Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Hypertension and Its Determinants Among Patients with Diabetes Mellitus: A Hospital- Based Cross-Sectional Study

Endale Gurmessa
Nekemte Public Health Research and Referral Laboratory Center
Endalu Tesfaye Guteta
endalutesfaye4@gmail.com
Nekemte Public Health Research and Referral Laboratory Center
Takele Gemechu
Nekemte Public Health Research and Referral Laboratory Center
Jira Wakoya
Wallaga University
Wase Benti
Wallaga University
Dugasa Garoma
Nekemte College of Health Sciences
Getu Sileshi
Armaeur Hansen Research Institute

Research Article

Keywords: Hypertension, diabetes mellitus, prevalence, associated factors

Posted Date: July 27th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10101551/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Hypertension is a frequent comorbidity among patients with diabetes mellitus (DM) and substantially increases the risk of cardiovascular and renal complications. Despite its growing burden, evidence on hypertension among diabetic patients remains limited in Ethiopia. Therefore, this study aimed to determine the prevalence of hypertension and identify its associated factors among patients with DM in Ethiopia.

Methods

A hospital-based cross-sectional study was conducted on 396 diabetic patients attending their follow-up at Nekemte city Public Hospitals from May 1 to April 30, 2022. Systematic random sampling technique was used to select study participants and structured questionnaire was used for data collection. Data were entered into Epi-Data version 4.6 and exported to Statistical Software for Social Sciences (SPSS) version 26 for analysis. Variables with p-value < 0.25 in bi-variate analysis were candidates for multivariable logistic regression analysis to identify the independent association. Finally, variables with a p-value < 0.05 in the multivariable analysis were considered statistically significant, and adjusted odds ratios (AORs) with 95% confidence interval (CI) were estimated to measure the strength of the associations. Results were presented using tables, frequencies, percentages, and summary statistics.

Results

A total of 396 patients with DM were enrolled in the study, resulting in a response rate of 100%. The prevalence of hypertension among the participants was 40.7% (95% CI: 36.4–45.4). In multivariable logistic regression analysis, age > 50 years (AOR = 2.86; 95% CI: 1.20–4.80), a duration of diabetes greater than 5 years (AOR = 1.95; 95% CI: 1.13–3.96), and a family history of hypertension (AOR = 6.10; 95% CI: 3.56–10.40) were independently associated with increased odds of hypertension. Conversely, having health insurance coverage (AOR = 0.41; 95% CI: 0.24–0.71), and engagement in regular physical activity (AOR = 0.45; 95% CI: 0.26–0.77) were associated with lower odds of hypertension among patients with DM.

Conclusion

The study found that there is high magnitude of hypertension among diabetic patients. Age, duration with DM, family history of hypertension, health insurance membership, and physical activity were significantly associated with hypertension among patients with DM. Early detection and appropriate interventions should be an important action among patients.

Introduction

According to the World Health Organization (WHO), blood pressure levels are considered hypertensive when repeated measurements demonstrate a systolic blood pressure of at least 140 mmHg and/or a diastolic blood pressure of at least 90 mmHg (1). Hypertension remains the most common risk factor for cardiovascular diseases, imposing a substantial burden through increased morbidity, disability, and mortality across the globe (2). It is a major contributor to the global disease burden and the number of patients with hypertension continues to increase because of an aging population, particularly in developed countries (3). Globally, hypertension affects over 1.39 billion people, over 75% of whom live in low- and middle-income countries and stands as the leading cause of death worldwide, claiming an estimated 10 million lives annually (4). In addition, it imposes a significant financial burden on individuals, families, health systems, and economies (5).

Hypertension and DM, which are both non-communicable diseases (NCDs), are global public health concerns (6). Hypertension is a frequent comorbidity among individuals with type 2 diabetes mellitus (T2DM), substantially increasing the burden of disease through its contribution to cardiovascular events and worsening renal function (7). Approximately three-quarters of individuals with T2DM also have hypertension, while people with hypertension are about 2.5 times more likely to develop diabetes than their normotensive counterparts (8). Hypertension promotes diabetic microvascular complications, whereas adequate blood pressure control can reduce their development and progression (9).

Hypertension and DM frequently coexist and share several underlying pathophysiological mechanisms (10). They commonly coexist because they share underlying mechanisms, including insulin resistance, endothelial dysfunction, and chronic inflammation. Together, these conditions substantially increase the risk of cardiovascular, vascular, and kidney complications (11–13). Several factors have been consistently associated with an increased risk of hypertension among patients with DM. Older age, female gender, family history of hypertension (14, 15), presence of comorbidities, poor adherence to medications (16), and obesity (17) are risk factors for hypertension in patients with DM. On the other hand, it was also found that having diabetes for longer years and poor glycemic control were risks for hypertension in DM patients (15). Moreover, physical inactivity and cigarette smoking are also found to be significant contributors (18). It was also revealed that uncontrolled blood sugar, poor adherence to medications and excessive salt intake were also risks for hypertension among DM patients (19). Furthermore, alcohol consumption is an important modifiable risk factor for hypertension among patients with DM (20).

The prevalence rate of hypertension among type 2 diabetics is higher than that of aged and sex-matched patients without diabetes, ranging between 32% to 82% (21, 22). In sub-Saharan Africa, hypertension affects approximately 58.1% of individuals with T2DM, with considerable regional variation, ranging from 51.5% in West Africa and 53.0% in East Africa to 69.1% in Southern Africa and 77.6% in Central Africa, underscoring the substantial disparities in the burden of these coexisting conditions across the region (23).

