

Hypertension and Its Associated Factors Among Cancer Patients at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia: Hospital-Based Cross-Sectional Study

Anteneh Ayelign Kibret¹, Hailu Aragie¹, Daniel Gashaneh Belay^{1,2}, Meseret Derbew Molla³, Ephrem Tafesse Teferi⁴, Endalkachew Belayneh Melese⁴, Yilkal Belete Worku⁴, Haileab Fekadu Wolde², Dagnew Getnet Adugna¹

¹Department of Human Anatomy, School of Medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia; ²Department of Epidemiology and Biostatistics, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia; ³Department of Biochemistry, School of Medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia; ⁴Department of Internal Medicine, School of Medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

Correspondence: Dagnew Getnet Adugna, Department of Human Anatomy, School of Medicine, College of Medicine and Health Science, University of Gondar, P.O.Box 196, Gondar, Ethiopia, Tel +2510932223887, Email dagnewgetnet5@gmail.com

Introduction: Hypertension is the most common comorbidities in adult cancer patients. Although hypertension is a leading cause of cancer-related death and disability, there is no evidence about its prevalence and associated factors among cancer patients in Ethiopia. Therefore, this study aimed to assess the prevalence and associated factors of hypertension among cancer patients.

Methods: Hospital-based cross-sectional study was conducted among cancer patients from January to March 2021. A systematic random sampling technique was performed to select 403 study participants. To collect the data, structured interviewer-administered questionnaires were used. Both bi-variable and multivariable binary logistic regression analyses were used to identify factors associated with hypertension. In the multivariable logistic regression analysis, adjusted odds ratios (AOR) with 95% confidence interval (CI) and P-value of less than 0.05 were used to determine significant factors.

Results: The final result was based on 384 cancer patients. In this study, the prevalence of hypertension among adult cancer patients was 36.2% [95% CI: (31.5, 41.2)]. In the multivariable logistic regression analysis, age greater than 57 years [AOR = 5.0; 95% CI (1.7, 14.9)] and having a family history of hypertension [AOR 10.9; 95% CI (5.5, 21.6)] were found to be significantly associated with hypertension.

Conclusion: The prevalence of hypertension among cancer patients was considerably high. Age >57 years and family history of hypertension were found to increase the odds of having hypertension among cancer patients. Therefore, it is important to emphasize cancer patients that are at high risk of hypertension and develop preventive strategies to decrease the burden of this disease. There is a need for routine screening for hypertension for those having a positive family history of hypertension and older age, as they have an increased likelihood of developing high blood pressure among cancer patients.

Keywords: hypertension, prevalence, cancer, associated factors, Ethiopia

Introduction

Hypertension (HTN) is defined as a systolic blood pressure (SBP) of ≥ 140 mmHg and/or a diastolic pressure (DBP) of ≥ 90 mmHg.¹ It is a major public health problem due to its high prevalence and concomitant risks of cardiovascular and renal diseases like heart disease, strokes, and kidney dysfunction. Globally, around 35 million people died due to non-communicable diseases (NCDs), with 80% of deaths occurring in developing countries.² HTN is predicted to cause the death of 1.75 million people each year, accounting for 12.8% of all deaths in Sub-Saharan Africa.^{3,4}

HTN and cancer are complex, severe, and chronic NCDs. HTN has been associated with an increased likelihood of developing certain malignancies and patients with HTN experienced a high rate of cancer-related mortality.^{5,6} Cancer is also one of the main causes of morbidity and mortality in the world. In 2018, there were over 18 million new cancer cases and 9.6 million cancer-related mortality worldwide, and these figures are expected to increase in the next two decades.⁷ As a result, if high blood pressure and/or HTN are linked to an increased risk of cancer, this could have serious public health implications. Many cancers and chemotherapeutic drugs directly or indirectly cause HTN; thus, cancer patients have a higher risk of developing HTN when compared to the general population.⁸ In the previous years, the survival rate of cancer patients enhanced dramatically. However, toxicities of chemotherapeutic treatment, a high number of aging patients with several comorbid diseases, accompanied by lack of adequate knowledge and risk factors' treatment, causes an increased incidence of HTN in cancer patients.⁹ Cardiovascular disease is becoming the second most common cause of morbidity and mortality in cancer patients.⁹ An increased prevalence of cardiovascular diseases in cancer patients is observed because of the overlapping of risk factors to both cancer and cardiovascular diseases.¹⁰

