



Association Between Age, Body Mass Index, and Hypertension Among Adults in Maysan Governorate, Iraq: A Cross-Sectional Study

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Received: 22/6/2026

Accepted: 15/8/2026

Published: 20/8/2026

Abstract

Background: Hypertension is a prevalent chronic condition globally and poses a significant public health burden in relation to cardiovascular diseases, stroke and renal diseases. Identification of the disease at an early stage and associated risk factors are necessary for successful prevention and control. **Aim:** To evaluate selected demographic and clinical features of adult subjects and to assess the relationship between selected risk factors and hypertension history. **Materials and methods:** We performed a cross-sectional study on 160 adult subjects. A structured questionnaire on demographic features, anthropometric measurements, blood pressure, history of hypertension, and use of antihypertensive drugs, was administered. Data were analyzed using descriptive statistics, Chi-square testing and statistical significance was set at $P < 0.05$. **Results:** The study population consisted of 160 subjects ($n=80$ hypertensive patients and $n=80$ normotensive controls). And 46.2% of those with hypertension were obese, 33.8% were overweight. Based on ACC/AHA categorization, were in Elevated 8.75%, Stage 1 HTN 48.75% and 42.5% in Stage 2 HTN. The hypertensive group also had significantly greater systolic and diastolic blood pressure, and body weight than the control group ($P < 0.05$). **Conclusion:** Findings, this clearly demonstrates that hypertension remains a significant public health issue, associated with several demographic and behavioral characteristics. Promoting healthy lifestyle, blood pressure screening, and early treatment intervention may help alleviate the hypertension load in the society.

Keyword : *Elevated Blood Pressure; Body Mass Index; Adults; Cross-Sectional; Risk Factors; Hypertension.*

Doi : <https://doi.org/10.64943/ljacs.2026.010205>

INTRODUCTION

Hypertension Non-Communicable Disease 3 is a highly prevalent disease globally and continues to pose a significant public health problem due to its strong link with cardiovascular disease, stroke, chronic kidney disease, and premature death [1,2]. Due to the lack of symptoms in the early stages of Disease X, hypertension is known as the “silent killer,” which causes late diagnosis and more likelihood of adverse outcomes [2]. The pathogenesis of hypertension is complex and multifactorial, and is the result of an interaction between genetic, environmental, metabolic, and lifestyle-related factors [3]. Advanced age is the most powerful determinant among the nonmodifiable risk factors for high blood pressure. Ageing progressively induces structural and functional alterations in the blood vessels (arterial stiffness, endothelium-dependent vasodilation, vascular smooth muscle cell tone, and vascular elasticity) those play a crucial role in elevating blood pressure [4,5]. Obesity, assessed frequently by body-mass index (BMI), is a strong and established modifiable risk factor for hypertension, pathophysiological mechanisms by

which excess body weight leads to hypertension include sympathetic nervous system activation, insulin resistance, chronic inflammation, endothelial dysfunction, and activation of the renin–angiotensin–aldosterone system [6,7]. As a result, the odd for developing hypertension in overweight and obese is significantly higher than that for those with normal body weight. Rapid urbanization, dietary change, declining physical activity, and rising obesity rates have driven an increase in the prevalence of hypertension in developing countries such as Iraq, with the highest rates of growth seen in recent decades [8]. This escalating pressure burden the healthcare systems, and it is important that locally applicable risk factors be identified in order to inform appropriate interventions for prevention and control, despite many investigations conducted internationally on hypertension and associated risk factors, there seems to be a lack of information with regard to southern Iraq specifically, particularly the association between age and BMI [9]. Elucidating these associations in the local population is crucial for the design of focused public health strategies and for the identification of individuals at high risk for early screening. Hence the present study was designed to compare age and body mass index (BMI) in hypertensive adults against a normotensive control group from Maysan Governorate, Iraq, and to determine their relationship with hypertension.

MATERIALS AND METHODS

Study Design and Setting

This study aims to assess the correlation between age and body mass index (BMI) with hypertension among adults in Maysan Governorate, Iraq in a cross-sectional design. 80 hypertensive patients and 80 age matched normotensive healthy controls were included in the study. Demographic data, anthropometric measurements, and blood pressure were obtained and analyzed for the association of age and BMI with AHT.