In Ethiopia, hypertension has emerged as one of the most common comorbidities among patients with DM. A systematic review and meta-analysis estimated that the pooled prevalence of hypertension among patients with type 2 DM in Ethiopia was 55% (24). Moreover, other studies from Debre Tabor (25) and Arba Minch (26) reported hypertension prevalence of 59.5% and 52.8% among DM patients, respectively. Given the growing burden of both diabetes and hypertension in Ethiopia and the limited availability of context-specific evidence, identifying the magnitude of hypertension and its associated factors among diabetic patients remains essential for designing targeted prevention and management strategies. Therefore, this study aimed to assess the prevalence of hypertension and its associated factors among patients with diabetes mellitus attending follow-up care in Ethiopia.

Methods and materials

Study setting, design and period

The study was conducted at Nekemte and Wallaga University Comprehensive Specialized Hospitals, located in Nekemte town, Oromia Region, Ethiopia. The hospitals provide comprehensive healthcare services, including chronic disease management and specialized diabetic care. The diabetic follow-up clinic serves many patients with type 1 and type 2 diabetes mellitus from the hospitals' catchment area and neighboring districts. During the study period, regular follow-up services, including clinical evaluation, blood pressure monitoring, and diabetes management, were provided by trained healthcare professionals. A hospital-based cross-sectional study was conducted among patients with DM attending the diabetic follow-up clinic from March 1 to May 30, 2022.

Population

All patients with DM who were registered for follow-up care at the DM clinics of public hospitals in Nekemte City constituted the source population. The study population comprised all eligible DM patients who attended the follow-up clinics during the data collection period. Patients with a confirmed diagnosis of DM and registered for routine diabetic follow-up care in the selected public hospitals were included in the study.

Eligibility criteria

All adult patients (≥ 18 years) with a confirmed diagnosis of DM and attending regular follow-up care during the study period were eligible for inclusion. Patients who were critically ill, unable to communicate, pregnant, or had incomplete medical records regarding key study variables were excluded from the study.

Sample size determination

The sample size was determined using a single population proportion formula considering the following assumptions: a prevalence of hypertension among diabetic patients of 37.4% obtained from a previous conducted at Jimma University medical center (27), a 95% CI, a margin of error of 5%, and a 10% non-response rate.

$$\mathbf{N} = \frac{(1.96)^2 * 0.374\ (1\text{-}0.374)}{(0.05)^2} = \frac{3.8416*0.374*0.626}{0.0025} = 360$$

Adding 10% non-response rate, the final sample size was 396.

Sampling procedure

The calculated sample size was proportionally allocated to each public hospital based on the number of diabetic patients attending follow-up clinics. Accordingly, 319 participants were allocated to Nekemte Comprehensive Specialized Hospital and 77 participants to Wallaga University Comprehensive Specialized Hospital. Following proportional allocation, study participants were selected from each hospital using a systematic random sampling technique (Fig. 1).

Variables

Hypertension among diabetic patients was dependent variable. Socio demographic variables (age, sex, residence, marital status, educational status, and occupation), clinical characteristics (DM type, duration on DM, regularity of follow-up, family history of DM, hypertension status, average systolic blood pressure, average diastolic blood pressure, fasting blood sugar, community level health insurance) and behavioral factors (smoking, chat chewing, alcohol drinking, type of oil, physical exercise) were independent variables.

Measurements

Blood pressure measurements were conducted after the subjects rested for more than 25 minutes; systolic blood pressure and diastolic blood pressure were taken from the left arm at the level of the heart using a mercury-based sphygmomanometer. Blood pressure was measured two times within 30-minute intervals, and the average value was taken. A portable weight scale machine was used to determine body weight. A stadiometer was used to measure height in meters while standing upright on a flat surface. The ratio of weight in kilograms (kg) to the square of height in meters was used to determine the body mass index (BMI).

Data collection tools and procedures

Data was collected using a structured interviewer-administered questionnaire and a medical record review checklist developed after reviewing relevant literatures (25–27). The questionnaire consisted of sections addressing socio-demographic characteristics, clinical characteristics, behavioral factors. Data were collected by trained health professionals through face-to-face interviews and review of patient medical records. Information on age, sex, duration of diabetes, family history of hypertension, medication use, fasting blood glucose, blood pressure measurements, and other clinical variables was obtained from medical records and participant interviews.

Anthropometric measurements were conducted according to standard procedures. Weight was measured using a calibrated digital weighing scale with participants wearing light clothing and no shoes. Height was measured using a stadiometer, and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2).

Blood pressure was measured using a calibrated sphygmomanometer after participants had rested for at least five minutes in a seated position. Two measurements were taken at least five minutes apart, and the average value was used for analysis.

Operational Definitions

Hypertension: An average SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg, or self-reported physician-diagnosed hypertension with ongoing antihypertensive treatment (26).

Diabetes patient

A confirmed diabetic patient receiving follow-up care at the study hospitals and possessing a medical record number.

Fasting blood sugar

The blood glucose level measured after a minimum of 8 hours of fasting (28).

Physically active

An individual who engages in physical exercise for at least 30 minutes per day on five or more days per week (29).

Physically inactive

Activities for work, travel and leisure activities less than 30 minutes per day (29).

