ORIGINAL RESEARCH

Hypertension and Its Associated Factors Among Long-Distance Truck Drivers in Ethiopia

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Introduction: Hypertension is rising globally and is one of the leading causes of cardiovascular disease. It affects people of different groups; however, owing to a rise in a sedentary lifestyle it is more prevalent among long-distance truck drivers. However, the prevalence of hypertension and its associated factors among truck drivers in Ethiopia is not known. Therefore, this study aimed to determine the prevalence of hypertension and its associated factors among long-distance truck drivers in Ethiopia.

Methods: A cross-sectional study was conducted among 415 long-distance truck drivers selected by systematic random sampling technique at Modjo dry port from May 15 to 30, 2021. The data were collected and entered into Epi-data 4.6 then it was exported to SPSS version 25 for analysis. Descriptive statistics, bivariable, and multivariable logistic regression analyses were executed. The odds ratio with a 95% confidence interval was computed. In the final model, a variable with a $p \leq 0.05$ was declared as a predictor of hypertension.

Results: The prevalence of hypertension among long-distance truck drivers in Ethiopia was 34.7%. The odds of hypertension was higher among drivers who were ≥45 years old [Adjusted odds ratio (AOR) = 4.32; 95% Confidence interval (CI): 2.16, 8.62], obese [AOR= 5.12; 95% CI: 1.33, 19.8], alcohol drinkers [AOR=3.05; 95% CI: 1.27, 7.31], and cigarette smokers [AOR= 3.74; 95% CI: 1.64, 8.51]. Drivers who had regular physical exercise were less likely [AOR=0.33; 95% CI: 0.17, 0.63] to have hypertension than drivers with no physical activity.

Conclusion: More than a third of the participants in Ethiopia had hypertension. Higher age, obesity, absence of rest between driving, short sleep duration, smoking, alcohol drinking, and physical inactivity were significantly associated with hypertension. Therefore, health education on lifestyle modifications, sleep habits, and the importance of rest breaks between driving should be considered to prevent hypertension and further complications.

Keywords: hypertension, long-distance truck drivers, Ethiopia

Introduction

Hypertension (HTN) is a long-term medical condition, characterized by persistently increased resting blood pressure,[1] clinically defined as systolic blood pressure (SBP) of 140 mmHg and/or diastolic blood pressure (DBP) of 90 mmHg and above.[2] Its etiology is still not fully understood in most (90–95%) of cases, named essential hypertension.[3] The remaining 5–10% of cases are categorized as secondary hypertension, defined as high blood pressure due to identifiable causes.[4] Hypertension typically does not cause symptoms.[5] Long-term hypertension, however, can damage the arterial walls and leads to several consequences involving the heart, brain, kidney, and eye.[2,6,7]

As the world health organization (WHO) estimates, approximately 1.13 billion (22%) of the world's adult population are affected by hypertension in 2019, with the peak levels in Africa (27%) and the lowest in America (18%). One in four men and one in five women of the world population are hypertensive with a higher incidence (2/3th) among adults in low

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and middle-income countries (LMICs).[7] In Ethiopia, more than 21% of people are estimated to have hypertension and more than 50% of these individuals were not aware of their blood pressure status.[8]

Hypertension affects people of different groups, however, owing to the rise in a sedentary lifestyle, and other risk factors such as diabetes mellitus, obesity, and a family history of similar illness, hypertension is more prevalent among long-distance truck drivers.[2,9] Many truckers use fast foods, snacks, and alcoholic beverages from hotels after extended periods of driving with little or no physical activity.[9–11] As a consequence of this forced sedentarism and other factors, long-distance truckers are at high risk of developing hypertension.[11,12] Moreover, studies conducted in Iran, Brazil, and Pakistan among drivers showed that drivers have an increased risk of hypertension.[13–15]

Globally, according to one meta-analysis, the prevalence of hypertension among truck drivers is higher (34%) than in the general population (22%).[7,16] A higher incidence of hypertension was also observed among long-distance drivers in South Africa (36%),[17] Ghana (38.7%),[18] and Nigeria (39.7%).[19]