Study Population and Sampling

The present study was conducted on 160 participants, consisting of 80 patients with hypertension and 80 normotensive controls. Convenience sampling was used to recruit participants from the community. This strategy was adopted because of availability of the participants and in order to have an equal comparison between two groups. However, since the sampling technique was convenience sampling, the sample may not be representative of the whole adult population of Maysan Governorate, thus the results should be generalized with caution. They were eligible if they were 18 years old or above and were willing to participate in the study. Subjects with unfinished questionnaires or unmeasured blood pressures were not included in the study.

Data Collection

The paper-based questionnaire was developed in advance to collect data. The questionnaire contained questions on demographics (age and sex), medical history, prior diagnosis of hypertension, use of antihypertensive medications, and smoking status. Body mass index (BMI) was expressed as kg/m^2 and was derived from measured height and weight. After participants had rested for a minimum of five minutes in a sitting posture, the investigator directly recorded the blood pressure using a validated Rossmax digital sphygmomanometer. When two measurements were taken in succession within 2–3 minutes, the mean of the readings was used for the data processing. The data collected was coded and analyzed to contrast between hypertensive and normotensive individuals, as well as determine the relationship between age and BMI with hypertension.

Anthropometric Measurements

Body weight was recorded in kilograms (kg) and centimeters (cm). The Body Mass Index (BMI) formula was used: ($BMI = \text{Body weight (kg)} / \text{Height}^2 (\text{m}^2)$). Participants were divided into three groups: normal weight, overweight, and obese, based on World Health Organization guidelines.

Blood Pressure Classification

Blood pressure was classified as normal person blood pressure and patient blood pressure. Hypertension was classified into three stages elevated, first and second, but in the study, both cases were calculated together, and the instructions were extracted from the leading American College of Cardiology/American Heart Association (ACC/AHA) guidelines 2017 [10].

Statistical Analysis

The data processing and analysis were carried out by using the Microsoft Excel 2021 (Microsoft Corporation, Redmond, WA, USA). Descriptive statistics for continuous variables were the mean $\pm$ standard deviation (SD) and for categorical variables were frequencies and percentages. The differences between the groups were tested by the independent samples t-test for continuous variables and the Chi-square test for categorical variables. A Pvalue of <0.05 was considered to be statistically significant.

Ethical Considerations

The study was performed according to the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to data collection. The confidentiality and anonymity of the participants were strictly preserved and the data were used solely for scientific purposes.

RESULT AND DISCUSSION

Results

Participant Characteristics

A total of 160 participants were included in the present study, 80 with hypertension and 80 normotensive healthy subjects. The demographic and clinical data of the two groups are shown in Table 1. Hypertensive subjects had a significantly higher body weight, systolic blood pressure (SBP), and diastolic blood pressure (DBP) than the controls ($P < 0.05$). There were no statistically significant differences in age or height between the two groups ($P > 0.05$) in contrast.

Table 1. Demographic and Clinical Characteristics of the Study Participants

Variable	Mean $\pm$ SD / n (%)Control	Mean $\pm$ SD / n (%)Patient	P-value
Age (years)	33.6 $\pm$ 12.4	36 $\pm$ 14.5	0.429
Height (cm)	158.3 $\pm$ 14.3	162.4 $\pm$ 6.8	0.106
Weight (kg)	73.4 $\pm$ 11.3	79.4 $\pm$ 13.3	0.033
Systolic Blood Pressure (mmHg)	117 $\pm$ 1.3	139 $\pm$ 1.3	0.001
Diastolic Blood Pressure (mmHg)	76 $\pm$ 0.8	82 $\pm$ 0.8	0.001

Note. Continuous variables are presented as the mean $\pm$ standard deviation (SD); Number of cases and percentages were reported for categorical variables.

Figure 1 shows the average age, height, weight, systolic blood pressure, and diastolic blood pressure between patients with hypertension and healthy individuals. Hypertensive individuals

were heavier and had higher blood pressure than healthy controls, whereas age and height slightly differed.

