HTN in night DBP, the waist circumference was not at risk for 39 (90.7%) participants and at risk for 4 (9.3%) participants. No statistically significant relationship was observed among females in all day SBP, all day DBP, day SBP, day DBP, night SBP and night DBP between the waist circumference (P Value>0.05) (Table 24)

Table 25: Descriptive analysis of waist to hip ratio in the study population (N=162)

Waist To Hip Ratio	Frequency	Percentages
In males (N=101)		
Not at risk	22	21.78%
At risk	79	78.22%
In females (N=61)		
Not at risk	2	3.28%
At-risk	59	96.72%

Among the males in the study population, 79 (78.22%) participants were at risk for adverse cardio vascular events as per waist to hip ratio, and among the females in the study population, 59 (96.72%) participants were at risk for adverse cardio vascular events as per waist to hip ratio. (Table 25 & Figure 27)

Figure 27: Bar chart for waist to hip ratio in males and females (N=162)

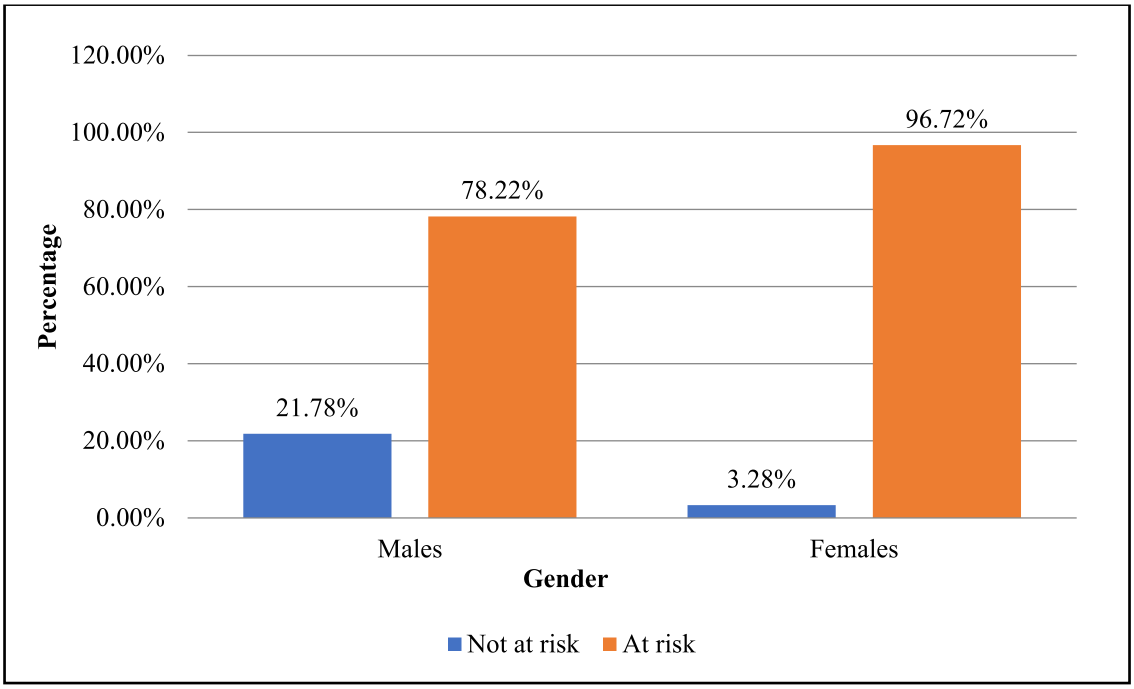


Table 26: Comparison of blood pressure between waist to hip ratio in males (N=101)

BP	Waist To Hip Ratio (Males)		Chi-square	P-value
	No-Risk	At-Risk		
All-day SBP				
No HTN (N=19)	3 (15.79%)	16 (84.21%)	0.493	0.758
HTN (N=82)	19 (23.17%)	63 (76.83%)		
All-day DBP				
No HTN (N=53)	12 (22.64%)	41 (77.36%)	0.048	0.826
HTN (N=48)	10 (20.83%)	38 (79.17%)		
Day SBP				
No HTN (N=38)	8 (21.05%)	30 (78.95%)	0.019	0.890
HTN (N=63)	14 (22.22%)	49 (77.78%)		
Day DBP				
No HTN (N=54)	12 (22.22%)	42 (77.78%)	0.013	0.909
HTN (N=47)	10 (21.28%)	37 (78.72%)		
Night SBP				
No HTN (N=8)	2 (25%)	6 (75%)	0.053	1.000
HTN (N=93)	20 (21.51%)	73 (78.49%)		
Night DBP				
No HTN (N=20)	3 (15%)	17 (85%)	0.673	0.552
HTN (N=81)	19 (23.46%)	62 (76.54%)		

Out of 82 male participants with HTN in all-day SBP, the waist to hip ratio was not at risk for 19 (23.17%) participants and at risk for 63 (76.83%) participants. Out of 48 male participants with HTN in all-day DBP, the waist to hip ratio was not at risk for 10 (20.83%) participants and at risk for 38 (79.17%) participants. Out of 63 male participants with HTN in day SBP, the waist to hip ratio was not at risk for 14 (22.22%) participants and at risk for 49 (77.78%) participants. Out of 47 male participants with HTN in day DBP, the waist to hip ratio was not at risk for 10 (21.28%) participants and at risk for 37 (78.82%) participants. Out of 93 male participants with HTN in night SBP, the waist to hip ratio was not at risk for 10 (21.28%) participants and at risk for 37 (78.82%) participants. Out of 81 male participants with HTN in night DBP, the waist to hip ratio was not at risk for 19 (23.46%) participants and at risk for 62 (76.54%) participants. No statistically significant relationship was observed among males in all day SBP, all day DBP, day SBP, day DBP, night SBP and night DBP between the waist to hip ratio (P Value>0.05) (Table 26)

Table 27: Comparison of blood pressure between waist to hip ratio in females (N=61)

BP	Waist To Hip Ratio (Females)		Chi-square	P-value
	No-Risk	At-Risk		
All-day SBP				
No HTN (N=17)	0 (0%)	17 (100%)	*	*
HTN (N=44)	2 (4.55%)	42 (95.45%)		
All-day DBP				
No HTN (N=40)	1 (2.5%)	39 (97.5%)	0.222	1.000
HTN (N=21)	1 (4.76%)	20 (95.24%)		
Day SBP				
No HTN (N=28)	0 (0%)	28 (100%)	*	*
HTN (N=33)	2 (6.06%)	31 (93.94%)		
Day DBP				
No HTN (N=39)	1 (2.56%)	38 (97.44%)	0.174	1.000
HTN (N=22)	1 (4.55%)	21 (95.45%)		
Night SBP				
No HTN (N=7)	0 (0%)	7 (100%)	*	*
HTN (N=54)	2 (3.7%)	52 (96.3%)		
Night DBP				
No HTN (N=18)	0 (0%)	18 (100%)	*	*
HTN (N=43)	2 (4.65%)	41 (95.35%)		

*No statistical test was applied due to 0-subjects in one of the cells.

Out of 44 female participants with HTN in all-day SBP, the waist to hip ratio was not at risk for 2 (4.55%) participants and at risk for 42 (95.45%) participants. Out of 21 female participants with HTN in all-day DBP, the waist to hip ratio was not at risk for 1 (4.76%) participant and at risk for 20 (95.24%) participants. Out of 33 female participants with HTN in day SBP, the waist to hip ratio was not at risk for 2 (6.06%)

participants and at risk for 31 (93.94%) participants. Out of 22 female participants with HTN in day DBP, the waist to hip ratio was not at risk for 1 (4.55%) participant and at risk for 21 (95.45%) participants. Out of 54 female participants with HTN in night SBP, the waist to hip ratio was not at risk for 2 (3.7%) participants and at risk for 52 (96.3%) participants. Out of 43 female participants with HTN in night DBP, the waist to hip ratio was not at risk for 2 (4.65%) participants and at risk for 41 (95.35%) participants. No statistically significant relationship was observed among females in all day DBP and day DBP between the waist to hip ratio (P Value>0.05) (Table 27)

Table 28: Descriptive analysis of waist to height/stature ratio in study population (N=162)

Waist to height ratio	Frequency	Percentages
In males (N=101)		
No risk	20	19.80%
At risk	81	80.20%
In females (N=61)		
No risk	14	23.00%
At-risk	47	77.00%

Among the males in the study population, 20 (19.80%) participants were at risk for adverse cardiovascular events as per waist to height/stature ratio, and among the females in the study population, 47 (77.00%) participants were at risk for adverse cardiovascular events as per waist to height ratio. (Table 28 & Figure 28, 29)

Figure 28: Pie chart for waist height ratio in males (N=162)

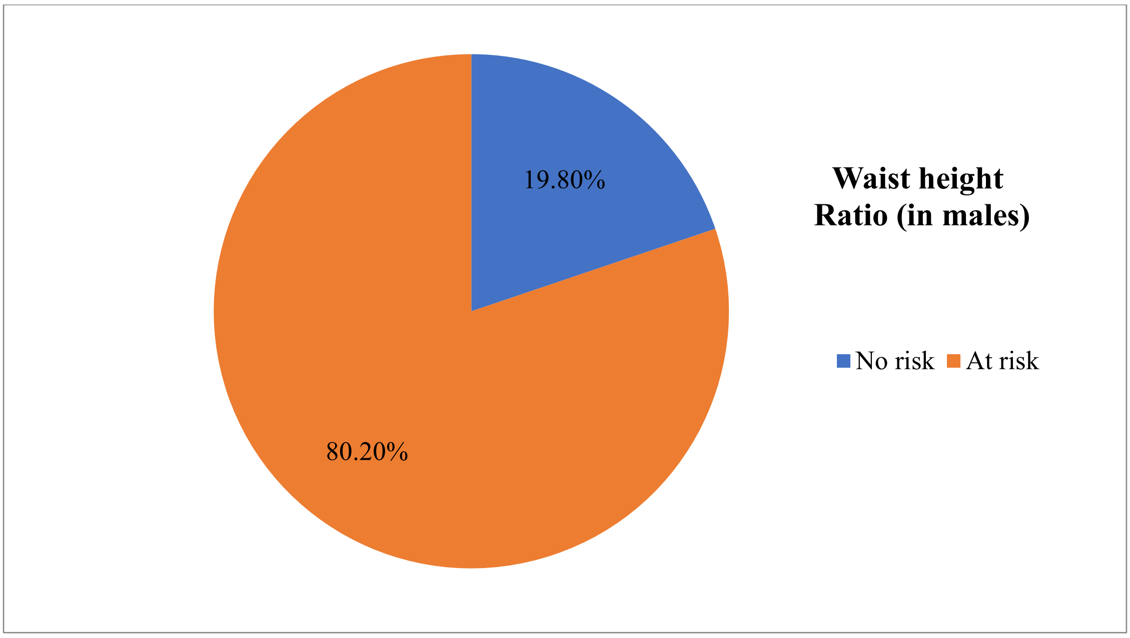


Figure 29: Pie chart for waist height ratio in females (N=162)

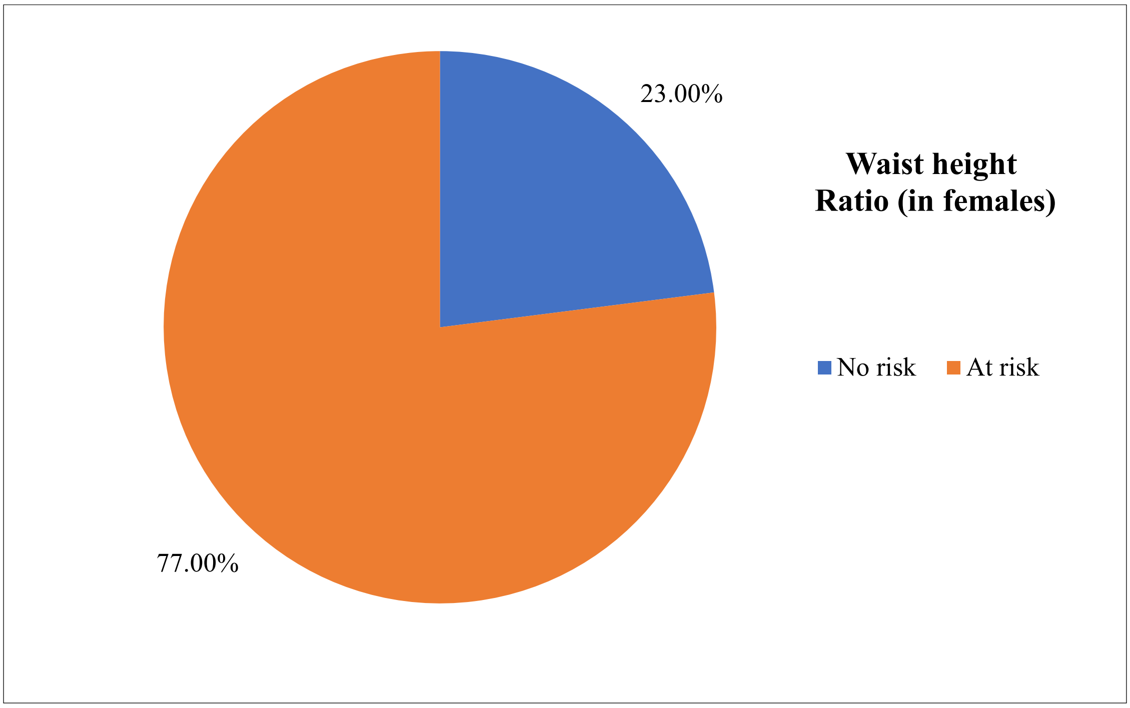


Table 29: Comparison of blood pressure between waist to height ratio in males (N=101)