Data quality assurance

The questionnaire was initially prepared in English, translated into Afaan Oromo, and then translated back into English to ensure consistency. Data collectors and supervisors received training before data collection. A pretest was conducted on 5% of the sample size at a hospital outside the study area.

Necessary modifications were made based on the findings of the pretest. Daily supervision and review of complete questionnaires were performed to ensure completeness and consistency of the collected data.

Data processing and analysis

Data were entered into Epidata version 4.6 and analyzed using SPSS version 26. Descriptive statistical analyses, including frequencies, percentages, means, and standard deviations where appropriate, were used to summarize the characteristics of the study participants. Binary logistic regression was performed to identify factors associated with hypertension, and variables with $p < 0.25$ in the bivariable analysis were included in the multivariable model. Associations were reported using AORs with 95% confidence intervals, and statistical significance was declared at $p < 0.05$. Model fitness and multicollinearity were assessed using the Hosmer–Lemeshow test and variance inflation factor (VIF), respectively. The findings were presented using tables, figures, and narrative descriptions.

Results

Socio-Demographic Characteristics of study participants

A total of 396 diabetic patients were participated in the study, yielding a response rate of 100%. Of the participants, 203 (51.3%) were male. The mean age of the respondents was 43.84 years (± 14.5 SD). Most participants, 238 (60.1%), were urban residents, while the remaining 158 (39.9%) resided in rural areas (Table 1).

Table 1
Socio-demographic characteristics of study participants on hypertension and its determinants among patients with DM at tertiary hospitals, Western Ethiopia, 2024

Variables		Frequency	Percent
Sex	Male	203	51.3
	Female	193	48.7
Age	≤ 30	87	22.0
	31–50	153	38.6
	> 50	156	39.4
Residence	Urban	238	60.1
	Rural	158	39.9
Marital status	Single	61	15.4
	Married	315	79.6
	Divorced	8	2.0
	Widowed	12	3.0
Educational level	No formal education	86	21.7
	Primary school (1–8)	113	28.5
	Secondary school (9–12)	83	21.0
	College and above	114	28.8
Occupation	Student	23	5.8
	Self employed	203	51.3
	Government employee	89	22.5
	Husband and wife	81	20.5

Clinical characteristics of study participants

Of the 396 study participants, 228 (57.6%) had T2DM, while 168 (42.4%) had T1DM. More than half of the participants, 211 (53.3%), had been living with diabetes for more than five years, whereas 185 (46.7%) had a disease duration of less than five years. Additionally, 219 (55.3%) participants reported having regular follow-up care and support at the hospitals (Table 2).

Table 2
Clinical characteristics of study participants on hypertension and its determinants among patients with DM at tertiary hospitals, Western Ethiopia, 2024

Variables		Frequency	Percentage
Type of DM	Type 1	168	42.4
	Type 2	228	57.8
Duration with DM	≤ 5	185	46.7
	> 5	211	53.3
Follow up status	Regular	219	55.3
	Not regular	177	44.7
Family history of DM	Yes	134	33.8
	No	262	66.2
Body mass index (BMI)	< 18.5	44	11.1
	18.5–24.9	210	53.0
	25-29.9	93	23.5
	> 29.9	49	12.4
Hypertension status	Yes	161	40.7
	No	235	59.3
Average SBP	≥ 140	161	40.7
	< 140	235	59.3
Average DBP	≥ 90	159	40.2
	< 90	237	59.8
FBS	≥ 126	330	83.3
	< 126	66	16.7
Community health	Yes	246	62.1
Insurance	No	150	37.9

DM-Diabetes mellitus SBP - Systolic blood pressure SBP-Diastolic blood pressure FBS-Fasting blood sugar

Behavioral characteristics of study participants

Regarding behavioral characteristics, only 19 (4.8%) participants had ever smoked cigarettes, while the vast majority, 377 (95.2%), had never smoked. At the time of the study, 15 (3.8%) participants were smokers, whereas 381 (96.2%) were non-smokers. Similarly, most participants, 383 (96.7%), reported never chewing khat, while only 13 (3.3%) had chewed khat at least once in their lifetime (Table 3).

Table 3
Behavioral and lifestyle characteristics of study participants on hypertension and its determinants among patients with DM at tertiary hospitals, Western Ethiopia, 2024

Variables		Frequency	Percentages
Cigarette smoking	Yes	15	3.8
	No	381	96.2
Chewing khat	Yes	13	3.3
	No	383	96.7
Drink alcohol	Yes	38	9.6
	No	358	90.4
Type of oil used	Vegetable oil	242	61.1
	Solid fat oil	132	33.3
	Butter ghee	22	5.6
Physical exercise	Yes	162	40.9
	No	234	59.1

Magnitude of hypertension among diabetic patients

The overall magnitude of hypertension among diabetic patients was found to be 161 (40.7%).

Determinants of hypertension among patients with diabetes mellitus

In binary logistic regression analysis, variables with a p-value < 0.25 were considered candidates for inclusion in the multivariable logistic regression model. Accordingly, ten variables met the selection criterion and were entered into the multivariable analysis: age, residence, occupation, type of DM, regularity of follow-up, duration of DM, family history of hypertension, physical activity status, cigarette smoking, and health insurance membership. In the multivariable logistic regression analysis, age > 50 years, duration of DM > 5 years, a family history of hypertension, lack of health insurance membership, and physical inactivity were independently associated with hypertension among patients with DM.