Furthermore, the association between HTN, cancer diseases, and other cardiovascular diseases are multidimensional and they share many common risk factors such as smoking, diabetes mellitus, and obesity.^{11,12} The co-occurrence of risk factors permits the application of harmonized preventive strategies to many NCDs.¹³ HTN has been reported as the most common comorbidities in adult cancer patients and the estimated prevalence among cancer patients is particularly higher compared with the general population.^{14–19} As result, HTN is the foremost modifiable risk factor for the development of cardiovascular diseases, which is quickly emerging as one of the main causes of death and disability in adult cancer patients.^{5,19} Prior to the administration of chemotherapeutic drugs, HTN prevalence in cancer patients was similar to the general adult population (29%).^{20,21} However, a higher prevalence is seen after starting certain chemotherapeutic drugs like angiogenesis inhibitors (17–80%), alkylating agents (36–39%), and immunodepressants after stem-cell transplantation (30–80%).^{22–24} Therefore, many chemotherapeutic drugs have been associated with the development of new-onset HTN or worsening of previously well-controlled HTN because of the direct influences of these drugs on vascular endothelial growth factors, sympathetic function, and renal toxicity.⁸ The co-occurrence of HTN and cancer is common in adult patients and the prevalence of both diseases is increased with advanced age.^{14,25,26}

In 2020, a systematic and meta-analysis was conducted in Ethiopia and the overall prevalence of HTN in the adult population was 21.81%.²⁷ However, awareness about the management and prevention of HTN is very low in Ethiopia. Previous studies indicated that several factors have been associated with HTN. These include age, obesity, diabetes mellitus, physical inactivity, alcohol use, positive family history of HTN and diabetes mellitus, chat chewing, cigarette smoking, and socioeconomic status.^{27–30}

HTN is becoming a main public health issue in low- and middle-income countries including Ethiopia since it is the main risk factor for coronary heart disease, stroke, heart failure, and end-stage renal disease.²¹ However, there is no evidence about the prevalence and associated factors of HTN among cancer patients in developing countries, particularly in Ethiopia. Besides, documented data on the prevalence and associated factors of HTN among cancer patients is very crucial for understanding the burden of the diseases, identifying high-risk groups, and developing effective curative and preventive strategies. Therefore, this study aimed to assess the prevalence of HTN and its associated factors among adult cancer patients visiting the oncology unit, in the University of Gondar Comprehensive Specialized Hospital, Gondar, Ethiopia.

Methods

Study Area and Period

The study was conducted among adult cancer patients visiting the Oncology unit at the University of Gondar Comprehensive Specialized Hospital from January to March 2021. The hospital was founded in 1954 and is located in the Central Gondar Zone of the Amhara National Regional State, which is far around 750 km from Addis Ababa, the capital city of Ethiopia. According to the 2015 population projection of major cities in Ethiopia, the overall population size of Gondar town was around 323,900. Today, Gondar town has 9 public health institutions (one Comprehensive Specialized Hospital and eight Health Centers). University of Gondar Comprehensive Specialized Hospital is a teaching

hospital, which serves more than 7.5 million people of the Central Gondar Zone and neighboring regions. This hospital has one Oncology ward. The ward serves more than 1500 cancer patients every year. The oncology unit currently has 15 beds for the treatment of patients with cancer.

Study Design

A hospital-based cross-sectional study was employed.

Population

All adult cancer patients visiting the Oncology unit at the University of Gondar Comprehensive Specialized Hospital were the source population. The study population was all adult cancer patients who visited the Oncology unit at the University of Gondar Comprehensive Specialized Hospital during the study period.

Inclusion and Exclusion Criteria

All adult cancer patients whose age is greater than 18 years and visiting the hospital were included in the study. Critically ill patients who were unable to respond were excluded.