BP	Waist height ratio (in males)		Chi-square	P-value
	At-Risk	No-Risk		
All-day SBP				
No HTN (N=19)	17 (89.47%)	2 (10.53%)	1.268	0.350
HTN (N=82)	64 (78.05%)	18 (21.95%)		
All-day DBP				
No HTN (N=53)	42 (79.25%)	11 (20.75%)	0.064	0.801
HTN (N=48)	39 (81.25%)	9 (18.75%)		
Day SBP				
No HTN (N=38)	33 (86.84%)	5 (13.16%)	1.693	0.193
HTN (N=63)	48 (76.19%)	15 (23.81%)		
Day DBP				
No HTN (N=54)	43 (79.63%)	11 (20.37%)	0.024	0.878
HTN (N=47)	38 (80.85%)	9 (19.15%)		
Night SBP				
No HTN (N=8)	6 (75%)	2 (25%)	0.148	0.656
HTN (N=93)	75 (80.65%)	18 (19.35%)		
Night DBP				
No HTN (N=20)	14 (70%)	6 (30%)	1.633	0.219
HTN (N=81)	67 (82.72%)	14 (17.28%)		

Out of 82 male participants with HTN in all-day SBP, the waist-to-height ratio was not at risk for 18 (21.95%) participants and at risk for 64 (78.05%) participants. Out of 48 male participants with HTN in all-day DBP, the waist-to-height ratio was not at risk for 9 (18.75%) participants and at risk for 39 (81.25%) participants. Out of 63 male participants with HTN in day SBP, the waist to height ratio was not at risk for 15 (23.81%) participants and at risk for 48 (76.19%) participants. Out of 47 male participants with HTN in day DBP, the waist to height ratio was not at risk for 9 (19.15%) participants and at risk for 38 (80.85%) participants. Out of 93 male participants with HTN in night SBP, the waist to height ratio was not at risk for 18 (19.35%) participants and at risk for 75 (80.65%) participants. Out of 81 male participants with HTN in night DBP, the waist to height ratio was not at risk for 14 (17.28%) participants and at risk for 67 (82.72%) participants. No statistically significant relationship was observed among males in all day SBP, all day DBP, day SBP, day DBP, and night DBP between the waist to height ratio (P Value>0.05). (Table 29)

Table 30: Comparison of blood pressure between waist to height ratio in females (N=61)

BP	Waist height ratio (in females)		Chi-square	P-value
	At-Risk	No-Risk		
All-day SBP				
No HTN (N=17)	14 (82.35%)	3 (17.65%)	0.375	0.738
HTN (N=44)	33 (75%)	11 (25%)		
All-day DBP				
No HTN (N=40)	29 (72.5%)	11 (27.5%)	1.360	0.342
HTN (N=21)	18 (85.71%)	3 (14.29%)		
Day SBP				
No HTN (N=28)	22 (78.57%)	6 (21.43%)	0.068	0.795
HTN (N=33)	25 (75.76%)	8 (24.24%)		
Day DBP				
No HTN (N=39)	28 (71.79%)	11 (28.21%)	1.688	0.194
HTN (N=22)	19 (86.36%)	3 (13.64%)		
Night SBP				
No HTN (N=7)	6 (85.71%)	1 (14.29%)	0.336	1.000
HTN (N=54)	41 (75.93%)	13 (24.07%)		
Night DBP				
No HTN (N=18)	14 (77.78%)	4 (22.22%)	0.008	1.000
HTN (N=43)	33 (76.74%)	10 (23.26%)		

Out of 44 female participants with HTN in all-day SBP, the waist-to-height ratio was not at risk for 11 (25%) participants and at risk for 33 (75%) participants. Out of 21 female participants with HTN in all-day DBP, the waist-to-height ratio was not at risk for 3 (14.29%) participants and at risk for 18 (85.71%) participants. Out of 33 female participants with HTN in day SBP, the waist to height ratio was not at risk for 8 (24.24%) participants and at risk for 25 (75.76%) participants. Out of 22 female participants with HTN in day DBP, the waist to height ratio was not at risk for 3 (13.64%) participants and at risk for 19 (86.36%) participants. Out of 54 female participants with HTN in night SBP, the waist to height ratio was not at risk for 13 (24.07%) participants and at risk for 41 (75.93%) participants. Out of 43 female participants with HTN in night DBP, the waist to height ratio was not at risk for 10 (23.26%) participants and at risk for 33 (76.74%) participants. No statistically significant relationship was observed among females in all day SBP, all day DBP, day SBP, day DBP, night SBP and night DBP between the waist to height ratio (P Value>0.05). (Table 30)

DISCUSSION

One of the most common co-morbidities in Type 2 Diabetes Mellitus is systemic hypertension. Because of the pitfalls associated with office blood pressure readings, it has been suggested that ABPM be used for the assessment of hypertension.[8-10] ABPM has the ability to detect masked Hypertension, White coat hypertension besides giving information about 24-hour blood pressure rhythm and nocturnal blood pressure.[10-14] So, the present study was carried out to estimate the prevalence of hypertension in normotensive type 2 diabetic patients by using a 24-hour ambulatory blood pressure machine and also to assess the relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients.

Baseline characteristics of the study sample population:

A cross-sectional hospital-based study was conducted on 162 people attending a tertiary care institute over the age of 18 who had type 2 diabetes and a BMI of 25 to 40 kg/m2 (Asian cut-off >23 kg/m2). All subjects underwent a standardized medical examination that included routine anthropometric, clinical, laboratory tests, and 24-hour ambulatory blood pressure monitoring using an AMBP monitor after an overnight fast of at least 12 hours. The primary goal of this study was to use an AMBP monitoring device to estimate the prevalence of hypertension in type 2 diabetes patients. Gorostidi M et al.[81] studied their database of 68,045 subjects on ABPM and identified 12,600 (18.5%) hypertensive patients with diabetes. Some studies assessed the relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients. Singh S et al.[76] conducted a study to evaluate Ambulatory BP patterns in subjects who are obese and overweight. Shikha D et al.[87] (2015), in their study on 100 African-Caribbean subjects, compared 24-hour ABPM and anthropometric parameters in T2DM Vs. obese subjects. Similar to the present study, diabetic dyslipidemia was also evaluated by Choi S et al.[94] and Mithal A et al.[84] Some authors like Mesquita P et al.[77] specifically measured the prevalence of Orthostatic hypotension in elderly subjects (age> 60 years). Venugopal K et al.[80] studied the prevalence of hypertension in 250 type II diabetic subjects.

Demographic characteristics:

The baseline demographic characteristics of the present study subjects were comparable to that of the studies done by Mesquita P et al.[77] and Venugopal K et al.[80] The majority of the subjects were males (62.35%) in the present study. 55.6% of the subjects were males in the study by Venugopal K et al.[80] This slight male preponderance could be due to the relatively easy accessibility to hospital services for males compared to females in India.

The mean age was 60.65 ± 11.46 years in the present study. Mesquita P et al.[77] did their study on elderly patients (patients aged >60 years) with Type 2 DM. In the study by Venugopal K et al.[80] more than 60% of the subjects were aged between 41 to 60 years. The prevalence of Type II DM increases with age, and hence the mean age of the present study population was reported to be around 60 years.

Table 31: Comparison of baseline study sample characteristics across studies.

S. No.	Author	Reporting/ Published year	Country	Sample size	Major inclusion criteria and Variable for study	Gender (Male)	Mean age or common age group
1	**Present study**	2021	India	162	Type 2 DM patients with BMI of >25 to <40 Kg/m2 (Asian cut off >23) and aged above 18 years and 24-hour ABPM done	62.35%	60.65 ± 11.46 years
2	**Singh S et al.[96]**	2019	India	95	50 overweight, 20 normals, and 25 obese subjects.	47.3% (Total)	38.48±10.9 years in overweight 41.72±10.4 Years in obese
3	**Mesquita P et al.[77]**	2015	Brazil	97	Elderly patients with Type 2 DM	30.9%	68.97 ± 6.8 years
4	**Venugopal K et al.[80]**	2014	India	250	Type 2 DM	55.6%	60% of the subjects were aged between 41 to 60 years
5	**Gorostidi M et al.[81] (2011)**	2011	Spain	68045	Hypertensive patients with diabetes compared with nondiabetic hypertensives, for whom ABPM was done	53.1%	58.5 years

Anthropometric characteristics:

Obesity is an independent modifiable risk factor for Hypertension. Obesity is also an independent risk factor for Diabetes mellitus. The mean BMI was 28.31 ± 2.15 kg/m^2 in the present study population. It is in line with the inclusion criteria, as only subjects with BMI of >25 (Asian cut off >23) to <40 Kg/m^2 were only included. In the study by Gorostidi M et al.[81] Hypertensive patients with diabetes had higher BMI and abdominal obesity prevalence compared to the non-diabetic hypertensives. In the present study, only 13% of the males were obese compared to 85% of the females in the present study. Also, only 78% of males had an increased waist to hip ratio compared to 96.7% in females. But with regards to waist to height ratio, 80.2% of males had increased waist to height ratio compared to 77% in females. This is due to the difference in the cut-off point for males (0.95) and females (0.85) for the waist-hip ratio to determine the risk of adverse cardiovascular events. But with regards to waist to height ratio, only a single cut-off of 0.5 was used for both men and women.

Overall. The mean waist to hip ratio was 1 ± 0.07, while the mean waist to height ratio was 0.54 ± 0.05, indicating the increased cardiovascular risk in the present study population.

Characteristics of 24-hour Ambulatory Blood Pressure Monitoring:

The procedure of measuring blood pressure while moving around and living a normal life is known as ABPM. It is usually done for a 24-hour period. Because Office BP has a low level of reliability, ABPM is recommended in patients with T2DM.

Patients with T2DM are more likely to experience non-dipping, reverse dipping, nocturnal SHT, and masked phenomenon. Non-dipping is defined as a drop in blood pressure of less than 10% during the night.[67] Physiologically, during sleep, BP falls by >10% during night time. Nocturnal non-dipping is associated with an increased risk of cardiovascular events, including death and end-organ damage. Non-dipping is common in diabetic patients and is present in approximately 30% of diabetic subjects.[8] Systolic non-dipping was observed in 93.39 percent of overweight subjects and 90.24 percent of obese subjects, as determined by BMI. Diastolic non-dipping was seen in 76.86 percent of overweight people and 73.17 percent of obese people, according to BMI. In the current study, there was no statistically significant link between the presence or absence of BP dipping (both systolic and diastolic) and BMI classification as obese or overweight. Overall, there was also no clinically significant difference in a mean day vs. night systolic or mean day vs. night diastolic blood pressure. The overall average decline was less than 10%. The mean day SBP was 134.76 ± 13.51 mm/hg, while the mean night SBP was 128.95 ± 15.59 mm/hg when the 24 hr ABP measurements were divided into day and night BP. The mean

DBP during the day was 77.12 ± 11.43 mm/hg, while the mean DBP during the night was 72.95 ± 10.4 mm/hg.

Subjects with DM tend to have higher nocturnal Blood Pressure and higher Morning Blood Pressure Surge (MBPS).[33] Hence, even normotensive diabetic subjects are at risk of developing hypertension. Gorostidi M et al.[81] also observed that non-dipping BP profile prevalence was higher in subjects with diabetes (64.2% *vs*. 51.6%, P<0.001). They compared Blood pressure between Diabetic hypertensive and non-diabetic hypertensive's and found that Diabetic hypertensives had higher SBP in every ABPM period (daytime 135.4 *vs*. 131.8, P<0.001 and night time 126.0 *vs*. 121.0 mm Hg, P<0.001).

Prevalence of hypertension:

Systemic hypertension is one of the most common co-morbidities seen in Type 2 Diabetes Mellitus. In subjects with DM, around 35% to 75% of complications are due to HTN.[32] The mean all-day SBP was 133.66 ± 13.53 mm/hg, while the mean all-day DBP was 76.45 ± 10.99 mm/hg in the present study. In the present study, 2017 American Heart Association guidelines were used for defining hypertension based on ABPM.[6] According to those guidelines, mean all day SBP ≥125 mm Hg or mean all day DBP ≥75 mm Hg were defined as Hypertension. They defined mean daytime SBP ≥130 mm Hg or DBP ≥80 mm Hg as daytime hypertension and mean night-time SBP ≥110 mm Hg or DBP ≥65 mm Hg as Night-time hypertension, respectively.