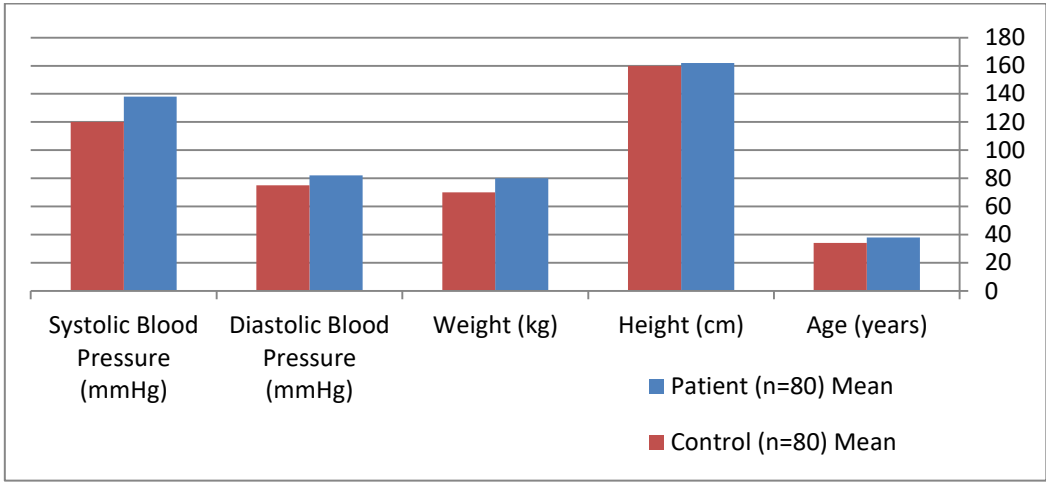


Figure 1. Comparison of the Mean Age, Height, Weight, Systolic Blood Pressure, and Diastolic Blood Pressure Between Hypertensive Patients and Healthy Controls.

Figure 2. Comparison of Mean Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) Between Hypertensive Patients and Healthy Controls.

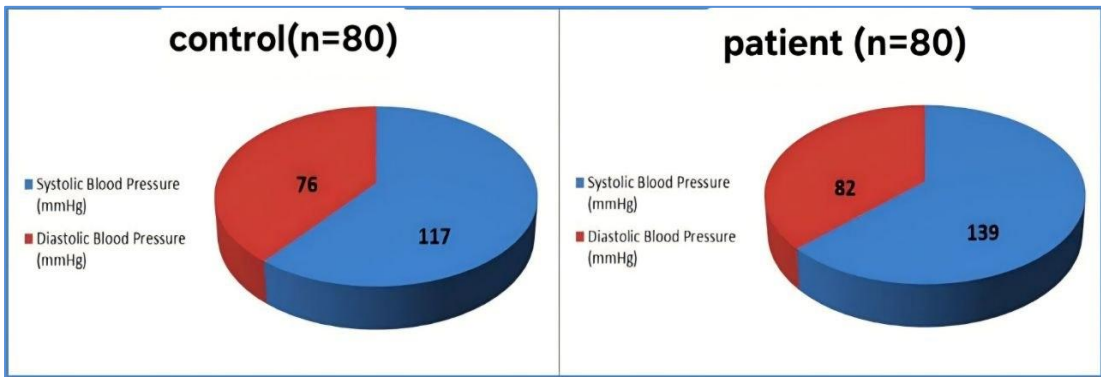


Figure 2. Comparison of Mean Systolic and Diastolic Blood Pressure Between Hypertensive Patients and Healthy Controls

Body Mass Index Distribution Among Hypertensive Patients

The proportion of hypertensive patients in each BMI category is shown in Table 2. Of the 80 patients, 46.2% were obese, 33.8% were overweight, and 20.0% had normal body weight based on the classification of the World Health Organization (WHO). This suggests that a large number of hypertensive patients were overweight.

Table 2. The BMI Categories for the Participants in the Study (N = 80)

BMI Category	N	%
Normal weight	16	20.0
Overweight	27	33.8
Obese	37	46.2
Total	80	100.0

Note. BMI = Body Mass Index.

Figure 3 shows the prevalence of BMI categories in hypertensive individuals. Overweight was the second highest category and normal body mass was the least proportion of patients.