Poorly controlled hypertension may interfere with work activities and brings economic dependency if they terminate their work despite the increased cost of medication and family care.[20] Besides, drivers may also be accidentally affected by cardiovascular and cerebrovascular complications.[6,21–23] These can result in fatal road accidents if they happen while driving.[24]

Many researchers have identified several potential factors that were associated with HTN among long-distance truck drivers, these include socio-demographic factors like age, income, marital status, family history of HTN,[25–27] and lifestyle factors linked to smoking, alcohol drinking, physical activity, and duration of sleep as well as the existence of comorbidities like overweight, obesity, and diabetes.[13,18,19] Linked to these findings, lifestyle interventions that are increasingly gaining attention, have been strongly recommended by different health organizations.[2,7] The intervention involves daily physical activity, reduction of substance use and body weight, correcting eating habits, and promotion of appropriate sleep patterns coupled with circadian entrainment.[28]

Various works of literature tried a lot to assess the prevalence and determinant factors of hypertension among drivers worldwide.[16] However, in Ethiopia, most of the works of literature focused on the general population[8,29,30] or among non-driver sections of the population.[31–33] To the best of our knowledge, nothing is known about hypertension and its associated factors among long-distance truck drivers in Ethiopia, while they are one of the most vulnerable groups of people.

This is the first attempt to explore simultaneously, the association between hypertension and factors such as socio-demographic, anthropometric, and lifestyle indicators among long-distance truck drivers. Early recognition of at-risk individuals will promote timely intervention and foster the efforts of cardiovascular disease prevention. This study aimed to determine the prevalence of hypertension and its associated factors among long-distance truck drivers in Ethiopia.

Methods and Materials
Study Setting, Design, and Period
This institution-based cross-sectional study was carried out at Modjo Dry Port from May 15 to 30, 2021. Modjo Dry Port is the first port established at the end of 2009 to relieve the congestion in the Djibouti port. It is located in central Ethiopia, 73 km from Addis Ababa, and is connected to the new Ethio-Djibouti Railway line. The port has a vital role in the Ethiopian-Djibouti trade corridor; it handles about 95% of Ethiopia's trades. Based on information obtained from the port management about 4 to 5 thousand truckers are serving in transporting goods and raw materials between ports.[34]

Population and Eligibility Criteria
All long-distance truck drivers at Modjo dry port in Ethiopia were considered as source populations whereas truck drivers who came to Modjo Dry Port during the study period were considered as the study population and were included.

Sample Size Determination and Sampling Technique
The sample size was determined using the single population proportion formula, with the following assumptions: the magnitude of hypertension (p) 50%, the margin of error (d) 5%, reliability coefficient ($Z_{\alpha/2}$) 1.96, a confidence level of 95%. The minimum sample size was 384 and after adding a non-response rate of 10%, the final sample size was 423.

$$n = \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 \times p(1-p)}{d^2} = \frac{(1.96)^2 \times (0.5)(0.5)}{(0.05)^2} = 384 + 10\% = 423 \qquad (1)$$

A systematic random sampling technique was used to select the study participants. On average, a maximum of 15 days was required for a truck to make a round trip from Modjo Dry Port to Djibouti International Port and back to Modjo Dry Port unless a technical problem on the vehicle or other accidents occurred. Based on the information from the port management, an average of 300 to 400 trucks arrive daily at the port. With this consideration the total drivers during the study period were computed as 300×15= 4500, whereas the constant value was obtained as followed: K = 4500 ÷ 423 ≈11, to give each driver an equal chance of inclusion, a random number between 1 and 11 was chosen as a starting number that was 3 and every 11th driver from the randomly chosen driver was studied until the total sample size was obtained.

Data Collection Instrument and Procedure

We used an adapted interviewer-administered questionnaire to collect the data, which consists of four main parts: Socio-demographic characteristics, lifestyle characteristics, medical information, and work-related factors. Participants' blood pressure and anthropometric indices were measured using standard devices including a portable weight measuring scale, inelastic measuring tape, portable height measuring board, mercury sphygmomanometer, and stethoscope.