Participants aged ≥ 50 years had nearly threefold higher odds of hypertension (AOR = 2.86; 95% CI: 1.20–4.80). Similarly, patients living with DM for more than five years were almost twice as likely to have

hypertension compared with those with a disease duration of ≤ 5 years (AOR = 1.95; 95% CI: 1.13–3.96). The strongest association was observed among participants with a family history of hypertension, who had more than sixfold higher odds of hypertension than their counterparts without such a history (AOR = 6.10; 95% CI: 3.56–10.40).

Conversely, health insurance membership and regular physical activity were protective factors against hypertension. Participants who were members of a health insurance scheme had 57% lower odds of hypertension compared with non-members (AOR = 0.43; 95% CI: 0.25–0.76). Likewise, physically active participants were 55% less likely to have hypertension than physically inactive participants (AOR = 0.45; 95% CI: 0.26–0.77) (Table 4).

Table 4
Bivariable and multivariable binary logistic regression analysis of factors associated with hypertension among patients with DM at tertiary hospitals, Western Ethiopia, 2024

Variables	Hypertension		Bivariate analysis	Multivariate Analysis	
	Yes	No	COR (95% CI)	AOR (95% CI)	*p-value*
Age (year)					
< 30	15	72	1	1	
31–50	47	106	2.13 (1.10–4.09)	1.1(0.49–2.4)	0.822
> 50	99	57	8.30 (4.30–15.80)	2.86 (1.20–4.70)	**0.015***
Residence					
Urban	132	106	0.66 (0.44-1.00)	0.88 (0.52,1.50)	0.659
Rural	103	55	1	1	
Occupation					
Student	7	16	1	1	
Self employed	81	122	1.42 (0.56–3.60)	1.2 (0.32–4.50)	0.787
Gov't employee	48	41	2.29 (0.86–6.05)	1.44 (0.36–5.76)	0.608
House and wife	49	32	1.40 (0.52–3.80)	1.57 (0.386-6.7)	0.528
Type of DM					
Type 1	44	124	1	1	
Type 2	117	111	2.90 (1.90–4.50)	1.38 (0.77–2.44)	0.275
Duration with DM					
≤ 5	47	138	1	1	
> 5	114	97	3.45 (2.25–5.30)	1.92 (1.10–3.30)	**0.018***
Regular follow-up					
Yes	80	139	1	1	
No	81	96	1.46 (0.97–2.10)	0.86 (0.51–1.40)	0.556
Family history of hypertension					
Yes	97	37	8.11 (5.10–13.10)	6.1 (3.56–10.40)	**< 0.001***
No	64	198	1	1	
Health insurance member					

Variables	Hypertension		Bivariate analysis	Multivariate Analysis	
	Yes	No	COR (95% CI)	AOR (95% CI)	*p-value*
Age (year)					
Yes	73	173	0.29 (0.19–0.45)	0.41 (0.24–0.71)	**0.001***
No	88	62	1	1	
Cigarette smoking					
Yes	9	6	2.22 (0.79–6.50)	2.1 (0.48–9.60)	0.342
No	152	229	1	1	
Physical exercise					
Yes	48	114	0.45 (0.30–0.69)	0.45 (0.26–0.77)	**0.004***
No	113	121	1	1	
DM-Diabetes mellitus, COR-Crude odds ratio, AOR-Adjusted odds ratio, CI-Confidence interval					
***Significant at p < 0.05**					

Discussion

This study assessed magnitude and factors associated with hypertension among DM patients in tertiary hospitals in Nekemte Town. The overall magnitude of hypertension among DM patients was found to be 40.7% (95% CI: 36.40–45.40). The present finding is in agreement with a study conducted in Jimma, Ethiopia, which documented a 37.4% prevalence of hypertension among patients with diabetes mellitus, suggesting a similar burden of hypertension among diabetic populations in the two settings (27). Furthermore, the prevalence of hypertension in the present study exceeded the estimates reported from studies conducted in the Amhara Region of Ethiopia 21.3% (30), Central Ethiopia 34.6% (16), Nepal 5.3% (31), and Pakistan 21.8% (32). Conversely, the prevalence of hypertension observed in the current study was lower than that reported in a study conducted in Arba Minch 52.8% (26), Debre Tabor 59.5% (25), Kenya 85% (33), Tanzania 55.2% (34), Ghana 79.9% (35), China 54% (36), and Japan 50% (37), indicating regional variations in the burden of hypertension among patients with diabetes mellitus. The variation in hypertension prevalence across studies may be due to differences in participants' characteristics, healthcare access, and methodological approaches, including study design and diagnostic criteria.

In this study, age above 50 years was significantly associated with hypertension among diabetic patients, with older individuals being nearly three times more likely to develop hypertension (AOR = 2.86; 95% CI: 1.20–4.70). This finding is in line findings from other studies in Ethiopia (30, 38, 39) and elsewhere in the world (34, 40). This finding is biologically plausible, as advancing age is associated with arterial stiffness, reduced vascular elasticity, endothelial dysfunction, and increased peripheral vascular

resistance, all of which contribute to elevated blood pressure. Moreover, older adults are more likely to have prolonged exposure to diabetes-related metabolic abnormalities and other cardiovascular risk factors, increasing their susceptibility to hypertension.