In this study, the prevalence of HTN as measured by all-day SBP was 77.78%, while it was 42.59% for all-day DBP. The prevalence of HTN as measured by day SBP was 59.26% and was 42.6% for day DBP**.** The prevalence of HTN as measured by night SBP was 90.7% and was 76.5% for night DBP in the present study. Venugopal K et al.[80] in their study, observed that prevalence of hypertension was

25.6% in Type 2 DM patients measured by office BP readings. 52.4% were prehypertensive in their study. This significantly lower prevalence of Hypertension in their study could be due to the use of office BP readings instead of ABPM. Masked HTN is said to be present when office BP levels are normal in an untreated subject, and ABPM levels are elevated and are more common in diabetic patients.

Diabetic dyslipidaemia (Lipid profile):

Diabetic Dyslipidemia is one of the main culprits for CAD in Diabetics in India.[85] Diabetic dyslipidaemia is characterized by elevated triglycerides levels, low HDL-cholesterol elevated small density LDL-cholesterol.[45] These lipid changes are linked with adverse cardiovascular outcomes in the diabetic population.[45]

The mean HDL was slightly decreased in the present study but without any significant increase in LDL. The mean HDL was 35.34 ± 42.25 mg/dl; mean LDL was 66.43 ± 42.95 mg/dl, the mean Cholesterol was 127.74 ± 47.44 mg/dl, while the mean TG was 166.52 ± 131.3 mg/dl. LDL was abnormal only in 14.81%, while HDL was abnormal in only 4.32% of study subjects. Triglycerides were high in 19.8% and very high in 3.7%. The mean HbA1c level was 9.69 ± 2.81 in the study population, indicating a very poor glycaemic control. Stemmer K et al. [83], in their review article, observed that dyslipidaemia is a major risk factor for cardiovascular morbidity in T2DM with obesity. Hirano T[47], observed that serum triglyceride (TG) is a leading predictor of atherosclerotic cardiovascular disease, comparable to low-density lipoprotein cholesterol in populations with type 2 diabetes, which exceeds the predictive power of hemoglobinA1c. Atherogenic dyslipidaemia in diabetes consists of "elevated serum concentrations of TG-rich lipoproteins (TRLs), a high prevalence of small dense low-density lipoprotein (LDL), and low concentrations of cholesterol-rich high-density lipoprotein (HDL)2-C". Uma NM et al.[79] in their study, also concluded that hypertension and its associated risk factor like obesity, dyslipidemia are important risk factors for the development of complications in diabetes patients.

Association between 24 hr ABPM characteristics and anthropometric variables:

Obesity increases the risk of the development of hypertension. Activation of the Renin-angiotensin system is involved in the pathogenesis of hypertension. Increased body mass index (BMI), Decreased physical activity, and sedentary lifestyle are established modifiable risk factors for hypertension, which are commonly seen in Type II Diabetes Mellitus.[16, 17] In DM, besides control of blood glucose, control of blood pressure (BP) is one of the cornerstones in managing micro-vascular and macro-vascular complications of diabetes.[2-5]

In the present study, there was a statistically significant association between all-day SBP, all-day DBP, day SBP and day DBP with BMI (P Value<0.05) in males. But in females, there was a statistically significant association between only all day SBP, day SBP with BMI (P Value<0.05). Similar to the present study, Gupta S and Kapoor S et al.[89] (2012) concluded that body mass index was the best predictor of having hypertension.

In the present study, there was no statistically significant association between various ABMP parameters with other anthropometric parameters like waist to hip ratio and also waist to height ratio (P Value>0.05) respectively in both males and females. Singh S et al.[96] observed that “Overweight and Obese subjects had higher 24-hr SBP (p-value < 0.001) and 24-hr DBP (p-value = 0.001); higher day-time SBP (p-value < 0.001); higher night-time SBP (p-value < 0.001); and widening of 24-hr pulse pressure (> 50 mmHg) (p-value < 0.001) as compared to normal subjects. However, among various abnormal ABPM parameters, the majority of the parameters revealed more incidence of BP abnormalities with increased BMI than with increased

WC, and BMI appeared to be a better anthropometric parameter than WC. They concluded that systolic hypertension is closely associated with adverse cardiovascular outcomes in overweight and obese subjects and, by evaluating ABPM recordings, found that obesity in even non-hypertensive subjects leads to elevation of both systolic blood pressure and diastolic blood pressure". Shikha D et al.[87] did their study on 100 African-Caribbean subjects using 24-hour ABPM observed that the nocturnal systolic fall in BP in Obese and T2DM did not differ from that of lean, whereas nocturnal diastolic fall in BP was significant in Obese and T2DM compared to lean (11.5 and 10.4 vs. 20.6 mm Hg; $p < 0.01$). In the present study, there was also no significant association between BMI status (Overweight Vs. Obese) and systolic, diastolic dipping, respectively (Presence Vs. Absence). Mesquita P et al.[77] (2015), in their study, observed that mean BMI was significantly higher in patients with Orthostatic hypertension than in those without it. But the present study did not evaluate about orthostatic hypertension.

Over the past decade, noninvasive ABPM has been developed that can reliably record changes in blood pressure over 24 hours. Office measurement of BP is not an ideal method for representing 24-hour BP on comparison with ABPM.[35] Only Clinic based BP measurements are used to manage blood pressure in the majority /of the hypertensive subjects, but their daily variability in BP is not available. The sensitivity of Clinic/ Office monitoring of BP to predict hypertension-associated organ damage is less.[36, 37] Patients with T2DM are likely to benefit from routine ABP monitoring by early identification and management of Hypertension in Type II DM.[38]

CONCLUSION

1. One of the most common co-morbidities in Type 2 Diabetes Mellitus is Systemic Hypertension.
2. ABPM is the procedure of measuring BP while moving around and living in normal life for a period of 24 hours. It is more reliable compared to office BP readings.
3. A cross-sectional hospital-based study was done on 162 subjects aged more than 18 years with type 2 diabetes mellitus having BMI of >25 (Asian cut off >23) to <40 Kg/m2 in a tertiary care institute.
4. The majority of the subjects were males (62.35%). The mean age was 60.65 ± 11.46 years.
5. The mean BMI was 28.31 ± 2.15 kg/m^2. Only 13% of the males were obese compared to 85% of the females.
6. 78% of males had an increased waist to hip ratio compared to 96.7% in females. 80.2% of males had an increased waist-to-height ratio compared to 77% in females.
7. The mean HbA1c was 9.69 ± 2.81, indicating a poor glycaemic control in the study population.
8. The mean HDL (35.34 ± 42.25 mg/dl) was slightly decreased in the present study, but without any significant increase in mean LDL (66.43 ± 42.95 mg/dl) and mean TG (166.52 ± 131.3 mg/dl).
9. The mean all-day SBP was 133.66 ± 13.53 mm/hg, while the mean all-day DBP was 76.45 ± 10.99 mm/hg. The prevalence of HTN as measured by all-day SBP was 77.78%, while it was only 42.59% for all-day DBP.
10. The mean day SBP was 134.76 ± 13.51 mm/hg, while the mean night SBP was 128.95 ± 15.59 mm/hg. The mean day DBP was 77.12 ± 11.43 mm/hg, while the mean night DBP was 72.95 ± 10.4 mm/hg.

11. The prevalence of HTN as measured by day SBP was 59.26% while it was 42.6% for day DBP while the prevalence of HTN as measured by night SBP was 90.7% while it was 76.5% for night DBP.
12. The difference between overall mean day and night BP for both systolic and diastolic components was <10%.
13. Systolic non-dipping was seen in 93.39% of overweight and 90.24% of obese subjects as classified by BMI, respectively. Diastolic non-dipping was seen in 76.86% of overweight and 73.17% of obese subjects as classified by BMI, respectively.
14. There was a statistically significant association between all-day SBP, all-day DBP, day SBP and day DBP with BMI (P Value<0.05) in males. But in females, there was a statistically significant association between only all day SBP, day SBP with BMI (P Value<0.05).
15. There was no statistically significant association between various ABMP parameters with other anthropometric parameters like waist to hip ratio and also waist to height ratio (P Value>0.05) respectively in both males and females.
16. Patients with T2DM can benefit from routine ABPM by early identification and management of Hypertension in Type II DM.

SUMMARY

Systemic Hypertension (HTN) is one of the most common co-morbidities in Diabetes Mellitus (DM). Because of the drawbacks of office blood pressure monitoring, it has been suggested that ambulatory blood pressure monitoring (ABPM) be used for hypertension assessment. The sensitivity of Clinic/Office monitoring of BP to predict hypertension-associated organ damage is less. Besides Hypertension, obesity is a major independent and modifiable risk factor for type 2 diabetes mellitus. The link between high blood pressure and obesity has long been known. ABPM has the ability to detect masked Hypertension, White coat hypertension besides giving information about 24-hour blood pressure rhythm and nocturnal blood pressure. Hence the present study was carried out to estimate the prevalence of hypertension in normotensive type 2 diabetic patients by using a 24-hour ambulatory blood pressure machine and also to assess the relationship between blood pressure patterns and anthropometric measurements in overweight and obese type 2 diabetic patients.

A cross-sectional hospital-based study was conducted on 162 people, attending a tertiary care institute over the age of 18, who had type 2 diabetes and a BMI of 25 to 40 kg/m2 (Asian cut- off > 23 kg/m2). All subjects underwent a standardized medical examination that included routine anthropometric, clinical, laboratory tests, and 24-hour ambulatory blood pressure monitoring using an AMBP monitor after an overnight fast of at least 12 hours. The primary goal of this study was to use an AMBP monitoring device to estimate the prevalence of hypertension in type 2 diabetes patients. The following blood investigations were done after an overnight 8 hours fast; Fasting blood sugar, Post Prandial blood sugar, Fasting lipid profile and HbA1C. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. P value

<0.05 was considered statistically significant. The data were analysed by using SPSS software.

Majority of the subjects were males (62.35%). The mean age was 60.65 ± 11.46 years. The mean BMI was 28.31 ± 2.15 kg/m^2. Only 13% of the males were obese compared to 85% of the females. 78% of males had increased waist to hip ratio compared to 96.7% in females. 80.2% of males had increased waist to height ratio compared to 77% in females. The mean HbA1c was 9.69 ± 2.81, indicating a poor glycemic control in the study population. The mean HDL (35.34 ± 42.25 mg/dl) was slightly decreased in the present study, but without any significant increase in mean LDL (66.43 ± 42.95 mg/dl) and mean TG (166.52 ± 131.3 mg/dl).

The mean all day SBP was 133.66 ± 13.53 mm/hg while the mean all day DBP was 76.45 ± 10.99 mm/hg. The prevalence of HTN as measured by all day SBP was 77.78% while it was only 42.59% for all day DBP. The mean day SBP was 134.76 ± 13.51 mm/hg while the mean night SBP was 128.95 ± 15.59 mm/hg. The mean day DBP was 77.12 ± 11.43 mm/hg while the mean night DBP was 72.95 ± 10.4 mm/hg. The prevalence of HTN as measured by day SBP was 59.26% while it was 42.6% for day DBP while the prevalence of HTN as measured by night SBP was 90.7% while it was 76.5% for night DBP. The difference between overall mean day and night BP for both systolic and diastolic components was <10%. Systolic non-dipping was seen in 93.39% of overweight and 90.24% of obese subjects as classified by BMI, respectively. Diastolic non-dipping was seen in 76.86% of overweight and 73.17% of obese subjects as classified by BMI, respectively.

There was a statistically significant association between all day SBP, all day DBP, day SBP and day DBP with BMI (P Value <0.05) in males. But in females, there was a statistically significant association between only all day SBP, day SBP with BMI (P Value < 0.05). There was no statistically significant association between various ABMP parameters with other anthropometric parameters like waist to hip ratio and also waist to height ratio (P Value > 0.05) respectively in both males and females. Patients with T2DM can benefit from routine ABPM by early identification and management of Hypertension in Type II DM.

The present study was limited by the cross-sectional nature of the study. The causal or temporal association cannot be proved in the cross-sectional design as to whether diabetes mellitus occurred before hypertension or hypertension occurred before diabetes mellites. Because of the practical constraints, only consecutive hospital-based sampling was done.

The present study was one of the kind in the study region as there was no report of ABPM parameters in the study population. Larger scale, Multi-centric follow up studies on a cohort of Type II Diabetes Mellitus, with follow up from the time of diagnosis would be beneficial to determine the incidence of Hypertension in Type II DM. Community based studies will increase the validity of the results.

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ANNEXURE I. ETHICAL CLEARANCE.

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH

(Deemed-to-be-University)

Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (Govt.)