Experienced four data collectors (clinical Nurses) and one supervisor (Health officer) were involved in the process of data collection. The supervisor controlled and supervised all the data collection processes. First, data on socio-demographic characteristics, lifestyle characteristics, medical information, and work-related factors were collected by two nurses. Next, blood pressure and anthropometric parameters including weight, height, waist circumference, and hip circumference were measured using the standardized devices by the rest of the two nurses. During data collection, all current covid-19 prevention protocol was implemented such as wearing a mask, keeping a physical distance, and using hand sanitizer before and after the interview.

Triple blood pressure measurement was taken with a mercury sphygmomanometer at 5-minute intervals after 5 minutes of rest and for participants who took a caffeinated beverage; measurement was conducted after 30 minutes of rest. The measurement was performed in a sitting position with the legs uncrossed and arm supported on the table, with the palm facing upward and the cloth removed. The appropriate size cuff was positioned 1–2 cm above the elbow at the level of the heart. Then as to the world health organization (WHO) recommendation, since the first measurement is highly sensitive to conditions, the average systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the last two measurements were used to diagnose hypertension.[35]

Body weight was measured to the nearest 0.1 kg using a calibrated scale, with subjects wearing light cloth and no shoes. Measurement scales were calibrated and checked for 0.00 before each data collection. Height was measured to the nearest 0.1 cm using a portable stadiometer, with subjects barefooted. Body Mass Index (kg/m2) was calculated by dividing the individual's weight in Kg by the square of height in meters.[36]

Waist circumference (WC) was measured with a measuring tape placed between the inferior angle of the ribs and the supra-iliac crest with the patient standing and expiring normally. The hip circumference (HC) was measured by positioning the measuring tape around the maximum circumference of the buttocks while the person is standing, and reading the measurement to the nearest 0.1 cm. The Waist to Hip Ratio (WHR) was calculated and recorded to the nearest two decimal places.[36]

Data Quality Control

First, the English version questionnaire was translated into Amharic by a language expert and then back to English by another language expert to ensure consistency of the questionnaire. Before the actual data collection date, one-day theoretical and practical training was given to the data collectors and supervisor concerning the objective and the process of data collection; the presence of any ambiguity in the questionnaire was requested and clarified. A pretest was conducted among 21 long-distance drivers at Akaki customs station to check the quality of the tool and little modification

was done. Moreover, completeness and consistency were checked every day after data collection, and the questionnaire was also checked before entering data into the computer software program.

Data Analysis Procedure

Data was entered using Epi-data 4.6.Statistical software and then exported to SPSS version 25 for analysis. Descriptive statistics such as frequencies, percentages, the mean, and standard deviation were performed. Bivariable and multi-variable logistic regression analyses were executed after checking the necessary assumptions of the model. All independent variables with a p-value of less than 0.2 in the bivariable analysis were considered for the multivariable logistic regression analysis. Independent variables with a p-value of ≤ 0.05 in the multivariable logistic regression analysis were considered statistically significant. The odds ratio with a 95% confidence level was used to measure the strength of the association between hypertension and explanatory variables. Hosmer and Lemeshow goodness of fit was also performed to assess model fitness at a p-value of > 0.05.

Variables

The dependent variable was hypertension which was dichotomized as yes or no. Participants were considered to have hypertension if he was under antihypertensive medical treatment or had at least one of the following statements:

- Systolic blood pressure greater than or equal to 140 mmHg (SBP $\geq$ 140 mmHg);
- Diastolic blood pressure greater than or equal to 90 mmHg (SBP $\geq$ 90 mmHg);
- Systolic blood pressure greater than or equal to 140 and diastolic blood pressure greater than or equal to 90 mmHg (SBP $\geq$ 140 and DBP $\geq$ 90 mmHg).[2]

The independent variables for this study were age, sex, marital status, educational level, monthly income, body mass index, waist circumference, waist to height ratio, cigarette smoking, khat chewing, alcohol drinking, physical exercise, mealtime habit, and sleep duration (SD), diabetes status, and family history of HTN, work experience, work hour per day (WHPD), workday per weak (WDPW), and rest break between driving.