Another risk factor identified in this study was living with DM for more than five years. In the present study, diabetic patients who had lived with diabetes for more than 5 years were nearly twice as likely to have hypertension compared with those with a disease duration of 5 years or less (AOR = 1.92, 95% CI: 1.10–3.30). This is found to be similar to other study findings that reported longer duration with DM as a risk factor for developing hypertension (23, 26, 38). This association may be explained by the cumulative effects of prolonged hyperglycemia, which can lead to endothelial dysfunction, arterial stiffness, atherosclerosis, and other vascular complications that contribute to elevated blood pressure. Furthermore, a longer duration of diabetes increases exposure to metabolic abnormalities and cardiovascular risk factors, thereby increasing the likelihood of developing hypertension over time.

Moreover, the odds of hypertension were significantly higher among diabetic patients with a family history of hypertension (AOR = 6.10, 95% CI: 3.60–10.40). this finding was found to be consistent with the findings reported other studies worldwide (41–44). This finding may be attributed to shared genetic predispositions that influence blood pressure regulation, as well as common environmental and lifestyle factors within families, such as dietary habits, physical inactivity, and other cardiovascular risk factors. Moreover, individuals with a family history of hypertension may inherit susceptibility to metabolic and vascular abnormalities that increase the risk of developing hypertension.

In addition, membership in a health insurance scheme was associated with significantly lower odds of hypertension among diabetic patients (AOR = 0.41, 95% CI: 0.26–0.71). In the present study, diabetic patients who were members of health insurance schemes had 59% lower odds of developing hypertension compared with those who were not insured. Similarly, several studies over the world have also supported this finding (45–48). This protective effect may be due to improved access to healthcare services, regular follow-up, early detection and treatment of hypertension, and reduced financial barriers to care among insured individuals.

Furthermore, regular physical exercise was significantly associated with lower odds of hypertension among diabetic patients (AOR = 0.45, 95% CI: 0.26–0.77). In the present study, diabetic patients who engaged in regular physical exercise had 55% lower odds of hypertension compared with their physically inactive counterparts. Other study findings also supported this finding (18, 49–51). This finding may be explained by the beneficial effects of physical activity on cardiovascular health, including improved endothelial function, reduced arterial stiffness, enhanced insulin sensitivity, weight control, and decreased sympathetic nervous system activity. Regular exercise also contributes to better blood pressure regulation and glycemic control, thereby reducing the risk of hypertension among patients with diabetes mellitus.

Limitation of the Study

This study has some limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to establish temporal or causal relationships between hypertension and the identified associated factors. Second, as the study was conducted in public hospitals, the findings may not be generalizable to diabetic patients receiving care in private health facilities or those not attending regular follow-up clinics. Third, some behavioral variables, such as physical activity and alcohol consumption, were self-reported and may be subject to recall or social desirability bias. Finally, important factors such as dietary salt intake, medication adherence, and glycemic control were not comprehensively assessed, which may have influenced the observed associations.

Conclusion

In this study, the prevalence of hypertension among patients with diabetes mellitus was high, affecting approximately four in ten patients. Advanced age, longer duration of diabetes, and a family history of hypertension were significant risk factors, whereas regular physical activity and membership in a health insurance scheme were protective factors. These findings highlight the need for targeted hypertension screening and prevention strategies, particularly among older diabetic patients, those with a longer duration of diabetes, and individuals with a family history of hypertension, while promoting physical activity and improving access to healthcare services through health insurance coverage.

Abbreviations

AOR
Adjusted odds ratio
BMI
Body mass index
CI
Confidence interval
COR
Crude odds ratio
DBP
Diastolic blood pressure
DM
Diabetes mellitus
FBS
Fasting blood sugar
NCD
Non-communicable disease
SBP
Systolic blood pressure
SPSS

Statistical Software for Social Sciences
VIF
Variance inflation factor

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Wallaga University Research Ethics Review Committee (RERC) (Ref. No. WU/R1/539/2022). Following approval, an official letter of cooperation was submitted to Nekemte Comprehensive Specialized Hospital and Wallaga University Comprehensive Specialized Hospital. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before data collection. To ensure confidentiality and privacy, no personal identifiers were recorded on the questionnaires; instead, unique identification numbers assigned for the study were used. All collected information was kept confidential and used solely for research purposes.

Consent for publication

Not applicable

Competing interests

The authors declare competing interests

Author detail

[1]Nekemte Public Health Research and Referral Laboratory Center, Nekemte, Ethiopia

[2]Department of Public Health, Institute Health Sciences, Wallaga University, Nekemte, Ethiopia

Funding

No funding was obtained for this research work

Author Contribution

EG conceived and designed the study, coordinated the research activities, performed the data analysis and interpretation. TG, JW, WB, and GS contributed to data collection. ET drafted the manuscript, while DG critically revised it for important intellectual content. All authors reviewed, read, and approved the final version of the manuscript.

Acknowledgement

The authors would like to express their sincere gratitude to the Department of Public Health, Institute of Health Sciences, Wallaga University, for its invaluable support and facilitation throughout this research project. We are also grateful to the staff of the Diabetes Mellitus Clinics at Nekemte Comprehensive Specialized Hospital and Wallaga University Comprehensive Specialized Hospital for their cooperation and commitment during the data collection process. Finally, we extend our heartfelt appreciation to all study participants for their willingness to participate and for providing the valuable information that made this study possible.

Data availability

The datasets used and analyzed during the study are available from the corresponding author upon reasonable request.