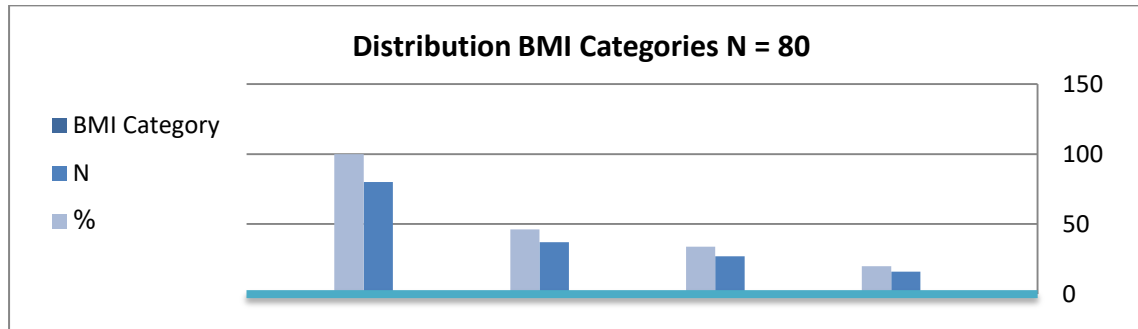


Figure 3. Frequency of BMI Categories in Hypertensive Cases (n=80).

Blood Pressure Classification Among Hypertensive Patients

Table 3 displays blood pressure status of hypertensive patients according to 2017 ACC/AHA guidelines. Almost half of the patients (48.75%) were in the Stage 1 hypertension group and 42.5% in the Stage 2 group. A mere 8.75% were identified as having elevated blood pressure. These findings suggest that the majority of hypertensive individuals lie within Stage 1 or Stage 2 hypertension group.

Table 3. Blood Pressure Classification Among Hypertensive Patients (N = 80)

Blood Pressure Classification	N	%
Elevated	7	8.75
Stage 1 Hypertension	39	48.75
Stage 2 Hypertension	34	42.5
Total	80	100.0

Note. The blood pressure was categorized based on the American College of Cardiology/American Heart Association (ACC/AHA) guidelines.

Figure 4 displays the distribution of blood pressure categories in hypertensive subjects. Stage 1 hypertension was the most common group, followed by Stage 2 hypertension, and only a handful of subjects were in the elevated blood pressure category.

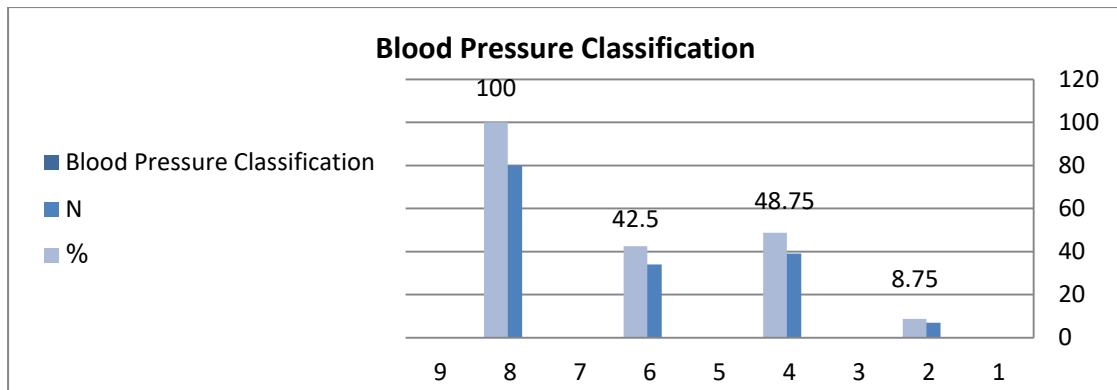


Figure 4. Breakdown of Blood Pressure Categories in Patients with Hypertension Based on the 2017 ACC/AHA Guidelines (n = 80).