Sample Size Determination and Sampling Procedure

The sample size was calculated using a single population proportion formula by considering the following parameters: confidence level (95%), the margin of error = 5%, and proportion of HTN among adult cancer patients taken as 50% since no previous study in the area. By adding a non-response rate of 5%, the required sample size was 403. A systematic random sampling technique was performed to select study participants. The average number of patients visiting the Oncology unit within the previous three months was calculated and was 630. The sampling interval (K) was calculated by dividing the average number of patients visiting oncology unit per three months by sample size ($630/403$), which is approximately 2. The 1st respondent was chosen by lottery method. Finally, every other second respondent was selected and interviewed until the required sample size was achieved.

Variables of the Study

The outcome variable for this study was HTN.

Independent Variables

Socio-demographic factors of the participants like age, sex, religion, marital status, occupational status, residence, and income were assessed. Besides, behavioral factors such as alcohol consumption, khat chewing, cigarette smoking, physical inactivity, and use of oil were also assessed. Moreover, cancer-related clinical factors like stage of cancer, types of cancer, site of cancer, metastasis, cancer treatment, and duration of treatment were assessed. Anthropometric characteristics such as weight, height, body mass index (BMI), and waist circumference were measured.

Data Collection Procedure and Tools

The data were collected by interviewing the patients and reviewing their medical records using a structured interviewer-administered questionnaire. Patients were interviewed by four general practitioners working in the oncology department under the supervision of the principal investigator and one oncology specialist doctor. The questionnaire was initially developed in English, and translated into Amharic language by experts, and then back into English by a panel of professionals who are fluent in both languages. Blood pressure (BP) was measured in the left arm using a standard mercury sphygmomanometers BP cuff with participants sitting after resting for at least 5 minutes. Patients were asked if they had consumed any caffeinated product, such as tea or coffee, had a cigarette, or engaged in any high-intensity physical activity 30 minutes before measurement; if they did, their BP was taken after 30 minutes of initial consumption. Three BP measurements were taken in every 5-minute intervals between consecutive measurements. The average systolic and diastolic BP of the three consecutive records was analyzed. HTN was defined as a SBP of ≥ 130 mmHg or DPB of ≥ 80 mmHg or previous diagnosis of HTN or the use of antihypertensive medications on regular basis.³¹ Blood sugar of the patients was measured using CareSenseN glucometer and diabetes mellitus

was diagnosed based on WHO guideline which is fasting blood sugar ≥ 126 mg/dl or random blood sugar ≥ 200 mg/dl or self-report of the previous diagnosis of diabetes mellitus by physicians or recent use of diabetes medication.³² The participants' heights were measured in a standing upright position with bare feet. Participants' weight was also measured using a calibrated weight scale while wearing light clothing. BMI was determined accordingly and was classified as underweight (< 18.5 kg/m²), normal (18.5–24.99 kg/m²), overweight (25–29.99 kg/m²), and obese (≥ 30 kg/m²). The waist circumference was measured using flexible plastic tape with light closing at an approximate mid-point between the lower edge of the lowest palpable rib and the top of the iliac crest. A waist circumference of ≥ 80 for females and ≥ 94 for males was considered as high risk.

Data Quality Control

Two-days training were provided for data collectors and supervisors about the content of questionnaires, data collection technique, and measurement procedures. Before data collection, a pretest was done among 5% of the sample size to see the effectiveness of the questionnaire. The principal investigator supervised the data collectors daily, and the collected data were reviewed for completeness, accuracy, and clarity before being entered.

Data Processing and Analysis

Data was entered to Epidata version 4.6 and analyzed by STATA software version 14. Descriptive statistics such as percentages, proportions, mean and standard deviations were calculated for selected variables. The results were presented using tables and text. A chi-square assumption was tested for all categorical explanatory variables. Binary logistic regression analysis was used to examine independent variables associated with HTN. Bi-variable and multivariable logistic regression models were used. Variables with a p-value of less than 0.2 at the bivariable analyses were entered into multivariable logistic regression analysis. In the multivariable logistic regression analysis, adjusted odds ratios (AOR) with 95% confidence interval (CI) and P-value of less than 0.05 were used to determine significant factors. The Hosmer–Lemeshow goodness of fit test was used to check model fitness.