References

1. Gudayneh YA, Shumye AF, Gelaye AT, Tegegn MT. Prevalence of hypertensive retinopathy and its associated factors among adult hypertensive patients attending at Comprehensive Specialized Hospitals in Northwest Ethiopia, 2024, a multicenter cross-sectional study. Int J Retin Vitr. 2025;11(17):1–13.
2. Hinneh T, Akyirem S, Bossman IF, Lambongang V, Ofori-Aning P, Ogungbe O, et al. Regional prevalence of hypertension among people diagnosed with diabetes in Africa, a systematic review and meta-analysis. PLOS Glob Public Heal. 2023;3(12):1–18.
3. Satoh M, Nakayama S, Nobayashi H, Iwabe Y, Izumi S, Murakami T, et al. Current hypertension epidemiology and contemporary approaches using the Real-World Evidence Cycle framework. Hypertens Res. 2026;49:756–67.
4. Jobe M, Beye SM, Gaye ND, Ka MM, Perel P, Perkins AD, et al. Hypertension in Sub-Saharan Africa: Burden, Barriers and Priorities for Improving Treatment Outcomes. Circ Res. 2025;137(1):106–18.
5. Farrar J, Frieden T. WHO global report on hypertension 2025. Lancet. 2025;406:2318–9.
6. Abdelbagi O, Musa IR, Musa SM, ALtigani SA, Adam I. Prevalence and associated factors of hypertension among adults with diabetes mellitus in northern Sudan: a cross-sectional study. BMC Cardiovasc Disord. 2021;21(168):1–7.
7. Wander GS, Panda JK, Pal J, Mathur G, Sahay R, Tiwaskar M, et al. Management of Hypertension in Patients with Type 2 Diabetes Mellitus: Indian Guideline 2024 by Association of Physicians of India and Indian College of Physicians. J Assoc Physicians India. 2024;72(8):e1–25.
8. Shrestha PL, Shrestha PA, Vivo RP. Epidemiology of comorbidities in patients with hypertension. Curr Opin Cardiol. 2016;31(4):376–80.

9. Yamazaki D, Hitomi H, Nishiyama A. Hypertension with diabetes mellitus complications. Hypertens Res. 2018;41(147):147–56.
10. Usui I. Common metabolic features of hypertension and type 2 diabetes. Hypertens Res. 2023;46(5):1227–33.
11. Okazaki RA, Rizvi SH, Lyons R, Behrooz L, Hamburg NM. Vascular dysfunction in diabetes and pharmacotherapeutic opportunities: a focus on endothelial cell health. Am J Physiol - Hear Circ Physiol. 2025;329(3):H705–18.
12. An Y, Xu B, tuo, Wan S, rong, Ma X, mei, Long Y, Xu Y, et al. The role of oxidative stress in diabetes mellitus-induced vascular endothelial dysfunction. Cardiovasc Diabetol. 2023;22(237):1–17.
13. Hezam AAM, Shaghdar HBM, Chen L. The connection between hypertension and diabetes and their role in heart and kidney disease development. J Res Med Sci. 2024;29(1):1–8.
14. Wake AD. Incidence and predictors of hypertension among diabetic patients attending a diabetic follow-up clinic in Ethiopia: a retrospective cohort study. J Int Med Res. 2023;51(10):1–23.
15. Stanikzai MH, Amirzada ME, Ishaq N, Kamil KA, Anwary Z, Farzad A et al. Prevalence of Hypertension and Its Associated Factors Among Patients with Type 2 Diabetes in Southern Afghanistan: A Multi-Center Cross-Sectional Study. Diabetes, Metab Syndr Obes. 2025;18:715–25.
16. Negussie YM, Abebe AT. Hypertension and associated factors among patients with diabetes mellitus attending a follow-up clinic in central Ethiopia. Sci Rep. 2025;15(13150):1–9.
17. Iqbal S, Hanan H, Maqbool A, Munawar N. J Contemp Pharm JcponlinePk. 2023;8(1):24–31.
18. Kassa A, Woldesemayat EM. Hypertension and Diabetes Mellitus among Patients at Hawassa University Comprehensive Specialized Hospital, Hawassa, Southern Ethiopia. Int J Chronic Dis. 2019;2019:1–8.
19. Gebreziher LH, Beyene MG, Mekonnen D, Baye AM. Predictors of uncontrolled hypertension among type 2 diabetic patients in Ethiopia: Multicenter cross-sectional study. Int J Cardiol Cardiovasc Risk Prev. 2024;22:1–7.
20. Mayl JJ, German CA, Bertoni AG, Upadhya B, Bhave PD, Yeboah J, et al. Association of alcohol intake with hypertension in type 2 diabetes mellitus: The accord trial. J Am Heart Assoc. 2020;9(18):1–8.
21. MA B. Prevalence of Hypertension in Patients with Type 2 Diabetes Mellitus. Saudi J Med. 2025;10(03):46–50.
22. Mubarak FM, Froelicher ES, Jaddou HY, Ajlouni M. original article. Ann Saudi Med. 2008;28(October):346–51.
23. Simelane X, Fina-Lubaki JP, Francis JM. Epidemiology of hypertension among patients with type 2 diabetes in the Democratic Republic of Congo. Afr J Prim Heal Care Fam Med. 2025;17(1):1–9.
24. Haile TG, Mariye T, Tadesse DB, Gebremeskel GG, Asefa GG, Getachew T. Prevalence of hypertension among type 2 diabetes mellitus patients in Ethiopia: A systematic review and meta-Analysis. Int Health. 2023;15(3):235–41.