DISCUSSION

Hypertension continues to be the top modifiable risk factor for CVD and its associated mortality burden globally. This work aims to estimate the association between age, body mass index (BMI), and hypertension among adults in Maysan Governorate, Iraq. The findings revealed a significant prevalence of being overweight and obese and elderly had neither low systolic BP nor low diastolic BP irrespective of their BMI values. These results are in line with the well-known importance of both age and obesity as major risk factors for hypertension. Similarly, a recent meta-analysis recently highlighted the impact of a number of modifiable and non-modifiable risk factors on the development of arterial hypertension [4]. A major finding of this research the large number of overweight and obese subjects. This finding is especially significant against the backdrop of the Eastern Mediterranean region, where unhealthy diets and obesity are leading public health problems [8]. Prior studies also revealed a positive association between BMI and blood pressure in adults, which supports the association in this study [9]. The relationship between obesity and hypertension is a well-established one, and there are a number of biological pathways that may contribute to this association including sympathetic nervous system activation, endothelial dysfunction, chronic inflammation, and renin-angiotensin-aldosterone system activation, recent data advance the concept that endothelial dysfunction is the biologic mechanism linking obesity-hypertension-cardiovascular disease [7]. Hence, the extremely high rates of hypertension in study participants with a high body mass index in this study was biologically plausible and in concordance with the existing body of evidence. This study also indicated that hypertension prevalence is higher in older age. This supports the notion that older age is a robust, non-modifiable risk factor for hypertension [4]. Age-related vascular changes significantly influence this association. Vascular aging is associated with generalized atherosclerosis of the intimal layer, including structural and functional changes in the arterial wall that can lead to increased systolic blood pressure and the risk of cardiovascular disease [5]. New insights into healthy aging and cardiovascular disease highlight the significance of age-related cardiovascular changes in the elderly [11]. The higher prevalence of hypertension in the older subjects of this study could be, at least in part, an indication of the long-term impact of vascular aging and atherosclerosis. Recent studies in hypertensive subjects confirm the correlation found between body mass index (BMI) and hypertension, as this index is related to variations in hemodynamic parameters [12,13]. This corroborates the results of this study and infers that obesity may affect blood pressure by metabolic and hemodynamic routes. In addition, the coexistent of obesity and hypertension is more worrying because the two diseases that can increase cardiovascular disease risk us all and which may be an extensive manifestation of cardiometabolic risk factors [14,15]. However, there was no statistically significant association between sex and hypertension, this may imply that sex per se is not the major determinant of hypertension in the present study population as opposed to other factors such as age and BMI. Nevertheless, this finding must be interpreted with caution because the disparity of males and females in the sample may have limited the power to identify a statistically significant difference between the two sex groups. There is a need for more research with larger sample sizes to consider the role of gender and other factors that might be relevant [6,16]. The results of this study indicate its general prevalence in

Maysan Governorate. We emphasize the correlation between high blood pressure and the importance of addressing modifiable risk factors such as healthy nutrition, appropriate physical activity, weight control, and risk assessment. These data, which use the term obese, indicate that communication is particularly important in this group regarding obesity, blood pressure, and skeletal rigidity [17,18]. The effectiveness of healthy lifestyle choices in improving the overall health of many age groups and controlling high blood pressure is demonstrated [19,20]. Therefore, it is essential to follow a method for regularly monitoring blood pressure, and individuals with a high body mass index may be at increased risk of heart disease and other cardiovascular problems.

CONCLUSION

This is the first study from Maysan Governorate, Iraq to assess age and body mass index (BMI). The study found that participants were overweight and obese, indicating a potential public health problem. It also revealed a direct correlation between these factors, notably elevated blood pressure, confirming that age and BMI are key determinants of hypertension. These findings underscore the importance of regular blood pressure checks, early detection of at-risk individuals, and lifestyle interventions, including adopting a healthy lifestyle, maintaining a healthy weight, and engaging in physical activity. These measures could contribute to better disease prevention and a reduction in hypertension and its cardiovascular complications among the Iraqi population.

Strengths of the Study

This research has a few positive points. First, it reports recent data on hypertension in an adult population in Maysan Governorate, an area where epidemiological data have been scarce. Secondly, blood pressure was measured and anthropometric evaluation was standardized, which enhanced the quality of the obtained data. Third, both demographic and anthropometric parameters were analyzed in this research, thus allowing for a more comprehensive insight into the factors contributing to the development of hypertension in the local residents.

Limitations of the Study

Some limitations ought to be taken account of in the interpretation of the results. The cross-sectional design cannot infer causality relationships. The representativeness of the study population could have been compromised by the relatively small sample size and the sampling method of convenience. Additionally, several relevant factors such as smoking status, dietary sodium intake, physical activity, diabetes mellitus, family history of hypertension and socioeconomic status were not considered in the analyses. Thus, potential confounders were not completely adjusted for by multivariable statistical models, which may limit the interpretation and generalization of the observed association(s). It is recommended that prospective longitudinal studies with larger sample size and moderation assessment of potential confounders be conducted to replicate and further extend these findings.