Ethical Considerations

The study protocol was approved by the Ethical Review Board of University of Gondar. Permission letter was taken from the University of Gondar Comprehensive Specialized Hospital, Department of Oncology. Informed consent was obtained from all participants enrolled in the study. Participants' names and other personal identifiers were not included to maintain confidentiality and the data were password protected. This study was conducted in accordance with the Declaration of Helsinki.

Results

Socio-Demographic Characteristics of Adult Cancer Patients

A total of 384 participants were included in the study with a response rate of 95%. The mean (SD) age of the respondents was (49 $\pm$ 13) years. About 56.8% were in between 38 and 57 age groups. Of the total participants, about 51.3% were women, 64.4% were urban dwellers and 64.6% had medium-level income. Regarding marital status, nearly half (49.7%) of participants were married (Table 1).

Anthropometric Measurements of Study Participants

The mean ($\pm$ SD) heights of the study participants were 1.63 ($\pm$ 0.6) m while the mean ($\pm$ SD) weights of the study participants were 56.8 ($\pm$ 7) kg. Thus, the mean (SD) BMI of the study participants was 21.2 ($\pm$ 2.5) kg/m². Moreover, the mean ($\pm$ SD) waist circumferences of the study participants were 76.5 ($\pm$ 9.9) cm. Regarding central obesity of participants, about 19.3% had central obesity. About 80.7% of participants had normal BMI.

Behavioral and Dietary Characteristics of Study Participants

Of the total study participants, 6.2%, 59.1%, and 27.3% had a habit of smoking, alcohol drinking, and chewing khat, respectively. Regarding oil utilization, majority 97.4% of respondents were oil users. Of this, about 46% were liquid oil

Table I Socio-Demographic, Behavioral, Dietary, and Cancer-Related Clinical Characteristics of Adult Cancer Patients at Oncology Unit in University of Gondar Comprehensive Specialized Hospital, Gondar, Ethiopia, 2021

Variables	Category	Frequency	Percent (%)
Age	18–37	65	16.9
	38–57	218	56.8
	>57	101	26.3
Sex	Male	187	48.7
	Female	197	51.3
Residence	Urban	136	35.6
	Rural	246	64.4
Marital status	Single	44	11.5
	Married	191	49.7
	Divorced	73	19.0
	Widowed	76	19.8
Religion	Orthodox	243	63.3
	Muslim	91	23.7
	Protestant	45	11.7
	Others	5	1.3
Occupational status	Farmer	144	37.5
	Merchant	82	21.4
	Government employee	119	31.0
	Others	39	10.1
Average monthly income	Low	112	29.2
	Medium	248	64.6
	High	24	6.2
Cigarette smoking	Yes	62	16.2
	No	322	83.8
Alcohol user	Yes	227	59.1
	No	157	40.9
Chewing chat	Yes	105	27.3
	No	279	72.7
Do you use oil	Yes	374	97.4
	No	10	2.6
Frequency of oil utilization in a week	2–3 times	6	1.6
	4–6 times	53	14.2
	> 6 times	314	84.2
Types of oil used	Cruddy oil	122	32.6
	Liquid oil	172	46.0
	Butter	80	21.4
Levels of physical exercise	High or vigorous	50	13.0
	Moderate	132	34.4
	Poor	202	52.6
BMI (kg/m ²)	Underweight	47	12.2
	Normal	310	80.8
	Overweight	27	7.0
Central obesity	Yes	74	19.3
	No	310	80.7
Positive family history of HTN	Yes	72	18.8
	No	312	81.2
Diagnosed diabetes mellitus	Yes	64	16.7
	No	320	83.3
Started medication for diabetes mellitus	Yes	38	9.9
	No	346	90.1

(Continued)

Table 1 (Continued).

Variables	Category	Frequency	Percent (%)
Positive family history of diabetes mellitus	Yes	34	8.9
	No	350	91.1
Types of cancer	Lung	16	4.2
	Gynecologic related cancer	114	29.7
	Hematologic cancer	60	15.6
	Gastrointestinal	58	15.1
	Skin	13	3.4
	Others	123	32
Stages of cancer	Stage I	223	58.1
	Stage II	70	18.2
	Stage III	54	14.1
	Stage IV	37	9.6
Cancer metastasis	Yes	120	31.3
	No	264	68.7
Cancer treatment	Yes	317	82.5
	No	67	17.5
Treatment modalities of cancer (n=317)	Chemotherapy only	80	25.2
	Surgery only	123	38.8
	Surgery and chemotherapy	114	36
Duration of cancer treatment in months (n=317)	≤3	139	43.9
	4–6	104	32.8
	≥7	74	23.3

consumers. Among all study participants, 18.8% had a family history of HTN, 6.8% had a family history of diabetes mellitus, and 16.7% had diabetes mellitus (Table 1).