25. Akalu Y, Belsti Y. Hypertension and its associated factors among type 2 diabetes mellitus patients at Debre Tabor general hospital, northwest Ethiopia. Diabetes, Metab Syndr Obes Targets Ther. 2020;13:1621–31.
26. Andarge BD, Negash NA, Degualem SM, Bezie HE, Wondmagegn H, Meshesha TA, et al. Factors associated with hypertension among patients with type 2 diabetes mellitus at Arba Minch general hospital, South Ethiopia. Prev Med Rep. 2025;59:1–6.
27. Abdissa D, Kene K. Prevalence and Determinants of Hypertension Among Diabetic Patients in Jimma University. Diabetes. Metab Syndr Obes Targets Ther. 2020;13:2317–25.
28. American Diabetes Association. Cardiovascular disease and risk management: Standards of medical care in diabetesd 2021. Diabetes Care. 2021;44(1):S125–50.
29. Kenore Y, Abrha S, Yosef A, Gelgelu TB. Determinants of Hypertension Among Patients with Diabetes mellitus in Public Hospitals of Kembata Tambaro Zone, South Nations Nationalities and Peoples Region, Ethiopia, 2021; A Case Control Study. J Multidiscip Healthc. 2022;15:2141–52.
30. Asmare DS, Abebe TA, Miskir M, Ashenef B, Adugna A, Muche Y, et al. Magnitude and determinants of isolated systolic hypertension among type 2 diabetes patients in selected referral hospitals in Amhara Region, Ethiopia. Sci Rep. 2025;15(12221):1–8.
31. Silvanus V, Dhakal N, Shrestha N, Kafle PP. Comorbid Diabetes and Hypertension: Gender differences in prevalence and risk factors among adults (≥ 18 years) in an urban community in Kathmandu District in Nepal. Nepal Med Coll J. 2023;25(4):277–89.
32. Khan AG, Zia R, Khan A. Prevalence of Diabetes Mellitus and Hypertension in Adult Population of Rural Pakistan: A Cross-Sectional Study. C J Geriatr Med. 2026;18(5):218–23.
33. Ndege BW, Diero LO, Owiti MOG, Anjichi G, Siika AM. Prevalence, treatment and control of hypertension among type 2 diabetic patients at MOI teaching and referral hospital, Eldoret, Kenya. East Afr Med J. 2014;91(8):253–9.
34. Mwimo J, Kimondo FC, Mboya IB. Prevalence of hypertension and associated factors among diabetic patients in Kilimanjaro region, northern Tanzania: A hospital-based cross-sectional study. Clin Epidemiol Glob Heal. 2023;23(101387):1–5.
35. Boima V, Yorke E, Ganu V, Twumasi L, Ekem-Ferguson G, Dey D, et al. Prevalence of Hypertension and Its Clinical and Psychological Factors in Type 2 Diabetes Patients in Ghana: A Secondary Analysis of a Cross-Sectional Study. J Diabetes Res. 2024;2024(1):1–9.
36. Zhang X, Yang XL, Liu S, Ye YS, Yang QT, Xia LN. Prevalence of hypertension among type 2 diabetes mellitus patients in China: a systematic review and meta-analysis. Int Health. 2024;16(2):144–51.
37. Tatsumi Y, Ohkubo T. Hypertension with diabetes mellitus: Significance from an epidemiological perspective for Japanese. Hypertens Res. 2017;40(9):795–806.
38. Takele M, Bayisa Z, Benti T, Dida N, Seid A. Determinants of hypertension among adults with diabetes mellitus attending chronic care clinics in public hospitals, Ambo Town, West Shoa, Oromia, Ethiopia, 2024. Discov public Heal. 2026;23(401):1–17.

39. Yakob B, Israel E, Jaldo MM, Abraham A, Yakob T. Factors associated with hypertension among patients with type 2 diabetes: evidence from a resource-limited setting—Southern Ethiopia. Front Endocrinol (Lausanne). 2025;16:1–11.
40. Bani A, Hyassat D, Suhail A, Makahleh Z, Khader Y, El-khateeb M, et al. The prevalence of hypertension and its progression among patients with type 2 diabetes in Jordan. Ann Med Surg. 2022;73(103162):1–5.
41. Mossu Y, Anegagregn A, Wubeshet K, Semere A, Abera E, Markos E, et al. Magnitude of Hypertension and Associated Factors Among Diabetic Patients at Hawassa University Comprehensive Specialized Hospital, Ethiopia: A Cross-Sectional Study. Heal Sci Rep. 2026;9(4):1–12.
42. Li A, Peng Q, Shao Y, Fang X, Zhang Y. The interaction on hypertension between family history and diabetes and other risk factors. Sci Rep. 2021;11(4716):1–7.
43. Belew MA, Abate TW, Berhie AY, Abeje ED, Ayele DA, Abate MD, et al. Determinants of hypertension among diabetes patients attending selected comprehensive specialized hospitals of the Amhara Region, Ethiopia: An unmatched casecontrol study. PLoS ONE. 2022;17:1–17.
44. Kotiso KS, Degemu N, Gebremedhin S, Taye M, Petros A, Belayneh F, et al. Determinants of hypertension among patients with type 2 diabetes mellitus on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa: A case-control study. PLoS ONE. 2021;16:1–16.
45. Zhang X, Zhang Y, Xiao X, Ma X, He J. The relation between health insurance and management of hypertension in Shanghai, China: A cross-sectional study. BMC Public Health. 2016;16(959):1–8.
46. Bleich SN, Cutler DM, Adams AS, Lozano R, Murray CJL. Impact of insurance and supply of health professionals on coverage of treatment for hypertension in Mexico: Population based study. Br Med J. 2007;335(7625):875–8.
47. Hendriks ME, Rosendaal NTA, Wit FWNM, Bolarinwa OA, Kramer B, Brals D, et al. Sustained effect of health insurance and facility quality improvement on blood pressure in adults with hypertension in Nigeria: A population-based study. Int J Cardiol. 2016;202:477–84.
48. Cole MB, Kim JH, Levengood TW, Trivedi AN. Association of Medicaid Expansion with 5-Year Changes in Hypertension and Diabetes Outcomes at Federally Qualified Health Centers. JAMA Heal Forum. 2021;2(9):1–14.
49. Yeshitla M, Habte T, Argaw Z, Getahun N. The prevalence of cardiovascular disease and its associated factors among type 2 diabetes mellitus patients in selected public hospitals in Addis Ababa, Ethiopia. Int J Afr Nurs Sci. 2025;23(100861):1–9.
50. Anjajo EA, Workie SB, Tema ZG, Woldegeorgis BZ, Bogino EA. Determinants of hypertension among diabetic patients in southern Ethiopia: a case-control study. BMC Cardiovasc Disord. 2023;23(1):1–11.
51. Kotiso KS, Degemu N, Gebremedhin S, Taye M, Petros A, Belayneh F, et al. Determinants of hypertension among patients with type 2 diabetes mellitus on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa: A case-control study. PLoS ONE. 2021;16:1–16.