JAWAHARLAL NEHRU MEDICAL COLLEGE,

NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)

Website: http//www.jnmc.edu
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Phone: (+91-(0)831 Office : 2472550
Principal : 2471701
Fax No. +91 (0)831 : 2470759

Ref: MDC/DOME/ 224 Date: 24/12/2019

To,

REGISTRATION NO: BG0119014

PG student in Medicine,
J.N.Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"BLOOD PRESSURE MONITORING IN NORMOTENSIVE TYPE – 2 DIABETICS USING 24HR BLOOD PRESSURE MONITORING DEVICE AND ITS RELATIONSHIP WITH ANTHROPOMETRIC MEASUREMENTS: A ONE YEAR HOSPITAL BASED CROSS SECTIONAL STUDY"**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Anita Dalal)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

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ANNEXURE II

INFORMED CONSENT

TITLE OF RESEARCH STUDY: **BLOOD PRESSURE MONITORING IN NORMOTENSIVE TYPE – 2 DIABETICS USING 24HR BLOOD PRESSURE MONITORING DEVICE AND ITS RELATIONSHIP WITH ANTHROPOMETRIC MEASUREMENTS – 1 YEAR HOSPITAL BASED CROSS- SECTIONAL STUDY**

Principle Investigator:
REGISTRATION NO: BG0119014
Post Graduate Student,
Department Of General Medicine,
JNMC, Belagavi.
Guide:

DR.___________________
Professor & Head,
Department of Medicine
KLES Dr. Prabhakar Kore Hospital
And Research Centre Campus –
Belagavi.

Introduction and Purpose:-
Procedure:

If you agree to be part of the research study, you will be asked the relevant history and

1 Your height and weight will be measured and BMI (body mass index) will be calculated.
2 Your waist circumference will also be calculated.
3 Your hip measurement will be taken.
4 Blood investigation will be done to find out Fasting blood sugar, Post prandial blood sugar, Fasting lipid sugar (Total cholesterol, Triglycerides; High density lipoprotein cholesterol, Low density lipoprotein cholesterol) and Hba1c.

5. Blood pressure measuring cuff of appropriate size will be tied around your arm for 24 hrs.

Risk and Benefits:

The risks involved in drawing blood from a vein may include, but are not limited to, momentary discomfort at the site of the blood draw, possible bruising, redness, and swelling around the site, bleeding at the site, feeling of lightheadedness when the blood is drawn, and rarely, an infection at the site of the blood draw.

The only risk and possible discomfort you might get is skin irritation, noise, inconvenience with work, disturbance in sleep and hematoma with ambulatory blood pressure monitor.

You may or may not be benefitted by this study but you will be part of a study which is going to be useful to others in the future.

Alternative:

Taking part in this study is voluntary. You may choose not to take part in this study. If you decide to take part you can later change your mind and withdraw from the study. Your decision will not change the present or future health care or other services that you receive. The study doctor or sponsor may stop your participation in this study at any time. If you choose not to take part in the study. You will receive the standard treatment for patients with your condition.

Privacy and Confidentiality:

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. The code number will identify you in this research record. Information from this study may be published but your identity will be confidential in any publication.

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicates that I have read this consent form, or it has been read to me, this consent form and have had all the questions answered.

Institution/ Sponsor's Policy:
Does not apply to this research

Financial incentives for participation:

You will not be paid / offered any gifts /incentives for participating in the study.

Authorization to publish the results:

The results of the study would be forwarded to the KLE University, Belgaum as part of requirement towards the completion of MD degree, review and publishing.

In case of the queries during study or in future you may contact following persons,

Dr. Roopa Bellad
Chairman,
J.N.M.C Ethical Committee for Human Research
9480275601

Dr. ___________
Professor & Head
Dept. of General Medicine,
JNMC, Belgaum.
9448845883

REG. NO: BG0119014
PG in General Medicine,
JNMC, Belgaum.
9460733029

INFORMED CONSENT FORM

Title Of Research Study: BLOOD PRESSURE MONITORING IN NORMOTENSIVE TYPE – 2 DIABETICS USING 24HR BLOOD PRESSURE MONITORING DEVICE AND ITS RELATIONSHIP WITH ANTHROPOMETRIC MEASUREMENTS: A ONE YEAR HOSPITAL BASED CROSS SECTIONAL STUDY

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicates that I have read this consent form, or it has been read to me and has been explained to me in my vernacular language, and all my questions have been answered. I will be given a copy of this consent form.

Signature / Left Thumb print of the Participant or legally authorized representative

Participant's name:……………………………...

Signature / Left thumb impression:……………………………...
of the participant

Name of the legally authorized:……………………………...
representative / guardian

Signature / Left thumb impression:……………………………...

Witness' name:……………………………...

Signature / Left thumb impression:……………………………...

Investigator's name and signature:……………………………...

Date:

Place:

ಮಾಹಿತಿ ವಿಷಯ

ಸಂಶೋಧನಾ ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ: "ನಾರ್ಮೋಟೆನ್ಸಿವ್ ಟೈಪ್‌ನಲ್ಲಿ ರಕ್ತದೊತ್ತಡ ಮಾನಿಟರಿಂಗ್ - 2 ಡಯಾಬಿಟಿಕ್ಸ್ 24 ಹೆಚ್‌ಆರ್ ರಕ್ತದೊತ್ತಡ ಮಾನಿಟರಿಂಗ್ ಸಾಧನ ಮತ್ತು ಅದರ ಸಂಬಂಧವನ್ನು ಆಂಥ್ರೊಪೊಮೆಟ್ರಿಕ್ ಮಾಪನದೊಂದಿಗೆ ಬಳಸುವುದು - 1 ವರ್ಷ ಕ್ರಾಸ್ ಸೆಕ್ಷನಲ್ ಸ್ಟಡಿ"

ತತ್ವ ತನಿಖಾಧಿಕಾರಿ: -

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ಸ್ನಾತಕೊತ್ತರ ವಿದ್ಯಾರ್ಥಿ,

ಜನರಲ್ ಮೆಡಿಸಿನ್ ಇಲಾಖೆ,

ಜೆಎನ್‌ಎಂಸಿ, ಬೆಳಗಾವಿ.

ಮಾರ್ಗದರ್ಶಿ: -

ಡಾ. ________________

ಪರಿಚಯ ಮತ್ತು ಉದ್ದೇಶ: -

ವಿಧಾನ:

ಸಂಶೋಧನಾ ಅಧ್ಯಯನದ ಭಾಗವಾಗಲು ನೀವು ಒಪ್ಪಿದರೆ, ನಿಮಗೆ ಸಂಬಂಧಿತ ಇತಿಹಾಸವನ್ನು ಕೇಳಲಾಗುತ್ತದೆ ಮತ್ತು

1. ನಿಮ್ಮ ಎತ್ತರ ಮತ್ತು ತೂಕವನ್ನು ಅಳೆಯಲಾಗುತ್ತದೆ ಮತ್ತು BMI (ಬಾಡಿ ಮಾಸ್ ಇಂಡೆಕ್ಸ್) ಅನ್ನು ಲೆಕ್ಕಹಾಕಲಾಗುತ್ತದೆ.
2. ನಿಮ್ಮ ಸೊಂಟದ ಸುತ್ತಳತೆಯನ್ನು ಸಹ ಲೆಕ್ಕಹಾಕಲಾಗುತ್ತದೆ.
3. 3 ನಿಮ್ಮ ಸೊಂಟದ ಅಳತೆಯನ್ನು ತೆಗೆದುಕೊಳ್ಳಲಾಗುತ್ತದೆ.
4. ಯಾದೃಚ್ blood ೕ ರಕ್ತದಲ್ಲಿನ ಸಕ್ಕರೆ, ಒಟ್ಟು ಕೊಲೆಸ್ಟ್ರಾಲ್, ಟ್ರೈಗ್ಲಿಸರೈಡ್ಗಳನ್ನು ಕಂಡುಹಿಡಿಯಲು ರಕ್ತ ತನಿಖೆ ನಡೆಸಲಾಗುವುದು; ಹೆಚ್ಚಿನ ಸಾಂದ್ರತೆಯ ಲಿಪೊಪ್ರೋಟೀನ್ ಕೊಲೆಸ್ಟ್ರಾಲ್, ಕಡಿಮೆ ಸಾಂದ್ರತೆಯ ಲಿಪೊಪ್ರೋಟೀನ್ ಕೊಲೆಸ್ಟ್ರಾಲ್.
5. ಸೂಕ್ತವಾದ ಗಾತ್ರದ ರಕ್ತದೊತ್ತಡವನ್ನು ಅಳೆಯುವ ಪಟ್ಟಿಯನ್ನು ನಿಮ್ಮ ತೋಳಿನ ಸುತ್ತಲೂ 24 ಗಂಟೆಗಳ ಕಾಲ ಕಟ್ಟಲಾಗುತ್ತದೆ.

ಅಪಾಯ ಮತ್ತು ಪ್ರಯೋಜನಗಳು:

ರಕ್ತನಾಳದಿಂದ ರಕ್ತವನ್ನು ಸೆಳೆಯುವಲ್ಲಿ ಉಂಟಾಗುವ ಅಪಾಯಗಳು ಒಳಗೊಂಡಿರಬಹುದು, ಆದರೆ ಅವುಗಳಿಗೆ ಸೀಮಿತವಾಗಿಲ್ಲ, ರಕ್ತ ಸೆಳೆಯುವ ಸ್ಥಳದಲ್ಲಿ ಕ್ಷಣಿಕ ಅಸ್ವಸ್ಥತೆ, ಮೂಗೇಟುಗಳು, ಕೆಂಪು ಮತ್ತು ಸೈಟ್ ಸುತ್ತಲೂ elling ತ, ಸೈಟ್ನಲ್ಲಿ ರಕ್ತಸ್ರಾವ, ರಕ್ತ ಬಂದಾಗ ಲಘು ತಲೆನೋವಿನ ಭಾವನೆ ರಕ್ತವನ್ನು ಸೆಳೆಯುವ ಸ್ಥಳದಲ್ಲಿ ಸೋಂಕು ಎಳೆಯಲಾಗುತ್ತದೆ ಮತ್ತು ವಿರಳವಾಗಿ ಕಂಡುಬರುತ್ತದೆ.

ಚರ್ಮದ ಕಿರಿಕಿರಿ, ಶಬ್ದ, ಕೆಲಸದಲ್ಲಿ ಅನಾನುಕೂಲತೆ, ನಿದ್ರೆಯಲ್ಲಿ ಅಡಚಣೆ ಮತ್ತು ಆಂಬ್ಯುಲೇಟರಿ ರಕ್ತದೊತ್ತಡ ಮಾನಿಟರ್‌ನೊಂದಿಗೆ ಹೆಮಟೋಮಾ ಮಾತ್ರ ನೀವು ಪಡೆಯುವ ಅಪಾಯ ಮತ್ತು ಸಂಭವನೀಯ ಅಸ್ವಸ್ಥತೆ.

ಈ ಅಧ್ಯಯನದ ಮೂಲಕ ನಿಮಗೆ ಲಾಭವಾಗಬಹುದು ಅಥವಾ ಇಲ್ಲದಿರಬಹುದು ಆದರೆ ನೀವು ಭವಿಷ್ಯದಲ್ಲಿ ಇತರರಿಗೆ ಉಪಯುಕ್ತವಾಗಲಿರುವ ಅಧ್ಯಯನದ ಭಾಗವಾಗುತ್ತೀರಿ.

ಪರ್ಯಾಯ:

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವುದು ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸದಿರಲು ನೀವು ಆಯ್ಕೆ ಮಾಡಬಹುದು.

ನೀವು ಭಾಗವಹಿಸಲು ನಿರ್ಧರಿಸಿದರೆ ನೀವು ನಂತರ ನಿಮ್ಮ ಮನಸ್ಸನ್ನು ಬದಲಾಯಿಸಬಹುದು ಮತ್ತು ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು. ನಿಮ್ಮ ನಿರ್ಧಾರವು ಪ್ರಸ್ತುತ ಅಥವಾ ಭವಿಷ್ಯದ ಆರೋಗ್ಯ ರಕ್ಷಣೆ ಅಥವಾ ನೀವು ಸ್ವೀಕರಿಸುವ ಇತರ ಸೇವೆಗಳನ್ನು ಬದಲಾಯಿಸುವುದಿಲ್ಲ. ಅಧ್ಯಯನ ವೈದ್ಯರು ಅಥವಾ ಪ್ರಾಯೋಜಕರು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನಿಮ್ಮ ಭಾಗವಹಿಸುವಿಕೆಯನ್ನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನಿಲ್ಲಿಸಬಹುದು. ನೀವು ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸದಿರಲು ಆರಿಸಿದರೆ. ನಿಮ್ಮ ಸ್ಥಿತಿಯ ರೋಗಿಗಳಿಗೆ ನೀವು ಪ್ರಮಾಣಿತ ಚಿಕಿತ್ಸೆಯನ್ನು ಸ್ವೀಕರಿಸುತ್ತೀರಿ.