Mealtime habit was assessed based on Ethiopian usual time for breakfast, lunch, and dinner meal, in which subjects who had dinner mealtime after 5 o'clock were considered as late. Sleep duration (SD) was classified as duration greater than or equal to 7 and less than 7 hours.

Based on previous study work experience, WHPD, and WDPW were assessed by classifying subjects into <5 and $\geq$5 year of experience, <10 and $\geq$10 hour per day, and $\leq$6 and 7 and days per week respectively.

Operational Definitions

Anthropometric indices: Body mass index (BMI) was defined as normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2) and Obese ($\geq$ 30 kg/m^2).[37] Waist circumference (WC) that specific to males is defined as normal (< 94cm), overweight (94–101.9cm), and obese ($\geq$102 cm) whereas, Waist to hip ratio (WHR) that specific to males is defined as normal (<0.90), overweight (0.90–0.99), and obese (($\geq$1.0).

Long-distance truck drivers: drivers who are expected to drive longer and spend the night away from their homes as the journey is too long to be made in a day.[38]

Current smokers: drivers who have smoked at least 100 cigarettes in their entire life and now smoke some days (< 3 days/week) or every day ($\geq$ 3 days/week).[39,40]

Current drinker: A driver who has drunk alcohol ($\geq$12 drinks) in the past year. Further classified into Light drinkers ($\leq$ 3 drinks per week), Moderate drinkers ($\leq$ 14 drinks per week), and Heavier drinkers (> 14 drinks per week).[41,42]

Khat chewer: is a driver who chews a chat at least once within the last 30 days.[43]

Regular physical exercise: a driver who had 2 to 5 hours of regular physical activity (walking, running, riding, and stretching exercises, such as sit-ups and pull-ups) per week.[44]

Ethical Approval and Consent to Participate

Ethical clearance was gained from the Institutional Review Board (IRB) of the School of Medicine, College of Medicine and Health Science, University of Gondar. Next, permission for data collection was taken from the Modjo Dry Port directorate office. All study participants were also informed about the purpose, significance, and process of the study. Besides, they were informed that they can refuse or discontinue participation at any time and the fact that information is recorded without their name being mentioned to keep anonymity and confidentiality. Then, written informed consent was obtained and the data collection process proceeded. During data collection, anyone who was found hypertensive for the first time was advised to see a physician.

Results

Background characteristics of study participants.

Out of 423 male truck drivers, 415 were involved in the study, with a 98% response rate. The mean age of participants was 39.1 ± 9.0, ranging from 24 to 64 years, and the mean monthly income was $120.89 ± $51.1. The majority (77.8%) of the drivers were aged below 45 years, 82.7% of them were married, and had completed secondary education (71.5%). Few participants had a history of hypertension (8%) and diabetes (5.5%). Moreover, fewer proportions of participants were also found obese that classified by BMI (11.3%), WHR (15.4%), and WC (29.6%) (Table 1).

Lifestyle Characteristics of Study Participants

Regarding lifestyle characteristics, of the 415 truck drivers interviewed, higher proportions 255 (61.4%) of participants were physically inactive, were current alcohol drinkers 245 (59.1%) and had a short sleep duration of < 6 hours 268 (64.6%). Few drivers were smokers 51 (12.3%) and ate dinner late at night hours 64 (15.4%) (Table 2).

Prevalence and Predictors of Hypertension Among Long-Distance Truck Drives

In this study, the prevalence of hypertension among long-distance truck drivers in Ethiopia was 34.7% [95% CI; 30%, 39] of which 111 (26.7%) were newly diagnosed hypertensive (Figure 1).