Cancer-Related Clinical Characteristics of Study Participants

Of the total cancer patients, about 29.7% were gynecological-related cancers, 58.1% had stage I cancer and 31.1% have metastasis. Concerning the treatment of cancer, 82.5% have already started anti-cancer treatments and of these, 38.8% had undergone surgery (Table 1).

Prevalence of HTN Among Cancer Patients

In this study, the prevalence of HTN among adult cancer patients was 36.2% [95% CI: (31.5, 41.2)]. The frequency of HTN among various types of cancer patients was as follows: lung cancer patients (43.7%), gynecologic-related cancer (38%), gastrointestinal tract cancer (20%), and hematologic cancer (14%). The mean systolic and diastolic BP records were 121.3 (± 11 SD) and 74 (± 7.5 SD) mmHg respectively. Among the total hypertensive patients, 49.64% were taking antihypertensive medications currently. Of all study participants, 17.7% had a previous history of HTN.

Factors Associated with HTN

In the bivariable analysis: age, marital status, alcohol taking, having a positive family history of HTN, family history of diabetes mellitus, presence of diabetes mellitus, presence of metastasis of cancer were significantly associated with HTN. However, other variables such as cigarette smoking, khat chewing, BMI, waist circumference, and cancer treatment did not show any significant association in this study (Table 2).

In the multivariable logistic regression analysis, only age greater than 57 years and having a family history of HTN were identified as statistically significant risk factors of HTN.

In this study, age groups of greater than 57 years, proved to have an independently significant association with HTN. Cancer patients in the age group of greater than 57 years were 5 times more likely to develop HTN when compared to

Table 2 Bivariable Analysis for Factors Associated with HTN Among Adult Cancer Patients at Oncology Unit in University of Gondar Comprehensive Specialized Hospital, Gondar, Ethiopia, 2021

Variables	Category	Hypertension		COR (95% CI)	P- value
		Yes	No		
Age	18–37	9(13.8%)	56(86.2%)	1	1
	38–57	73(33.5%)	145(66.5%)	3.1(1.5, 6.7)	0.003
	>57	57(56.4%)	44(43.6%)	8.1(3.6, 18.1)	0
Marital status	Single	8(18.2%)	36(81.8%)	0.5(0.2, 1.2)	0.11
	Married	58(30.4%)	133(69.6%)	1	1
	Divorced	32(43.8%)	42(56.2%)	1.8(1.1, 3.1)	0.04
	Widowed	41(54%)	35(46%)	2.7(1.6, 4.6)	0
Alcohol intake	Yes	89(39.2%)	138(60.8%)	1.4(0.9, 2.1)	0.14
	No	50(31.8)	107(68.2%)	1	1
Cigarette smoking	Yes	21(33.9%)	41(66.1%)	0.9(0.5, 1.6)	0.66
	No	118(36.6%)	204(63.4%)	1	1
Chewing chat	Yes	40(38.1%)	65(61.9%)	1.1(0.7, 1.8)	0.63
	No	99(35.5%)	180(64.5%)	1	1
BMI (kg/m ²)	Underweight	14(29.8%)	33(70.2%)	1	1
	Normal	116(37.4%)	194(62.6%)	1.4(0.7, 2.7)	0.3
	Overweight	9(33.3%)	18(66.7%)	1.2(0.4, 3.2)	0.7
Central obesity	Yes	31(41.9%)	43(58.1%)	1.4(0.8, 2.5)	0.25
	No	108(34.8%)	202(65.2%)	1	1
Family history of HTN	Yes	59(81.9%)	13(18.1%)	13.2(6.9, 25.2)	0
	No	80(25.6%)	232(74.4%)	1	1
Diagnosed diabetes mellitus	Yes	34(53.1%)	30(46.9%)	2.3(1.4, 4.0)	0.002
	No	105(32.8%)	215(67.2%)	1	1
Family history of diabetes mellitus	Yes	20(58.8%)	14(41.2%)	2.8(1.4, 5.7)	0.005
	No	119(43%)	231(66%)	1	1
Cancer metastasis	Yes	51(42.5%)	69(57.5%)	1.5(0.9, 2.3)	0.084
	No	88(33.3%)	176(66.7%)	1	1
Cancer treatment	Yes	114(36%)	203(64)	0.9(0.5, 1.6)	0.83
	No	25(37.3%)	42(62.7%)	1	1