ಗೌಪ್ಯತೆ ಮತ್ತು ಗೌಪ್ಯತೆ:

ಈ ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ನಿಮ್ಮ ಬಗ್ಗೆ ಸಂಗ್ರಹಿಸಲಾದ ಎಲ್ಲಾ ಮಾಹಿತಿಯನ್ನು ಕಾನೂನಿನಿಂದ ಅನುಮತಿಸುವ ಮಟ್ಟಿಗೆ ಗೌಪ್ಯವಾಗಿಡಲಾಗುತ್ತದೆ. ಈ ಸಂಶೋಧನಾ ದಾಖಲೆಯಲ್ಲಿ ಕೋಡ್ ಸಂಖ್ಯೆ ನಿಮ್ಮನ್ನು ಗುರುತಿಸುತ್ತದೆ. ಈ ಅಧ್ಯಯನದ ಮಾಹಿತಿಯನ್ನು ಪ್ರಕಟಿಸಬಹುದು ಆದರೆ ಯಾವುದೇ ಪ್ರಕಟಣೆಯಲ್ಲಿ ನಿಮ್ಮ ಗುರುತು ಗೌಪ್ಯವಾಗಿರುತ್ತದೆ.

ಕೆಳಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪುತ್ತೇನೆ. ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಹಿಂತೆಗೆದುಕೊಳ್ಳಬಹುದು. ಈ ಫಾರ್ಮ್ಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ನಾನು ನನ್ನ ಯಾವುದೇ ಕಾನೂನು ಹಕ್ಕುಗಳನ್ನು ಬಿಟ್ಟುಕೊಡುತ್ತಿಲ್ಲ. ಕೆಳಗಿನ ನನ್ನ ಸಹಿ ನಾನು ಈ ಒಪ್ಪಿಗೆಯ ಫಾರ್ಮ್ ಅನ್ನು ಓದಿದ್ದೇನೆ ಅಥವಾ ಅದನ್ನು ನನಗೆ ಒಪ್ಪಿದೆ, ಈ ಒಪ್ಪಿಗೆಯ ಫಾರ್ಮ್ ಅನ್ನು ಓದಿದೆ ಮತ್ತು ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಲಾಗಿದೆ ಎಂದು ಸೂಚಿಸುತ್ತದೆ.

ಒಪ್ಪಿಗೆ ಪತ್ರ

ಸಂಸ್ಥೆ / ಪ್ರಾಯೋಜಕರ ನೀತಿ:

ಈ ಸಂಶೋಧನೆಗೆ ಅನ್ವಯಿಸುವುದಿಲ್ಲ

ಒಪ್ಪಿಗೆ ಪತ್ರ

ಕೆಳಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪುತ್ತೇನೆ. ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಹಿಂತೆಗೆದುಕೊಳ್ಳಬಹುದು. ಈ ಫಾರ್ಮ್ಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ನಾನು ನನ್ನ ಯಾವುದೇ ಕಾನೂನು ಹಕ್ಕುಗಳನ್ನು ಬಿಟ್ಟುಕೊಡುತ್ತಿಲ್ಲ. ಕೆಳಗಿನ ನನ್ನ ಸಹಿ ನಾನು ಈ ಒಪ್ಪಿಗೆಯ ಫಾರ್ಮ್ ಅನ್ನು ಓದಿದ್ದೇನೆ ಅಥವಾ ಅದನ್ನು ನನಗೆ ಒಪ್ಪಿದೆ, ಈ ಒಪ್ಪಿಗೆಯ ಫಾರ್ಮ್ ಅನ್ನು ಓದಿದೆ ಮತ್ತು ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಲಾಗಿದೆ ಎಂದು ಸೂಚಿಸುತ್ತದೆ.

ಭಾಗವಹಿಸುವವರ ಅಥವಾ ಕಾನೂನುಬದ್ಧವಾಗಿ ಅಧಿಕೃತ ಪ್ರತಿನಿಧಿಯ ಸಹಿ / ಎಡ ಹೆಬ್ಬೆರಳು ಮುದ್ರಣ

ಭಾಗವಹಿಸುವವರ ಹೆಸರು: ....

ಭಾಗವಹಿಸುವವರ ಸಹಿ / ಎಡ ಹೆಬ್ಬೆರಳು ಅನಿಸಿಕೆ: ....

ಕಾನೂನುಬದ್ಧವಾಗಿ ಅಧಿಕೃತ ಪ್ರತಿನಿಧಿ / ರಕ್ಷಕರ ಹೆಸರು: ....

ಸಹಿ / ಎಡ ಹೆಬ್ಬೆರಳು ಅನಿಸಿಕೆ: ....

ಸಾಕ್ಷಿಯ ಹೆಸರು: ....

ಸಹಿ / ಎಡ ಹೆಬ್ಬೆರಳು ಅನಿಸಿಕೆ: ....

माहितीपूर्ण संमती

संशोधन अभ्यासाचे शीर्षक: नॉर्मोटेंसिव्ह प्रकारात 24 तासाचा रक्तदाब बदल - २ मधुमेह 24 तास एम्बुलेटरी रक्तरंजित मॉनिटरींग वापरणे- 1 वर्षाचे क्रॉस सेक्शनल स्टडी

तत्त्व अन्वेषक:

पदव्युत्तर विद्यार्थी

REG. NO: BG0119014

सामान्य वैद्यकीय तपासणी विभाग

जे. एन. एम. सी. बेळगाव.

मार्गदर्शक-

डॉ. ____________

प्रस्तावना आणि उद्देश-

आपण संशोधन अभ्यासाचे भाग होण्यासाठी सहमत असल्यास, आपल्याला संबंधित इतिहास विचारला जाईल आणि

1. आपली उंची आणि वजन मोजला जाईल आणि बीएमआय (बॉडी मास इंडेक्स) मोजला जाईल
2. आपल्या कंबरचा घेर देखील मोजला जाईल.
3. आपला हिप मापुन घेतला जाईल.
4. रँडम ब्लड शुगर, टोटल कोलेस्ट्रॉल, ट्रायग्लिसराइड्स उच्च घनतेचा लिपोप्रोटीन कोलेस्ट्रॉल, कमी घनतेचा लिपोप्रोटिन कोलेस्ट्रॉल शोधण्यासाठी रक्त तपासणी केली जाईल;.
5. योग्य आकाराचे रक्तदाब मोजण्याचे कफ आपल्या हाताभोवती चोवीस तास बांधलेला असेल

जोखीम आणि फायदे:

रक्तव□□नीतून रक्त क□ढण्य□त □ण□□□जोखमीमध्य□रक्त ड्रॉच्य□जग□वर क्षणिक अस्वस्थत□, संभ□व्य जखम, ल□लसरपण□आणि त्य□जग□भोवती सूज □ण□,त्य□जग□ी रक्तस्त्र□व □ोण□,रक्त कमी □ोण□□□भ□वनांच□□समाव□श असू शकतो. रक्त क□ढल□ल्य□ जग□वर संक्रमण क्वचितच क□ढल□ज□त□

आपल्य□ल□ कद□चित एकम□त्र जोखीम आणि संभ□व्य असुविध□ची समस्य□ म्हणज□त्वच□ची जळजळ, आव□ज, क□म□ची असुविध□, झोप□ची गडबड आणि रूग्णव□□िक रक्तद□ब मॉनिटरस□ □□□ोम□

आपल्य□ल□□□अभ्य□स□च□ फ□□द□□ोऊ शक□ल किंव□नस□ल परंतु आपण अश□अभ्य□स□च□ भ□ग व्ह□ल ज□भविष्य□त इतर□ंन□ उप□ुक्त ठर□ल.

वैकल्पिक:

□□अभ्य□स□मध्य□भ□ग घ□ण□ऐच्छिक आ□□आपण □□अभ्य□स□मध्य□भ□ग न घ□ण□निवडू शकत□ आपण भ□ग घ□ण्य□च□निर्ण□ घ□तल्य□स आपण नंतर आपल□मत बदलू आणि अभ्य□स□प□सून दूर ज□ऊ शकत□ आपल□निर्ण□□मुळ□आपल्य□ल□प्र□प्त झ□ल□ल्य□सद्य किंव□भविष्य□तील आरोग्य स□व□किंव□इतर स□व□बदलण□र न□□ीत.

अभ्य□स डॉक्टर □□अभ्य□स□मध्य□आपल□स□भ□ग कधी□ी □□ब□वू शकतो. आपण निवडल्य□स अभ्य□स□त भ□ग घ□ऊ न□□आपल्य□स□ रूग्ण□ंस□ठी आपल्य□ल□प्रम□णित उपच□र मिळ□ल अट.

गोपनीयता:

□□अभ्य□स□च्य□दरम्य□न आपल्य□बद्दल संग्र□ित क□ल□ली सर्व म□□िती गोपनी□ ठ□वली ज□ईल. कोड आपल्य□ल□□□संशोधन र□कॉर्डमध्य□ओळख□ल. □□अभ्य□स□ची म□□िती प्रक□शित क□ली ज□ऊ शकत□परंतु आपली ओळख गोपनी□ अस□ल

संस्था / प्रायोजक यांचे धोरण:

□□संशोधन□स ल□गू □ोत न□□ी

संमती फॉर्म

मी खा□ली स्वा□क्षरी करून □□अभ्या□सा□त भा□ग घ□ण्या□स स्वा□च्छे□न□ □स□मत आ□□मी कधी□ी मा□घा□र घा□ऊ शकतो. □□फॉर्मवर स□ी करून मी कोणत□ी क□□दा□शीर □क्क दा□त न□ी. मा□झी स्वा□क्षरी खा□ली सूचित करता□ की मी □□संमती फॉर्म वा□चल□आ□, किंवा□ता□मल□वा□चल□गा□ल□आ□, आणि सर्व प्रश्ना□ंची उत्तरा□दिली आ□ा□त.

स□भा□गीची स□ी / डा□वा□अंगठा□ठस□

स□भा□गीचा□ना□व: ……………………………………………..

स□भा□गीची स□ी / डा□वा□अंगठा□ठस□ ……………………………………………..

क□□दा□शीररित्य□अधिकृत प्रतिनिधी / पा□लकांचा□ना□व: ……………………………….

स्वा□क्षरी / डा□व्या□अंगठा□चा□ठस□ ………………………………………………….

सा□क्षीदा□रा□चा□ना□व: ……………………………………………..

स्वा□क्षरी / डा□व्या□अंगठा□चा□ठस□ ……………………………………………..

ANNEXURE – III - PROFORMA

Date:

Patient identification no.:

I. Patient Information:

Name	
Age	
Sex	
IPD No.	
Address	
Socio-Economic Status	
Urban/rural	
Phone no.	
Education status Occupation	
Marital status	
Monthly Income	

Height	
Weight	
Waist circumference	
Hip circumference	
Body Mass Index	
Family history	
Diagnosis	

II. Ambulatory blood pressure monitor questionnaire

- Did you find the monitor heavy? 1. Yes ☐ 2. No ☐
- Did you find the monitor comfortable to wear? 1. Yes ☐ 2. No ☐
  the monitor straightforward to use? 1. Yes ☐ 2. No ☐
- Did you find the monitor cumbersome to wear?
  At home 1. Yes ☐ 2. No ☐
  At work 1. Yes ☐ 2. No ☐
  In hospital 1. Yes ☐ 2. No ☐
  Driving 1. Yes ☐ 2. No ☐
  Other
- After the first little inflation did the cuff inflation disturb you?
  At home 1. Yes ☐ 2. No ☐
  At work 1. Yes ☐ 2. No ☐
  In hospital 1. Yes ☐ 2. No ☐
  Driving 1. Yes ☐ 2. No ☐
  Other

- Did the noise of the pump disturb you?