In the bivariable binary logistic regression analysis, explanatory variables such as age, physical activity, cigarette smoking, alcohol drinking, eating late at night hours, driving experience, driving hour per day, rest between driving, sleep duration, body mass index, waist to hip ratio had shown statistically significant association at a p-value of<0.20. In multivariable analysis, all of the enrolled variables except driving hour per day, driving experience, and waist to hip ratio were significantly associated with hypertension occurrence at a p-value of ≤ 0.05.

The odds of hypertension among drivers aged 45 and above were 4 [adjusted odds ratio (AOR) = 4.32; 95% CI: 2.16, 8.62] times higher when compared to age less than 45. Similarly, drivers who had regular physical exercise were 67% [AOR=0.33; 95% CI: 0.17, 0.63] less likely to develop hypertension as compared to drivers with no physical activity. Regarding substance use, drivers who were drinking alcohol and smoking cigarettes were 3.1 [AOR=3.05; 95% CI: 1.27, 7.31] and 3.7 [AOR= 3.74; 95% CI: 1.64, 8.51] times more likely to develop hypertension as compared to non-drinker and non-smoker, respectively. The odds of developing hypertension were 58% [AOR= 0.42; 95% CI: 0.23, 0.77] lower among drivers with a sleeping duration (SD) of less than 7 hours as compared to drivers with SD ≥7. Obese drivers were nearly five times [AOR= 5.12; 95% CI: 1.33, 19.8] more likely to develop hypertension when compared to drivers with normal BMI (Table 3).

Discussion

Most of the factors associated with hypertension are greatly influenced by the Job and labor culture.[45] Truck driving is a job that imposes drivers to risk factors for hypertension than other jobs.[20] Based on the above facts, this study attempted to assess the prevalence and associated factors of hypertension among long-distance truck drivers in Ethiopia. The overall prevalence of hypertension in this study was 34.7% [95% CI; 30%, 39%], of which 76.9% were newly diagnosed. This finding is consistent with studies done in South Africa 36%,[17] Sri Lanka 36.7%,[26] and Ghana 38.7%.[18] However, it is higher than the prevalence reported by the studies conducted in the United States 21.2%[46] and India

Table 1 Background Characteristics of Long-Distance Truck Drivers at Modjo Dry Port in Ethiopia, 2021 (n=415)

Variables	Category	Frequency(n)	Percentage (%)
Age in years	<45	323	77.8
	≥45	92	22.2
Marital status	Not married	72	17.3
	Married	343	82.7
Religion	Orthodox	343	82.7
	Muslim	51	12.3
	Protestant	18	4.3
	Others[a]	3	0.7
Level of education	Can read and write	6	1.4
	Primary (1–8)	85	20.5
	Secondary (9–12)	297	71.6
	College and above	27	6.5
Income (in USD)	<45.2$)	16	3.9
	45.2–135.6$	263	63.4
	>135.6$	136	32.8
Income (in USD), mean (SD)	$120.89 + $51.1		
Recognized HTN	Yes	33	8
	No	382	92
Recognized DM	Yes	23	5.5
	No	392	94.5
Family history of HTN	Yes	81	19.5
	No	334	80.5
Body mass index (Kg/m^2)	Normal weight	188	45.3
	Overweight	180	43.4
	Obese	47	11.3
Waist to hip ratio	Normal weight	170	41
	Overweight	181	43.6
	Obese	64	15.4
Waist Circumference (cm)	Normal weight	159	38.3
	Overweight	133	32
	Obese	123	29.6

Note: [a]Catholic/traditional.
Abbreviation: USD, United States Dollar.