those in the age group between 18 and 37 years [AOR = 5.0; 95% CI (1.7, 14.9)]. Moreover, having a positive family history of HTN was significantly associated with HTN. Patients who had a family history of HTN were about 10.9 times high likely to be hypertensive than those who have not [AOR 10.9; 95% CI (5.5, 21.6)] (Table 3).

Discussion

In Ethiopia, HTN is becoming one of the most common NCDs. It has a significant contribution to a high burden of cardiac diseases.³³ This hospital-based study investigated the prevalence of HTN and its associated factors among cancer patients at oncology unit, University of Gondar, Comprehensive Specialized Hospital. Therefore, the overall prevalence of HTN among cancer patients in this study was 36.2% [95% CI: (31.5, 41.2)]. The current finding is similar with previous studies done in Oman (42%),³⁴ Malaysia (34.8%),³⁵ Australia (39%),³⁶ and Poland (37%).³⁷ However, the prevalence of HTN in this study is significantly higher than the prospective cohort study conducted in Iran (13.38%).³⁸ The possible discrepancy for this might be due to the study design, time, areas, and population difference. The proportion of HTN is also much higher than other community-based studies conducted in Ethiopia which reported the prevalence of HTN to be 28.3%,²⁹ 22.4%,²⁸ 14%,³⁰ and 27.9%.³⁹ The first reason for this discrepancy might be due to the difference in the study population because the study participants in the present study are only adult cancer patients while others are conducted on the general adult population. Secondly, HTN and cancer have many common risk factors such as smoking,

Table 3 Multivariable Analysis for Factors Associated with HTN Among Adult Cancer Patients at Oncology Unit in University of Gondar Comprehensive Specialized Hospital, Gondar, Ethiopia, 2021

Variables	Category	Hypertension		COR (95% CI)	AOR (95% CI)
		Yes	No		
Age	18–37	9	56	1	1
	38–57	73	145	3.1(1.5, 6.7) *	2.7(0.9, 7.4)
	>57	57	44	8.1(3.6, 18.1) **	5.0(1.7, 14.9)*
Marital status	Single	8	36	0.5(0.2, 1.2)	0.8(0.3, 3.0)
	Married	58	133	1	1
	Divorced	32	42	1.8(1.1, 3.1) *	1.6(0.8, 3.0)
	Widowed	41	35	2.7(1.6, 4.6) **	1.8(0.9, 3.6)
Alcohol intake	Yes	89	138	1.4(0.9, 2.1)	1.0(0.6, 1.7)
	No	50	107	1	1
Family history of HTN	Yes	59	13	13.2(6.9, 25.2) **	10.9(5.5, 21.6)**
	No	80	232	1	1
Diagnosed diabetes mellitus	Yes	34	30	2.3(1.4, 4.0) *	1.5(0.6, 4.0)
	No	105	215	1	1
Family history of diabetes mellitus	Yes	20	14	2.8(1.4, 5.7) *	1.2(0.4, 4.1)
	No	119	231	1	1
Cancer metastasis	Yes	51	69	1.5(0.9, 2.3)	1.1(0.7, 1.9)
	No	88	176	1	1

Notes: 1=reference category, * Statistically significant at $p < 0.05$, ** p -value < 0.001 .