At home	1. Yes ☐	2. No ☐
At work	1. Yes ☐	2. No ☐
In hospital	1. Yes ☐	2. No ☐
Driving	1. Yes ☐	2. No ☐
Other		

- Did the noise of the pump disturb others? 1. Yes ☐ 2. No ☐
- Did you find the monitor embarrassing to wear? 1. Yes ☐ 2. No ☐
- Did you find the monitor interfered with your normal sleeping pattern? 1. Yes ☐ 2. No ☐

III. Past History:

Diabetes	
Hypertension	
Renal Failure	
Liver Disease	
Cardiac Disease	
Other significant past history	

I. Personal History:

Alcohol	
Smoking	
Other substance abuse	

Other Concomitant Medications:

Sl. No	Drug	Dose	Duration

ANNEXURE - IV- MASTER CHART

S.No	AGE	SEX	HT	WT	BMI	WC IN CM	HC In cm	HBA1C	Cholesterol	LDL	HDL	TG	ALL DAY SBP	ALL DAY DBP	DAY SBP	DAYS DBP	NIGHTSBP	NIGHTDBP	Night SBP	Night DBP	Waist hip ratio	waist height ratio	BMI	Cholesterol
1.0	35.0	M	173.0	86.0	28.7	82.0	94.0	8.5	217.0	80.0	36.0	506.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	.87	.47	Overweight	Boderline
2.0	48.0	M	177.0	80.0	25.5	81.0	92.3	10.8	101.0	41.0	27.0	165.0	158.00	91.0	156.0	90.0	163.0	93.0	163	93	.88	.46	Overweight	Desirable
3.0	49.0	M	140.0	47.0	24.0	77.0	95.5	7.9	193.0	92.0	37.0	319.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	.81	.55	Normal	Desirable
4.0	77.0	M	168.0	84.0	29.9	80.0	94.0	6.4	50.0	15.0	12.0	115.0	133.00	71.0	134.0	72.0	130.0	67.0	130	67	.85	.48	Overweight	Desirable
5.0	56.0	M	155.0	60.0	25.0	83.0	93.0	14.0	98.0	56.0	31.0	57.0	156.00	81.0	155.0	81.0	158.0	82.0	158	82	.89	.54	Overweight	Desirable
6.0	60.0	F	170.0	74.0	25.6	82.0	99.0	14.0	127.0	60.0	44.0	115.0	154.00	74.0	153.0	73.0	155.0	77.0	155	77	.83	.48	Overweight	Desirable
7.0	29.0	M	167.0	89.0	32.0	87.0	92.6	8.7	166.0	106.0	43.0	86.0	151.00	98.0	154.0	101.0	141.0	90.0	141	90	.94	.52	Obese	Desirable
8.0	52.0	M	168.0	84.0	29.9	88.0	88.5	13.9	150.0	101.0	27.0	110.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	.99	.52	Overweight	Desirable
9.0	66.0	M	155.0	73.0	30.4	92.0	86.0	11.0	123.0	70.0	36.0	76.0	145.00	74.0	147.0	76.0	138.0	67.0	138	67	1.07	.59	Obese	Desirable
10.0	60.0	M	178.0	94.0	29.7	90.0	95.0	7.1	146.0	95.0	29.0	110.0	126.00	63.0	127.0	65.0	120.0	58.0	120	58	.95	.51	Overweight	Desirable
11.0	58.0	M	165.0	77.0	28.5	87.0	87.0	6.6	69.0	22.0	28.0	94.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	1.00	.53	Overweight	Desirable
12.0	73.0	M	140.0	47.0	24.0	93.0	87.0	7.3	80.0	38.0	12.0	149.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	1.07	.66	Normal	Desirable
13.0	50.0	F	170.0	88.0	30.7	94.0	96.0	6.7	221.0	98.0	87.0	181.0	142.00	92.0	146.0	97.0	135.0	85.0	135	85	.98	.55	Obese	Boderline
14.0	65.0	M	175.0	69.0	27.9	91.0	88.0	7.3	134.0	71.0	26.0	185.0	148.00	83.0	149.0	84.0	145.0	78.0	145	78	1.03	.52	Overweight	Desirable
15.0	55.0	F	168.0	84.0	29.9	87.0	89.0	8.2	81.0	34.0	33.0	70.0	144.00	83.0	145.0	84.0	139.0	80.0	139	80	.98	.52	Overweight	Desirable
16.0	48.0	F	140.0	47.0	24.0	80.0	87.0	13.0	157.0	88.0	36.0	167.0	118.00	73.0	118.0	74.0	117.0	71.0	117	71	.92	.57	Normal	Desirable
17.0	70.0	M	175.0	92.0	30.0	96.0	86.0	8.7	82.0	27.0	11.0	219.0	125.00	74.0	126.0	73.0	123.0	77.0	123	77	1.12	.55	Obese	Desirable
18.0	32.0	M	177.0	80.0	25.5	90.0	93.0	8.5	125.0	60.0	28.0	187.0	147.00	103.0	149.0	104.0	141.0	101.0	141	101	.97	.51	Overweight	Desirable
19.0	57.0	F	154.0	61.0	25.7	89.0	95.0	11.0	55.0	22.0	24.0	73.0	113.00	60.0	116.0	62.0	103.0	53.0	103	53	.94	.58	Overweight	Desirable
20.0	51.0	M	177.0	80.0	25.5	87.0	82.0	18.0	141.0	76.0	34.0	155.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	1.06	.49	Overweight	Desirable
21.0	54.0	F	155.0	60.0	25.0	86.0	87.0	14.1	164.0	79.0	22.0	315.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	.99	.55	Overweight	Desirable
22.0	30.0	M	175.0	92.0	30.0	90.0	93.0	9.0	134.0	52.0	50.0	159.0	117.00	79.0	126.0	85.0	105.0	70.0	105	70	.97	.51	Obese	Desirable
23.0	75.0	F	155.0	64.0	26.6	80.0	95.0	11.9	151.0	86.0	36.0	146.0	159.00	83.0	160.0	85.0	155.0	77.0	155	77	.84	.52	Overweight	Desirable
24.0	74.0	F	168.0	84.0	29.9	82.0	92.0	16.6	136.0	70.0	49.0	86.0	144.00	63.0	143.0	63.0	146.0	63.0	146	63	.89	.49	Overweight	Desirable
25.0	58.0	F	157.0	72.0	29.2	87.0	96.0	6.6	109.0	58.0	44.0	35.0	143.00	87.0	144.0	87.0	142.0	89.0	142	89	.91	.55	Overweight	Desirable
26.0	59.0	M	173.0	86.0	28.7	89.0	96.0	13.7	92.0	35.0	28.0	147.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	.93	.51	Overweight	Desirable
27.0	62.0	M	172.0	79.0	26.7	89.0	90.0	10.1	141.0	77.0	36.0	141.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	.99	.52	Overweight	Desirable
28.0	60.0	F	140.0	47.0	24.0	96.0	89.0	6.8	68.0	32.0	21.0	74.0	116.00	69.0	117.0	80.0	112.0	68.0	112	68	1.08	.69	Normal	Desirable
29.0	76.0	M	167.0	76.0	27.3	95.0	87.0	12.0	47.0	14.0	17.0	78.0	158.00	91.0	156.0	90.0	163.0	93.0	163	93	1.09	.57	Overweight	Desirable
30.0	42.0	M	174.0	79.0	26.1	88.0	86.0	9.4	175.0	85.0	41.0	243.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	1.02	.51	Overweight	Desirable
31.0	64.0	M	157.0	73.0	29.9	98.0	90.0	13.3	155.0	89.0	36.0	149.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	1.09	.62	Overweight	Desirable
32.0	57.0	M	170.0	88.0	30.7	95.0	80.0	6.9	86.0	48.0	17.0	104.0	156.00	81.0	155.0	81.0	158.0	82.0	158	82	1.19	.56	Obese	Desirable
33.0	50.0	M	177.0	80.0	25.5	90.0	82.0	10.2	211.0	98.0	15.0	612.0	151.00	98.0	154.0	101.0	141.0	90.0	141	90	1.10	.51	Overweight	Boderline
34.0	59.0	M	174.0	82.0	27.1	93.0	87.0	10.9	128.0	76.0	37.0	74.0	142.00	92.0	146.0	97.0	135.0	85.0	135	85	1.07	.53	Overweight	Desirable
35.0	70.0	M	178.0	94.0	29.7	96.3	89.0	6.7	77.0	35.0	17.0	127.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	1.08	.54	Overweight	Desirable
36.0	72.0	M	140.0	47.0	24.0	92.6	89.0	11.7	198.0	117.0	50.0	153.0	116.00	64.0	113.0	63.0	117.0	65.0	117	65	1.04	.66	Normal	Desirable
37.0	52.0	M	173.0	92.0	31.0	88.5	77.0	12.3	103.0	39.0	45.0	93.0	144.00	83.0	145.0	84.0	139.0	80.0	139	80	1.15	.51	Obese	Desirable
38.0	60.0	F	160.0	56.0	21.9	86.0	80.0	14.5	229.0	89.0	37.0	513.0	118.00	73.0	118.0	74.0	117.0	71.0	117	71	1.08	.54	Normal	Boderline
39.0	55.0	M	174.0	84.0	27.7	91.0	83.0	6.9	114.0	42.0	14.0	288.0	147.00	103.0	149.0	104.0	141.0	70.0	141	70	1.10	.52	Overweight	Desirable
40.0	60.0	M	177.0	80.0	25.5	87.0	82.0	11.1	152.0	100.0	29.0	114.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.06	.49	Overweight	Desirable
41.0	41.0	M	157.0	73.0	29.9	80.0	87.0	12.1	99.0	60.0	27.0	61.0	143.00	87.0	144.0	87.0	142.0	89.0	142	89	.92	.51	Overweight	Desirable
42.0	49.0	F	170.0	74.0	25.6	96.0	88.0	12.8	148.0	78.0	25.0	224.0	113.00	62.0	116.0	62.0	103.0	83.0	103	83	1.09	.56	Overweight	Desirable
43.0	55.0	M	167.0	89.0	32.0	90.0	92.0	8.2	119.0	38.0	48.0	167.0	132.00	81.0	133.0	881.0	131.0	81.0	131	81	.98	.54	Obese	Desirable
44.0	57.0	F	168.0	84.0	29.9	89.0	90.0	7.0	110.0	52.0	24.0	172.0	117.00	79.0	126.0	85.0	105.0	70.0	105	70	.99	.53	Overweight	Desirable
45.0	67.0	M	178.0	94.0	29.7	87.0	87.0	11.4	67.0	21.0	28.0	90.0	145.00	74.0	147.0	76.0	138.0	67.0	138	67	1.00	.49	Overweight	Desirable
46.0	57.0	M	165.0	77.0	28.5	86.0	93.0	6.5	110.0	62.0	15.0	165.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	.92	.52	Overweight	Desirable
47.0	65.0	M	172.0	90.0	30.6	97.0	92.0	7.7	99.0	52.0	26.0	104.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	1.05	.56	Obese	Desirable
48.0	58.0	F	170.0	88.0	30.7	95.0	95.5	10.1	175.0	112.0	23.0	202.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	.99	.56	Obese	Desirable