Figures

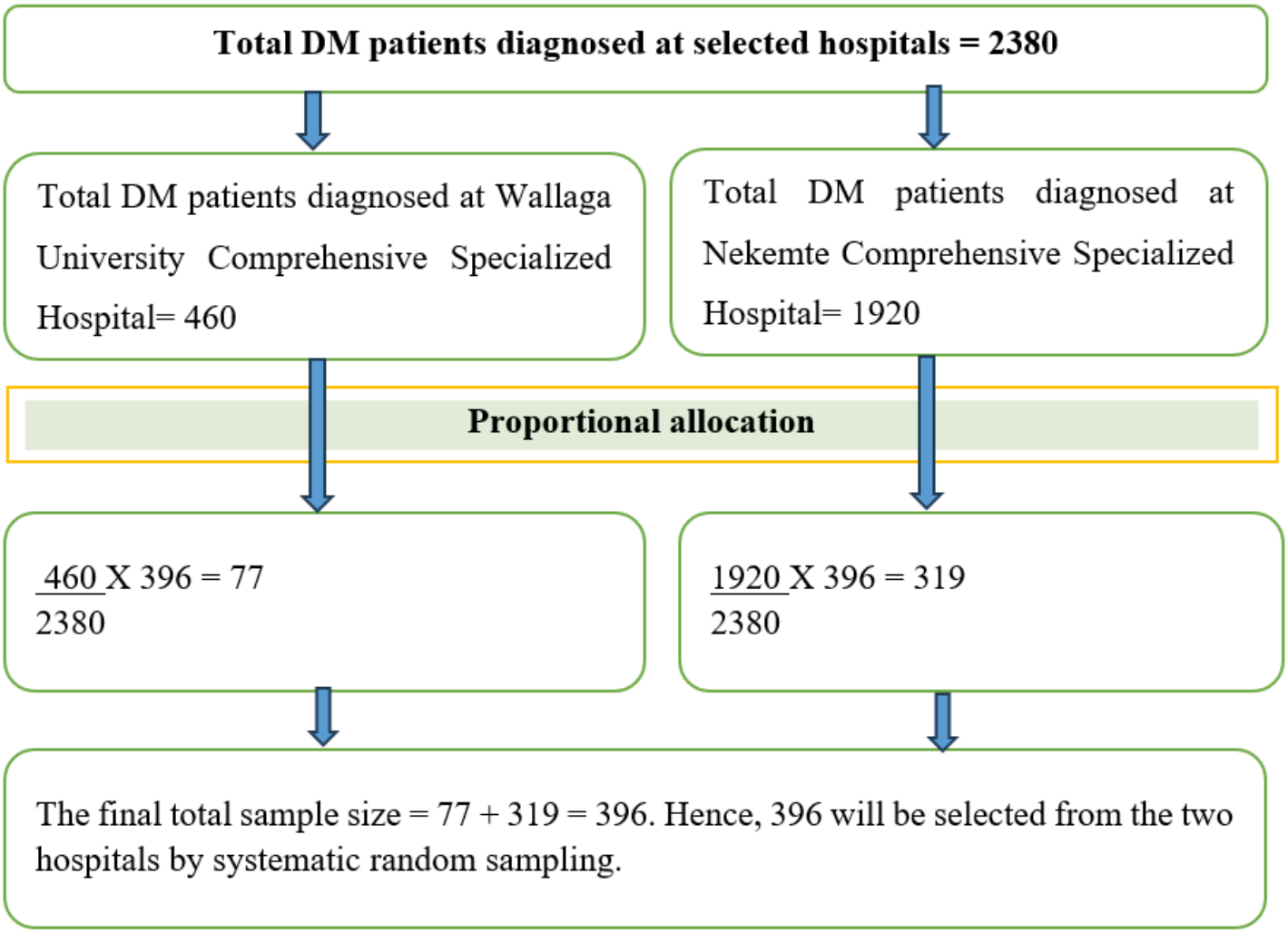


Figure 1

Sampling procedure