Recommendations

- Establish community links and conduct hypertension screening for early case detection among adults and above 40 years of age.
- Raise the public awareness of the importance of life long healthy body weight.
- Motivate the Primary Health Care (PHC) centres to do BMI and BP measurements as a routine for their attendance.
- Promoting health awareness aimed at preventing high blood pressure and its associated heart disease.
- It is recommended to conduct larger, representative studies in other Iraqi governorates and to account for other differences such as smoking, family history, and activity levels to confirm the findings.

Acknowledgments

The author expresses his gratitude for participating in this study without any expectation of reward, and thanks everyone who contributed to the completion of this work, whether in distributing the questionnaire or collecting the data. The author also expresses his appreciation to everyone who supported and encouraged this study.

Conflict of Interest

The author acknowledges having no affiliation with any entity that has a financial or non-financial interest in the subject matter or products of these lines, and therefore has no conflict of interest. The study was conducted objectively and independently, and all findings were presented with honesty and integrity.

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العلاقة بين العمر ومؤشر كتلة الجسم وارتفاع ضغط الدم لدى البالغين في محافظة ميسان، العراق: دراسة مقطعية

الملخص

الخلفية: يعد ارتفاع ضغط الدم أحد أكثر الأمراض المزمنة شيوعاً في العالم، ويمثل تحدياً كبيراً للصحة العامة نظراً لارتباطه بأمراض القلب والأوعية الدموية، والسكتة الدماغية، واضطرابات الكلى. ويُعد الكشف المبكر عن عوامل الخطر المرتبطة به وتحديد أمراً بالغ الأهمية للوقاية الفعالة منه وإدارته. الهدف: هدفت هذه الدراسة إلى تقييم الخصائص الديموغرافية والسريرية للبالغين، ودراسة العلاقة بين عوامل الخطر المختارة وتاريخ الإصابة بارتفاع ضغط الدم. المنهجية: أُجريت دراسة مقطعية شملت 160 مشاركاً بالغاً. جُمعت البيانات باستخدام استبيان مُنظم تضمن الخصائص الديموغرافية، وقياسات الجسم، وقراءات ضغط الدم، وتاريخ الإصابة بارتفاع ضغط الدم، واستخدام أدوية خفض ضغط الدم. استُخدمت الإحصاءات الوصفية واختبارات مربع كاي لتحليل البيانات، واعتُبرت الدلالة الإحصائية عند مستوى $P < 0.05$. النتائج: شملت الدراسة 160 مشاركاً (80 مريضاً بارتفاع ضغط الدم) و(80 شخصاً سليماً كمجموعة ضابطة). من بين مرضى ارتفاع ضغط الدم، كان 46.2% يعانون من السمنة، و33.8% يعانون من زيادة الوزن. وفقاً لتصنيف جمعية القلب الأمريكية/الكلية الأمريكية لأمراض القلب، كان لدى 8.25% ضغط دم مرتفع و48.75% من المشاركين ارتفاع ضغط الدم من المرحلة الأولى، و42.5% من المرحلة الثانية. كما لوحظ ارتفاع ملحوظ في ضغط الدم الانقباضي والانقباضي ووزن الجسم لدى مرضى ارتفاع ضغط الدم مقارنةً بالمجموعة الضابطة ($P < 0.05$). الخلاصة: تشير النتائج إلى أن ارتفاع ضغط الدم لا يزال يمثل مشكلة صحية هامة، ويرتبط بعوامل ديموغرافية وأخرى متعلقة بنمط الحياة. وقد يُسهم تشجيع أنماط الحياة الصحية، وإجراء فحوصات دورية لضغط الدم، والتدخل المبكر في الحد من عبء ارتفاع ضغط الدم في المجتمع.

الكلمات المفتاحية: ارتفاع ضغط الدم؛ ضغط الدم؛ مؤشر كتلة الجسم؛ دراسة مقطعية؛ عوامل الخطر؛ البالغون