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Table 2 Lifestyle Characteristics of Long-Distance Truck Drivers at Modjo Dry Port in Ethiopia, 2021(n=415)

Variables	Category	Frequency (n)	Percentage (%)
Regular physical exercise	Yes	160	38.6
	No	255	61.4
Physical activity	Active	21	13.1
	Moderate	83	51.9
	Light	56	35
Smoking history	Current smoker	34	8.2
	Former smoker	17	4.1
	Non-smokers	364	87.7
Alcohol drinking	Current drinker	245	59.07
	Former drinker	81	19.53
	Non-drinker	89	21.4
Khat chewing	Current chewer	57	13.76
	Former chewer	42	10.14
	Non-chewer	316	76.1
Feeding times per day	One time	7	1.7
	Two time	72	17.3
	Three and above time	336	80
Ate dinner late at night [a]	No	323	77.8
	Yes	64	15.4
Eating state	Ate whilst driving	8	1.9
	Ate whilst resting in the car	74	17.8
	Ate under a rushing state	166	40
	Ate in a stable state	169	40.2
Driving years	<5	51	12.3
	≥5	364	87.7
WHPD (hours)	<10	137	33
	≥10	278	67
Rest break in b/n driving	Yes	190	45.8
	No	225	54.2
WDPW (days)	≤6	295	71.1
	7	120	28.9
Sleep duration (hours)	<7	268	64.6
	≥7	147	35.4

Note: [a]Late eating time in this study is defined as eating dinner after 11 AM.
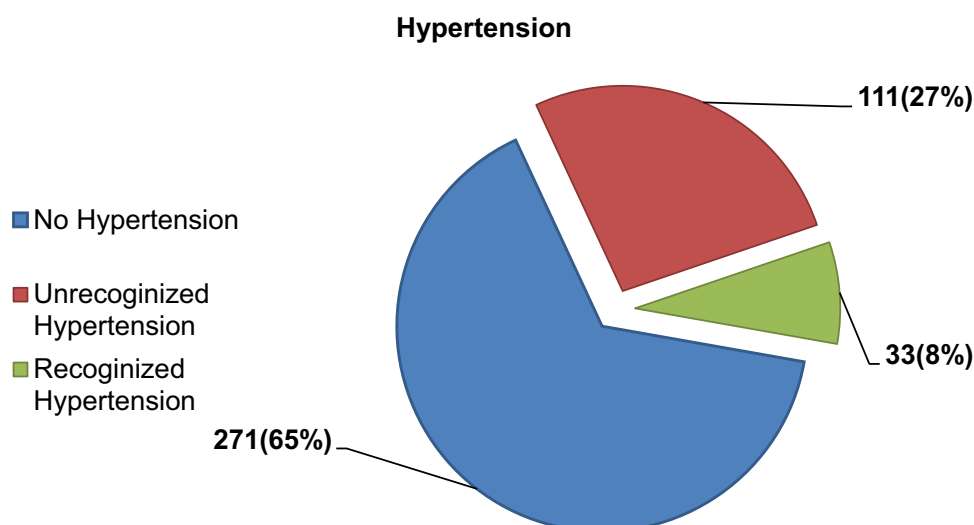**Abbreviations**: WHPD, work hours per day; WDPW, workday per week.

Hypertension

111(27%)

33(8%)

271(65%)

■ No Hypertension

■ Unrecoginized Hypertension

■ Recoginized Hypertension

Figure 1 Prevalence of hypertension among long-distance truck drivers in Ethiopia, 2021.

24.7%[47] but lower than the study done in Iran (59.8%).[27] The variations observed could be owing to the differences in operational definition, sample size, and measuring devices. In the previous study prevalence of hypertension was determined using unrecognized hypertension and digital form of measuring devices. Besides, the discrepancy might also be due to socio-demographic and cultural differences.

In this study, drivers with age 45 and above were more likely to have hypertension than drivers with age below 45. This is supported by studies done in Nigeria,[19] Iran,[27] and India.[48] This might be due to the aging process that leads to arterial stiffness. Aging alters the stiffness of the extra-cellular matrix (ECM) of the arterial wall by causing degenerative changes in the structural proteins such as elastin and collagen. Besides, the aging process is also attributed to endothelial dysfunction and loss of balance between vasodilators and vasoconstrictors. These alterations might lead to hypertension in older drivers.[49]