49.0	74.0	M	173.0	80.0	26.8	82.0	94.0	10.0	87.0	8.0	23.0	278.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	.87	.47	Overweight	Desirable
50.0	55.0	F	157.0	73.0	29.9	87.0	90.0	7.3	163.0	101.0	34.0	139.0	147.00	103.0	149.0	104.0	141.0	70.0	141	70	.97	.55	Overweight	Desirable
51.0	76.0	F	140.0	47.0	24.0	93.0	89.0	6.7	195.0	122.0	44.0	143.0	118.00	73.0	118.0	74.0	117.0	71.0	117	71	1.04	.66	Normal	Desirable
52.0	70.0	F	175.0	92.0	30.0	95.0	87.0	7.7	66.0	33.0	13.0	100.0	142.00	92.0	146.0	97.0	135.0	85.0	135	85	1.09	.54	Obese	Desirable
53.0	58.0	M	177.0	80.0	25.5	92.0	86.0	8.1	74.0	28.0	25.0	103.0	158.00	91.0	156.0	90.0	163.0	93.0	163	93	1.07	.52	Overweight	Desirable
54.0	80.0	M	175.0	92.0	30.0	96.0	97.0	7.1	145.0	79.0	46.0	101.0	132.00	82.0	133.0	81.0	131.0	81.0	131	81	.99	.55	Obese	Desirable
55.0	70.0	F	157.0	73.0	29.9	96.0	99.0	8.4	81.0	24.0	29.0	141.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	.97	.61	Overweight	Desirable
56.0	80.0	M	173.0	86.0	28.7	90.0	82.0	7.9	139.0	66.0	54.0	96.0	156.00	81.0	155.0	81.0	158.0	82.0	158	82	1.10	.52	Overweight	Desirable
57.0	70.0	M	175.0	92.0	30.0	89.0	87.0	7.7	49.0	12.0	15.0	108.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	1.02	.51	Obese	Desirable
58.0	64.0	M	140.0	47.0	24.0	87.0	93.0	8.9	115.0	65.0	35.0	77.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	.94	.62	Normal	Desirable
59.0	35.0	F	178.0	94.0	29.7	86.0	95.0	12.7	145.0	72.0	28.0	223.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	.91	.48	Overweight	Desirable
60.0	44.0	F	173.0	86.0	28.7	90.0	88.5	15.1	194.0	131.0	31.0	161.0	113.00	60.0	116.0	62.0	103.0	53.0	103	53	1.02	.52	Overweight	Desirable
61.0	62.0	M	173.0	92.0	31.0	80.0	86.0	7.8	123.0	65.0	43.0	75.0	144.00	63.0	143.0	63.0	146.0	63.0	146	63	.93	.46	Obese	Desirable
62.0	57.0	M	173.0	88.0	21.9	82.0	90.0	14.5	217.0	45.0	14.0	842.0	151.00	98.0	154.0	101.0	141.0	90.0	141	90	.91	.47	Normal	Boderline
63.0	65.0	F	177.0	80.0	25.5	87.0	87.0	7.5	91.0	35.0	6.0	248.0	125.00	74.0	126.0	73.0	123.0	77.0	123	77	1.00	.49	Overweight	Desirable
64.0	62.0	F	168.0	84.0	29.9	89.0	80.0	10.2	155.0	70.0	65.0	101.0	159.00	83.0	160.0	85.0	155.0	77.0	155	77	1.11	.53	Overweight	Desirable
65.0	45.0	M	170.0	74.0	25.6	89.0	96.0	11.2	83.0	36.0	34.0	65.0	132.00	82.0	133.0	81.0	131.0	81.0	131	81	.93	.52	Overweight	Desirable
66.0	73.0	M	167.0	89.0	32.0	77.0	90.0	9.1	50.0	17.0	12.0	107.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	.86	.46	Obese	Desirable
67.0	56.0	F	168.0	84.0	29.9	80.0	89.0	11.4	112.0	31.0	71.0	51.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	.90	.48	Overweight	Desirable
68.0	58.0	M	140.0	47.0	24.0	83.0	87.0	9.6	132.0	77.0	20.0	174.0	117.00	79.0	126.0	85.0	105.0	70.0	105	70	.95	.59	Normal	Desirable
69.0	58.0	M	165.0	77.0	28.5	82.0	86.0	9.5	124.0	62.0	41.0	107.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	.95	.50	Overweight	Desirable
70.0	67.0	F	172.0	90.0	30.6	87.0	97.0	6.1	193.0	116.0	26.0	253.0	145.00	74.0	147.0	76.0	138.0	67.0	138	67	.90	.51	Obese	Desirable
71.0	55.0	F	140.0	47.0	24.0	88.0	86.0	9.4	120.0	64.0	29.0	133.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	1.02	.63	Normal	Desirable
72.0	70.0	M	176.0	82.0	27.9	92.0	97.0	7.7	49.0	12.0	15.0	108.0	133.00	71.0	134.0	80.0	130.0	64.0	130	64	.95	.52	Overweight	Desirable
73.0	64.0	M	168.0	84.0	29.9	90.0	100.0	6.8	256.0	170.0	16.0	348.0	125.00	74.0	126.0	73.0	123.0	77.0	123	77	.90	.54	Overweight	High
74.0	61.0	M	177.0	80.0	25.5	87.0	93.0	8.9	200.0	158.0	37.0	134.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	.94	.49	Overweight	Boderline
75.0	76.0	M	175.0	92.0	30.0	93.0	82.0	7.6	127.0	68.0	37.0	112.0	145.00	74.0	147.0	76.0	141.0	90.0	141	90	1.13	.53	Obese	Desirable
76.0	70.0	M	177.0	80.0	25.5	92.0	87.0	6.8	116.0	45.0	52.0	96.0	158.00	91.0	156.0	90.0	163.0	90.0	163	90	1.06	.52	Overweight	Desirable
77.0	58.0	M	175.0	92.0	30.0	95.5	89.0	5.1	97.0	47.0	12.0	190.0	118.00	73.0	118.0	74.0	117.0	71.0	117	71	1.07	.55	Obese	Desirable
78.0	64.0	M	168.0	84.0	29.9	92.0	89.0	6.8	256.0	170.0	16.0	348.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	1.03	.55	Overweight	High
79.0	76.0	M	178.0	88.0	27.8	90.0	77.0	7.6	150.0	79.0	38.0	165.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.17	.51	Overweight	Desirable
80.0	54.0	M	175.0	92.0	30.0	89.0	80.0	7.0	73.0	37.0	19.0	87.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	1.11	.51	Obese	Desirable
81.0	58.0	M	168.0	84.0	29.9	87.0	83.0	14.5	147.0	59.0	13.0	377.0	126.00	63.0	127.0	65.0	120.0	58.0	120	58	1.05	.52	Overweight	Desirable
82.0	48.0	M	140.0	47.0	24.0	86.0	82.0	10.7	122.0	4.0	5.0	1053.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	1.05	.61	Normal	Desirable
83.0	38.0	F	173.0	86.0	28.7	97.0	87.0	9.4	151.0	89.0	23.0	195.0	148.00	83.0	149.0	84.0	145.0	78.0	145	78	1.11	.56	Overweight	Desirable
84.0	60.0	F	173.0	92.0	31.0	100.0	88.0	15.2	237.0	146.0	45.0	232.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	1.14	.58	Obese	Boderline
85.0	78.0	F	178.0	94.0	29.7	82.0	92.0	5.7	96.0	45.0	23.0	138.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	.89	.46	Overweight	Desirable
86.0	45.0	M	177.0	80.0	25.5	87.0	90.0	6.9	155.0	56.0	70.0	143.0	151.00	98.0	154.0	101.0	141.0	90.0	141	90	.97	.49	Overweight	Desirable
87.0	44.0	F	157.0	62.0	25.2	93.0	87.0	13.9	226.0	165.0	30.0	156.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.07	.59	Overweight	Boderline
88.0	65.0	F	165.0	66.0	26.8	95.0	93.0	11.3	168.0	191.0	34.0	216.0	132.00	82.0	133.0	81.0	131.0	81.0	131	81	1.02	.58	Overweight	Desirable
89.0	74.0	M	173.0	72.0	28.9	88.5	92.0	9.1	219.0	153.0	27.0	193.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	.96	.51	Overweight	Boderline
90.0	65.0	M	173.0	84.0	28.1	86.0	95.5	7.0	80.0	17.0	42.0	103.0	144.00	63.0	143.0	63.0	142.0	89.0	142	89	.90	.50	Overweight	Desirable
91.0	75.0	M	140.0	47.0	24.0	90.0	92.0	12.3	80.0	21.0	22.0	185.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	.98	.64	Normal	Desirable
92.0	68.0	F	157.0	62.0	25.2	87.0	90.0	7.1	127.0	63.0	51.0	63.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	.97	.55	Overweight	Desirable
93.0	48.0	F	170.0	74.0	25.6	80.0	89.0	13.0	157.0	88.0	36.0	167.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	.90	.47	Overweight	Desirable
94.0	50.0	F	155.0	60.0	25.0	96.0	87.0	7.3	134.0	72.0	33.0	145.0	126.00	63.0	127.0	65.0	120.0	58.0	120	58	1.10	.62	Overweight	Desirable
95.0	65.0	M	175.0	80.0	26.1	90.0	86.0	9.7	141.0	73.0	22.0	230.0	158.00	91.0	156.0	90.0	163.0	93.0	163	93	1.05	.51	Overweight	Desirable
96.0	71.0	M	168.0	66.0	29.6	89.0	97.0	7.8	104.0	57.0	27.0	215.0	133.00	60.0	116.0	62.0	103.0	83.0	103	83	.92	.53	Overweight	Desirable
97.0	50.0	M	173.0	88.0	29.4	87.0	100.0	12.3	134.0	80.0	13.0	205.0	151.00	98.0	154.0	101.0	141.0	90.0	141	90	.87	.50	Overweight	Desirable
98.0	52.0	F	157.0	55.0	27.5	86.0	92.0	6.6	70.0	23.0	20.0	133.0	159.00	83.0	160.0	85.0	155.0	77.0	155	77	.93	.55	Overweight	Desirable
99.0	49.0	M	175.0	92.0	30.0	97.0	87.0	8.9	141.0	82.0	39.0	99.0	143.00	87.0	144.0	63.0	146.0	63.0	146	63	1.11	.55	Obese	Desirable
100.0	75.0	F	177.0	80.0	25.5	86.0	93.0	14.5	74.0	38.0	13.0	113.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	.92	.49	Overweight	Desirable
101.0	65.0	F	140.0	47.0	24.0	97.0	95.0	18.0	19.0	10.0	538.0	137.0	118.00	73.0	118.0	74.0	117.0	71.0	117	71	1.02	.69	Normal	Desirable
102.0	72.0	M	168.0	84.0	29.9	100.0	88.5	7.2	79.0	21.0	46.0	58.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	1.13	.60	Overweight	Desirable
103.0	62.0	M	170.0	74.0	25.6	82.0	86.0	8.7	96.0	38.0	45.0	64.0	126.00	63.0	127.0	65.0	120.0	58.0	120	58	.95	.48	Overweight	Desirable
104.0	55.0	F	167.0	89.0	32.0	98.5	90.0	8.3	106.0	67.0	24.0	75.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	1.09	.59	Obese	Desirable
105.0	68.0	M	168.0	84.0	29.9	93.0	87.0	8.2	82.0	31.0	31.0	101.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	1.07	.55	Overweight	Desirable
106.0	49.0	M	178.0	94.0	29.7	87.0	80.0	12.3	228.0	139.0	58.0	155.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	1.09	.49	Overweight	Boderline