diabetes mellitus, obesity, and low physical activity;^{11,12} hence this could increase the prevalence of HTN among cancer patients. The third possible explanation for the higher prevalence in this study could be due to the use of angiogenesis inhibitors in cancer treatment. Many cancer treatments are highly associated with the development or worsening of HTN; thus, HTN is the most serious complication in cancer patients receiving chemotherapy.²¹ For instance, angiogenesis inhibitors such as vascular endothelial growth factor signaling pathway inhibitors (bevacizumab) directly block vascular endothelial growth factors from binding to its specific receptors, while small molecule inhibitors of tyrosine kinase (sorafenib and sunitinib) block tyrosine kinases activated by the vascular endothelial growth factors pathway.⁴⁰ The exact mechanism by which these chemotherapies cause HTN is not fully understood but may be directly related to the inhibition of vascular endothelial growth factors signaling via tyrosine kinase.⁴¹ Vascular endothelial growth factor signaling pathway is required for optimal endothelial function and the production of nitric oxide; so its inhibition induces vasoconstriction which in turn causes HTN.^{10,41}

The current finding is lower than the study conducted in Poland with a prevalence of 62%.⁴² The difference between the current study and the previous study might be due to the difference in study population since the previous study considered only colorectal cancer patients which increase the prevalence of HTN. Epidemiological studies suggested that certain types of cancers such as colorectal cancer have been highly associated with HTN.^{43,44} Another possible explanation might be due to the presence of age differences between the two study populations. The mean age of study populations in the previous study conducted in Poland was (67 ±11) years,⁴² leading to a higher prevalence of HTN, while the mean age of study participants in the present study was (49±13) years. This might increase the magnitude of HTN in the previous study. Besides, genetic differences may probably affect the prevalence of HTN.

In our study, cancer patients in the age group of greater than 57 years were found to have increased odds of having elevated BP compared to those in the age group between 18 and 37 years. This is supported by other studies conducted in Ethiopia,^{28,39,45} and elsewhere.^{46–48} This could be because of the biological effect of increased vascular resistance due to arterial thickening as one becomes older. As age increases, arterial blood vessels gradually lose some of their elasticity, which can lead to high BP.

Moreover, positive family history of HTN was significantly associated with the development of high BP. Patients who had a family history of HTN were about 10.9 times high likely to be hypertensive than their counterparts. Previous studies indicated that family history of HTN was a risk factor for high BP.^{28,29,49–51} This could be explained by genetic factors. Blood relatives may share many similar genes which can expose an individual to HTN, cardiac diseases, and stroke.^{52,53} Furthermore, family members may also share some of the risky lifestyles which could have a contribution to this association.

Previous studies have reported that cigarette smoking was significantly associated with high BP.^{30,39,54} However, in our study, cigarette smoking has no significant association with high BP. The possible discrepancy of this finding might be due to the low prevalence of this risk factor in cancer patients.

As strength, this study is the first of its kind in Ethiopia. So, it provides the opportunity of evaluating the prevalence of HTN in a rarely studied population (adult cancer patients). The main limitation of the study is the cross-sectional nature of the study design, which may not indicate the cause and effect relationship. In addition, the study did not include some factors such as salt intake, renal function test, and use of contraceptive drugs. Moreover, this study will be a base for future researchers to carry out better study designs such as prospective cohort and experimental studies in this area to bring results with better validity.

Conclusion

In this study, the prevalence of HTN among cancer patients was considerably higher than findings from other countries. Age >57 years old and family history of HTN were found to increase the odds of having HTN among cancer patients. The findings of this study have indicated that HTN is becoming a main public health problem among cancer patients in Ethiopia. Therefore, it is important to emphasize cancer patients that are at high risk of HTN and develop preventive strategies to decrease the burden of this disease. We recommend cancer and HTN clinics should work together to provide comprehensive care, which can improve the treatment outcome and prognosis of these diseases. There is a need for routine screening and monitoring for HTN for those with a positive family history of HTN and older age, as they have an increased likelihood of developing high BP among cancer patients.

Abbreviations

AOR, adjusted odds ratio; BMI, body mass index; BP, blood pressure; CI, confidence interval; COR, crude odds ratio; DBP, diastolic blood pressure; HTN, hypertension; NCD, non-communicable disease; SBP, systolic blood pressure.

Data Sharing Statements

The data will be available from the corresponding author based on your request with the email address of “dagnewget-net5@gmail.com”.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

All authors declare that they have no conflicts of interest related to this work.

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