Regarding physical activity, drivers who had engaged in regular physical exercise were less likely to develop hypertension as compared to a driver with no physical activity. This finding is similar to those of studies done in south India,[50] Brazil,[13] and Iran.[27] It has been suggested that physical inactivity may increase voluntary food intake and reduce metabolic rate which may lead to obesity.[51] Through different mechanisms obesity (excess accumulation of adipocytes) may cause hypertension. One of the mechanisms is by increasing serum levels of Angiotensin II and aldosterone,[52] and the other is by inducing endothelial damage and sympathetic overactivity.[53]

In the present study, the odds of hypertension among smokers were higher than in non-smokers. This finding is consistent with a cross-sectional study conducted among drivers in south India,[54] and Ghana.[18] The immediate noxious effect of smoking is connected to nervous system overactivity and impairment (attenuated) in cardiac baroreflex sensitivity (BRS), which leads to an increase in myocardial contractility, heart rate, and blood pressure in this individual.[55] Also, chronic cigarette smoking initiates arterial stiffness and this effect might persist even after cessation of smoking.[56]

The finding of this study also indicated a significant association between hypertension and alcohol consumption among drivers. This is supported by the study conducted in Iran,[27] Ghana,[18] and Nigeria.[19] The mechanism that underlies alcohol consumption and hypertension are numerous. But majorly, alcohol induces hypertension by stimulating cortisol secretion and generation of angiotensin II through the renin-angiotensin-aldosterone system (RAAS). One of the effects on blood pressure may be due to the mineralocorticoid activity of cortisol, which can bind to receptor having similar DNA sequence with that of aldosterone receptor inside the cell. Because of this, cortisol can have those actions of adrenal corticosteroids producing sodium and fluid retention and potassium excretion. Moreover, the vasoconstriction and salt restriction effect of angiotensin II and aldosterone hormone also could contribute to the development of hypertension.[57]

Regarding sleeping duration, there was a strong association between hypertension and short sleep duration. This finding is consistent with those studies done in the United States,[58] China,[59] Iran,[27] and Ghana.[18] This might be due to

Table 3 Bivariable and Multivariable Analyses of Factors Associated with Hypertension Among Long-Distance Truck Drivers at Modjo Dry Port in Ethiopia, 2021(n=415)

Variables		Hypertension		COR [95% CI]	AOR [95% CI]
		No (%)	Yes (%)		
Age in years	<45	238(73.7)	85(26.3)	1	1
	≥45	33(35.9)	59(64.1)	5.01[3.06–8.19]	4.32[2.16–8.62]***
Physical exercise	Yes	119(74.4)	41(25.6)	0.51[0.33–0.79]	0.33[0.17–0.63]**
	No	152(59.6)	103(40.4)	1	1
Cigarette smoking	Yes	24(47)	27(53)	2.38[1.31–4.29]	3.05[1.27–7.31]*
	No	247(67.9)	117(32.1)	1	1
Alcohol drinking	Yes	205(62.9)	121(37.1)	1.69[1.01–2.86]	3.74[1.64–8.51]**
	No	66(74.2)	23(25.8)	1	1
Ate late at night	No	223(69)	100(31)	1	1
	Yes	20(31.3)	44(68.7)	4.91[2.75–8.75]	6.42[2.62–15.7]***
Driving years	<5	47(92.2)	4(7.8)	1	1
	≥5	224(61.5)	140(38.5)	7.34[2.59–20.8]	1.70[0.50–5.79]
WHPD (days)	<10	94(68.6)	43(31.4)	1	1
	≥10	177(63.7)	101(36.3)	1.23[0.81–1.93]	1.80[0.91–3.57]
Rest break	Yes	143(75.3)	47(24.7)	0.43[0.28–0.66]	0.23[0.12–0.44]***
	No	128(56.9)	97(43.1)	1	1
Sleep duration (hours)	<7	162(60.4)	106(39.6)	1.88[1.21–2.92]	2.36[1.29–4.31]**
	≥7	109(74.1)	38(25.9)	1	1
BMI	Normal	149(79.3)	39(20.7)	1	1
	Overweight	109(60.6)	71(39.4)	2.49[1.57–3.93]	0.70[0.30–1.63]
	Obese	13(27.7)	34(72.3)	9.99[4.82–20.7]	5.15[1.33–19.9]*
WHR	Normal	141(82.9)	29(17.1)	1	1
	Overweight	111(61.3)	70(38.7)	3.06[1.86–5.05]	1.29[0.61–2.72]
	Obese	19(29.7)	45(70.3)	11.5[5.90–22.5]	3.61[0.91–14.4]