107.0	54.0	M	165.0	77.0	28.5	86.0	96.0	9.9	125.0	43.0	30.0	259.0	158.00	91.0	156.0	90.0	163.0	93.0	163	93	.90	.52	Overweight	Desirable
108.0	70.0	M	172.0	90.0	30.6	97.0	90.0	9.1	99.0	20.0	26.0	263.0	125.00	67.0	128.0	68.0	117.0	90.0	117	90	1.08	.56	Obese	Desirable
109.0	55.0	M	140.0	47.0	24.0	95.0	89.0	12.0	121.0	338.0	27.0	278.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	1.07	.68	Normal	Desirable
110.0	76.0	F	175.0	69.0	27.9	82.0	87.0	6.9	100.0	39.0	48.0	66.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	.94	.47	Overweight	Desirable
111.0	70.0	M	157.0	73.0	29.9	87.0	86.0	6.9	92.0	37.0	35.0	100.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	1.01	.55	Overweight	Desirable
112.0	64.0	M	177.0	80.0	25.5	93.0	97.0	14.7	148.0	78.0	27.0	213.0	159.00	83.0	160.0	85.0	155.0	80.0	155	80	.96	.53	Overweight	Desirable
113.0	47.0	M	175.0	92.0	30.0	101.0	86.0	12.4	83.0	34.0	36.0	66.0	142.00	92.0	146.0	97.0	135.0	81.0	135	81	1.17	.58	Obese	Desirable
114.0	61.0	M	177.0	80.0	25.5	89.0	97.0	10.0	189.0	111.0	57.0	105.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	.92	.50	Overweight	Desirable
115.0	55.0	M	175.0	92.0	30.0	94.0	91.0	8.7	145.0	64.0	52.0	146.0	147.00	103.0	149.0	104.0	141.0	101.0	141	101	1.03	.54	Obese	Desirable
116.0	60.0	M	157.0	73.0	29.9	101.0	82.0	7.6	141.0	78.0	34.0	147.0	144.00	63.0	143.0	63.0	146.0	63.0	146	63	1.23	.64	Overweight	Desirable
117.0	72.0	F	173.0	86.0	28.7	96.0	96.0	6.3	138.0	89.0	34.0	75.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.00	.55	Overweight	Desirable
118.0	73.0	F	175.0	92.0	30.0	93.0	93.0	7.9	143.0	75.0	32.0	180.0	147.00	103.0	149.0	104.0	141.0	70.0	141	70	1.00	.53	Obese	Desirable
119.0	50.0	M	157.0	73.0	29.9	88.5	88.5	11.9	134.0	53.0	24.0	287.0	142.00	92.0	146.0	97.0	135.0	85.0	135	85	1.00	.56	Overweight	Desirable
120.0	59.0	M	140.0	47.0	24.0	86.0	86.0	9.7	157.0	102.0	29.0	130.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	1.00	.61	Normal	Desirable
121.0	32.0	F	173.0	86.0	28.7	91.0	91.0	9.1	84.0	45.0	19.0	100.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	1.00	.53	Overweight	Desirable
122.0	73.0	M	140.0	47.0	24.0	87.0	87.0	6.9	152.0	89.0	47.0	79.0	116.00	69.0	117.0	69.0	112.0	68.0	112	68	1.00	.62	Normal	Desirable
123.0	70.0	F	165.0	77.0	28.5	80.0	80.0	8.7	97.0	43.0	21.0	166.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	1.00	.48	Overweight	Desirable
124.0	66.0	M	172.0	90.0	30.6	96.0	96.0	8.3	117.0	59.0	34.0	121.0	159.00	83.0	160.0	85.0	155.0	77.0	155	77	1.00	.56	Obese	Desirable
125.0	73.0	M	170.0	88.0	30.7	90.0	90.0	11.4	104.0	21.0	33.0	249.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	1.00	.53	Obese	Desirable
126.0	74.0	F	175.0	69.0	27.9	89.0	89.0	16.6	136.0	70.0	49.0	86.0	148.00	83.0	149.0	84.0	145.0	78.0	145	78	1.00	.51	Overweight	Desirable
127.0	64.0	F	157.0	73.0	29.9	87.0	87.0	7.8	139.0	86.0	37.0	79.0	126.00	73.0	127.0	65.0	120.0	58.0	120	58	1.00	.55	Overweight	Desirable
128.0	59.0	M	177.0	80.0	25.5	86.0	86.0	13.7	92.0	35.0	28.0	147.0	144.00	83.0	145.0	84.0	139.0	80.0	139	80	1.00	.49	Overweight	Desirable
129.0	85.0	M	175.0	92.0	30.0	97.0	97.0	7.1	69.0	35.0	19.0	73.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	1.00	.55	Obese	Desirable
130.0	68.0	F	177.0	80.0	25.5	90.0	90.0	7.7	137.0	76.0	37.0	118.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	1.00	.51	Overweight	Desirable
131.0	63.0	F	175.0	92.0	30.0	87.0	87.0	9.9	174.0	95.0	44.0	176.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	1.00	.50	Obese	Desirable
132.0	71.0	M	157.0	73.0	29.9	80.0	80.0	8.0	194.0	62.0	9.0	613.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	1.00	.51	Overweight	Desirable
133.0	68.0	M	173.0	86.0	28.7	96.0	96.0	11.0	115.0	63.0	31.0	105.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.00	.55	Overweight	Desirable
134.0	52.0	M	175.0	92.0	30.0	90.0	90.0	11.8	65.0	17.0	32.0	225.0	143.00	87.0	144.0	87.0	142.0	89.0	142	89	1.00	.51	Obese	Desirable
135.0	62.0	M	157.0	73.0	29.9	89.0	89.0	9.4	100.0	55.0	26.0	96.0	147.00	103.0	149.0	104.0	141.0	70.0	141	70	1.00	.57	Overweight	Desirable
136.0	54.0	F	178.0	94.0	29.7	87.0	87.0	8.8	76.0	5.0	13.0	302.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	1.00	.49	Overweight	Desirable
137.0	68.0	F	140.0	47.0	24.0	86.0	86.0	15.8	128.0	62.0	52.0	132.0	113.00	60.0	116.0	62.0	103.0	83.0	103	83	1.00	.61	Normal	Desirable
138.0	74.0	F	173.0	92.0	31.0	97.0	97.0	7.5	239.0	150.0	45.0	222.0	126.00	63.0	127.0	65.0	120.0	58.0	120	58	1.00	.56	Obese	Boderline
139.0	45.0	F	165.0	69.0	21.9	77.0	77.0	14.0	96.0	39.0	12.0	224.0	154.00	74.0	153.0	73.0	155.0	77.0	155	77	1.00	.47	Normal	Desirable
140.0	85.0	M	177.0	80.0	25.5	80.0	80.0	12.7	45.0	19.0	8.0	91.0	148.00	83.0	149.0	84.0	145.0	78.0	145	78	1.00	.45	Overweight	Desirable
141.0	55.0	F	167.0	89.0	32.0	83.0	83.0	6.5	65.0	1.0	14.0	249.0	128.00	78.0	133.0	80.0	121.0	74.0	121	74	1.00	.50	Obese	Desirable
142.0	72.0	M	140.0	47.0	24.0	82.0	82.0	7.6	79.0	16.0	46.0	83.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	1.00	.59	Normal	Desirable
143.0	69.0	M	172.0	90.0	30.6	87.0	87.0	6.9	114.0	55.0	38.0		145.00	74.0	147.0	76.0	138.0	67.0	138	67	1.00	.51	Obese	Desirable
144.0	45.0	M	157.0	73.0	29.9	88.0	88.0	12.8	185.0	117.0	42.0	131.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	1.00	.56	Overweight	Desirable
145.0	82.0	F	177.0	80.0	25.5	92.0	92.0	7.8	93.0	18.0	10.0	325.0	142.00	92.0	146.0	97.0	135.0	85.0	135	85	1.00	.52	Overweight	Desirable
146.0	66.0	M	175.0	92.0	30.0	100.0	100.0	6.4	142.0	80.0	51.0	54.0	128.00	65.0	128.0	64.0	127.0	72.0	127	72	1.00	.57	Obese	Desirable
147.0	48.0	M	140.0	47.0	24.0	98.0	92.0	6.9	92.0	39.0	30.0	113.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	1.07	.70	Normal	Desirable
148.0	55.0	F	168.0	84.0	29.9	89.0	89.0	12.8	118.0	66.0	16.0	182.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.00	.53	Overweight	Desirable
149.0	45.0	M	175.0	92.0	30.0	91.0	91.0	11.9	154.0	82.0	43.0	143.0	125.00	67.0	128.0	68.0	117.0	65.0	117	65	1.00	.52	Obese	Desirable
150.0	71.0	M	178.0	94.0	29.7	95.0	95.0	10.7	180.0	114.0	38.0	140.0	147.00	103.0	149.0	104.0	141.0	70.0	141	70	1.00	.53	Overweight	Desirable
151.0	65.0	F	173.0	86.0	28.7	94.6	94.6	6.3	160.0	91.0	43.0	128.0	148.00	83.0	149.0	84.0	145.0	78.0	145	78	1.00	.55	Overweight	Desirable
152.0	80.0	M	177.0	80.0	25.5	98.7	98.7	8.1	106.0	57.0	33.0	81.0	151.00	98.0	153.0	73.0	155.0	77.0	155	77	1.00	.56	Overweight	Desirable
153.0	46.0	M	168.0	84.0	29.9	96.0	96.5	14.1	158.0	95.0	48.0	76.0	118.00	73.0	118.0	74.0	117.0	71.0	117	71	.99	.57	Overweight	Desirable
154.0	62.0	M	167.0	89.0	32.0	105.0	105.0	8.0	114.0	63.0	32.0	97.0	132.00	81.0	133.0	81.0	131.0	81.0	131	81	1.00	.63	Obese	Desirable
155.0	56.0	F	168.0	84.0	29.9	100.0	100.0	7.4	222.0	150.0	45.0	133.0	126.00	63.0	127.0	65.0	120.0	58.0	120	58	1.00	.60	Overweight	Boderline
156.0	70.0	F	140.0	47.0	24.0	99.0	99.0	9.2	101.0	56.0	29.0	79.0	116.00	64.0	113.0	63.0	126.0	65.0	126	65	1.00	.71	Normal	Desirable
157.0	73.0	F	172.0	90.0	30.6	97.0	97.0	11.2	150.0	64.0	73.0	67.0	159.00	83.0	160.0	85.0	155.0	77.0	155	77	1.00	.56	Obese	Desirable
158.0	62.0	M	170.0	88.0	30.7	98.0	98.0	10.5	104.0	58.0	33.0	64.0	143.00	87.0	144.0	87.0	142.0	89.0	142	89	1.00	.58	Obese	Desirable
159.0	51.0	F	175.0	69.0	27.9	98.0	98.0	6.5	168.0	68.0	26.0	368.0	133.00	71.0	134.0	72.0	130.0	64.0	130	64	1.00	.56	Overweight	Desirable
160.0	46.0	F	168.0	84.0	29.9	99.0	99.0	8.2	116.0	72.0	24.0	98.0	125.00	74.0	126.0	73.0	123.0	77.0	123	77	1.00	.59	Overweight	Desirable
161.0	65.0	F	177.0	80.0	25.5	95.0	95.0	6.9	151.0	64.0	71.0	80.0	115.00	71.0	117.0	74.0	104.0	56.0	104	56	1.00	.54	Overweight	Desirable
162.0	65.0	F	175.0	92.0	30.0	102.0	102.0	10.8	85.0	28.0	45.0	60.0	136.00	74.0	136.0	74.0	114.0	64.0	114	64	1.00	.58	Obese	Desirable

S. No	LDL	HDL	TG	ALLDAY SBP	ALLDAY DBP	DAY DBP	DAY SBP_B	NIGHT SBP	NIGHT DBP
1.0	Normal	Not normal	Very high	No HTN	No HTN	No HTN	No HTN	HTN	HTN
2.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	HTN	HTN
3.0	Normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	HTN	HTN
4.0	Normal	Not normal	<150	No HTN	No HTN	HTN	No HTN	HTN	HTN
5.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
6.0	Normal	Normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
7.0	Not normal	Normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
8.0	Not normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
9.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
10.0	Normal	Not normal	<150	No HTN	HTN	HTN	No HTN	No HTN	HTN
11.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
12.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
13.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	HTN	HTN
14.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	HTN	HTN
15.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
16.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
17.0	Normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	HTN	HTN
18.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	No HTN	HTN
19.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	HTN
20.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
21.0	Normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	HTN	HTN
22.0	Normal	Normal	Borderline high	No HTN	No HTN	No HTN	No HTN	HTN	HTN
23.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
24.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
25.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	HTN
26.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
27.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	HTN
28.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
29.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
30.0	Normal	Normal	High	HTN	No HTN	No HTN	HTN	HTN	HTN
31.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	No HTN
32.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
33.0	Normal	Not normal	Very high	HTN	HTN	HTN	HTN	HTN	HTN
34.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
35.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
36.0	Not normal	Normal	Borderline high	HTN	No HTN	No HTN	No HTN	HTN	HTN
37.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
38.0	Normal	Not normal	Very high	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
39.0	Normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
40.0	Not normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
41.0	Normal	Not normal	<150	No HTN	HTN	HTN	No HTN	No HTN	HTN
42.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
43.0	Normal	Normal	Borderline high	HTN	No HTN	No HTN	HTN	HTN	No HTN
44.0	Normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
45.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
46.0	Normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
47.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
48.0	Not normal	Not normal	High	HTN	No HTN	No HTN	HTN	HTN	No HTN
49.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
50.0	Not normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
51.0	Not normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
52.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
53.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
54.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN

55.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
56.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
57.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
58.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	No HTN	HTN
59.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
60.0	Not normal	Not normal	Borderline high	No HTN	HTN	HTN	No HTN	No HTN	HTN
61.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	HTN
62.0	Normal	Not normal	Very high	HTN	No HTN	No HTN	HTN	HTN	No HTN
63.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
64.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
65.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
66.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
67.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
68.0	Normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
69.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
70.0	Not normal	Not normal	High	HTN	No HTN	No HTN	No HTN	HTN	HTN
71.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
72.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
73.0	Not normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	HTN	HTN
74.0	Not normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
75.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
76.0	Normal	Normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
77.0	Normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
78.0	Not normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
79.0	Normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
80.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
81.0	Normal	Not normal	High	HTN	No HTN	No HTN	HTN	HTN	No HTN
82.0	Normal	Not normal	Very high	HTN	No HTN	No HTN	HTN	HTN	HTN
83.0	Normal	Not normal	Borderline high	HTN	No HTN	HTN	HTN	HTN	No HTN
84.0	Not normal	Normal	High	HTN	No HTN	No HTN	No HTN	HTN	HTN
85.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
86.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	HTN
87.0	Not normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
88.0	Not normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	HTN	HTN
89.0	Not normal	Not normal	Borderline high	No HTN	No HTN	No HTN	No HTN	HTN	HTN
90.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
91.0	Normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
92.0	Normal	Normal	<150	HTN	No HTN	No HTN	No HTN	HTN	No HTN
93.0	Normal	Not normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
94.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
95.0	Normal	Not normal	High	HTN	No HTN	No HTN	No HTN	HTN	HTN
96.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
97.0	Normal	Not normal	High	HTN	No HTN	No HTN	HTN	HTN	No HTN
98.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
99.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
100.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	HTN
101.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
102.0	Normal	Normal	<150	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
103.0	Normal	Normal	<150	HTN	No HTN	No HTN	No HTN	HTN	No HTN
104.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
105.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	No HTN	HTN
106.0	Not normal	Normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
107.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
108.0	Normal	Not normal	High	HTN	HTN	No HTN	HTN	HTN	No HTN
109.0	Not normal	Not normal	High	HTN	No HTN	No HTN	HTN	HTN	No HTN
110.0	Normal	Normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
111.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	No HTN
112.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN

113.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
114.0	Not normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
115.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
116.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
117.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
118.0	Normal	Not normal	Borderline high	HTN	No HTN	No HTN	No HTN	HTN	HTN
119.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
120.0	Not normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
121.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
122.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
123.0	Normal	Not normal	Borderline high	HTN	No HTN	No HTN	HTN	HTN	No HTN
124.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
125.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
126.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
127.0	Normal	Not normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
128.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
129.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
130.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
131.0	Normal	Normal	Borderline high	HTN	HTN	HTN	HTN	HTN	HTN
132.0	Normal	Not normal	Very high	HTN	No HTN	No HTN	No HTN	HTN	No HTN
133.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
134.0	Normal	Not normal	High	HTN	No HTN	No HTN	No HTN	HTN	HTN
135.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
136.0	Normal	Not normal	High	HTN	No HTN	No HTN	No HTN	HTN	HTN
137.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
138.0	Not normal	Normal	High	HTN	No HTN	No HTN	HTN	HTN	No HTN
139.0	Normal	Not normal	High	HTN	HTN	HTN	HTN	HTN	HTN
140.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
141.0	Normal	Not normal	High	No HTN	No HTN	No HTN	No HTN	HTN	HTN
142.0	Normal	Normal	<150	HTN	No HTN	No HTN	No HTN	HTN	No HTN
143.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
144.0	Not normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
145.0	Normal	Not normal	High	HTN	No HTN	No HTN	HTN	HTN	HTN
146.0	Normal	Normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
147.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
148.0	Normal	Not normal	Borderline high	HTN	No HTN	No HTN	No HTN	HTN	HTN
149.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN
150.0	Not normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
151.0	Normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
152.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
153.0	Normal	Normal	<150	HTN	HTN	No HTN	HTN	HTN	HTN
154.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	HTN	HTN
155.0	Not normal	Normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
156.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	No HTN
157.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
158.0	Normal	Not normal	<150	HTN	HTN	HTN	HTN	HTN	HTN
159.0	Normal	Not normal	High	HTN	No HTN	No HTN	HTN	HTN	No HTN
160.0	Normal	Not normal	<150	HTN	No HTN	No HTN	No HTN	HTN	HTN
161.0	Normal	Not normal	<150	No HTN	No HTN	No HTN	No HTN	No HTN	No HTN
162.0	Normal	Normal	<150	HTN	No HTN	No HTN	HTN	HTN	No HTN