Notes: *Statistically significant at $p<0.05$, **statistically significant at $p<0.01$, ***statistically significant at $p<0.001$, 1 = references group. Hosmer and Lemeshow test: Sig.0.116, chi-square 12.9, df 8.
Abbreviations: CI, confidence Interval; COR, crude odds ratio; AOR, adjusted odds Ratio; WHPD, work hours per day; BMI, body mass index; WHR, waist to hip ratio.

the hypothesized effects of short sleep duration; sleep deprivation may impair the energy balance in the body and eventually favors the development of adipocyte-induced hypertension.[60] Moreover, prolonged sleep deprivation might lead to increased heart rate, increase salt retention, and elevated sympathetic nervous system activity, which entrains the cardiovascular system to operate under high pressure.[61]

Another finding of the present study was the association between late-night eating and hypertension. This concurs with cross-sectional studies conducted among Ghanaian[18] and Nigerian drivers.[19] Later circadian timing of food intake or food intake before sleep is implicated to bring obesity. A potential mechanism for increased body fat in response to later

meal timing may be due to decreased thermic effect of food, which is the energy expended in response to a meal. Later on, this would contribute to a positive energy balance and weight gain over time.[62]

In a cross-sectional study among Ghanaian long-distance bus drivers, long duration in a sitting position was a significant predictor of hypertension,[18] which is consistent with our present study. Not breaking in-between long sitting duration is a typical example of a sedentary habit that has been associated with obesity and hypertension.

In this study, long-distance truck drivers who were obese were more likely to develop hypertension. This study is supported by previous studies conducted elsewhere.[19,58,63,64] This association might be due to the metabolic effect of excess adipocytes in the body that favors hypertension occurrence. Excess adipocyte enhances activation of adipocyte-derived angiotensinogen and angiotensin-converting enzyme, expression of angiotensin receptors, and secretion of leptin. Moreover, excess adiposity is also linked to mitochondrial dysfunction, increased production of reactive oxygen species (ROS), and insulin resistance. Eventually, these may lead to hypertension by causing endothelial damage, sympathetic overactivity, and increased serum angiotensin II and aldosterone level.[65–67]

The strength of the present study is since Modjo dry port is the main port in the country; most of the long-distance truckers were included, to give equal chance for participants random sampling technique was used. Despite the significant findings of this study, the current study is not without limitations. This study did not measure participants' blood glucose levels, only used self-reported diabetic states. Furthermore, because the study was a cross-sectional one, we could not determine the direction of causality.

Conclusion

In conclusion, our results suggest that the prevalence of hypertension was high among long-distance truck drivers at Modjo dry port in Ethiopia. It is revealed that older age, obesity, short sleep duration, eating late at night, smoking, and alcohol drinking was positively associated with hypertension. On the other hand, the presence of rest breaks between driving and regular physical exercise was negatively associated with hypertension. Therefore health advice targeted on lifestyle modifications, sleep habits, and the importance of rest breaks between driving should be considered as part of an intervention to prevent hypertension.

Declarations

All the processes of study complied with the Declaration of Helsinki.

Abbreviations

BMI, body mass index; DBP, diastolic blood pressure; HTN, hypertension; SBP, systolic blood pressure; WC, waist circumference; WDPW, workday per week; WHO, World Health Organization; WHPD, work hour per day; WHR, waist to height ratio.

Data and Materials Availability

The dataset containing all the required data is found at the primary author that can be accessed with a justifiable request.

Acknowledgments

Author Contributions

All authors made a significant contribution to the work reported, and actively participated in the conceptualization, methodology, execution, acquisition of data, analysis, and interpretation, they also 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

No conflicts of interest are reported by the authors.

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