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The Open Public Health Journal, 2017, *10*, 303-312

The Open Public Health Journal

Content list available at: www.benthamopen.com/TOPHJ/

DOI: 10.2174/1874944501710010303

RESEARCH ARTICLE

Driving to Better Health: Screening for Hypertension and Associated Factors Among Commercial Taxi Drivers in Buffalo City Metropolitan Municipality, South Africa

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Received: July 23, 2017 Revised: November 23, 2017 Accepted: December 01, 2017

Abstract:

Background:

Hypertension is a critical public health issue in South Africa. Commercial taxi drivers constitute a vulnerable group who are predisposed to hypertension due to the nature of their work. Yet, unlike other population sub-groups, their health status and lifestyle behaviour have rarely been investigated.

Objective:

To screen for hypertension and the associated risks factors among commercial taxi drivers in Buffalo City Metropolitan Municipality (BCMM), South Africa.

Methods:

This was a cross-sectional, descriptive study of a convenience sample of 403 commercial taxi drivers in BCMM. The modified WHO STEPwise questionnaire was used for obtaining demographic and behavioural information from the participants. Blood pressure (BP), blood glucose and anthropometric measurements followed standard procedure. Pre-hypertension was defined as systolic BP of 120-139 mmHg and diastolic BP of 80-89 mmHg and hypertension was defined as a systolic BP ≥140mmHg and/or diastolic BP of ≥90mmHg, self-reported history of hypertension or current medication use. Descriptive and inferential statistics were used to determine the prevalence and associated factors of hypertension. A p-value ≤ 0.05 was considered statistically significant.

Results:

The study participants were 98.8% male, age ranged from 20 to 74 years, with a mean age of 43.3 years (SD±12.5).The prevalence of pre-hypertension was 33.7% and hypertension was 57.0%. After adjusting for confounders, age>35 years (p=0.004), obesity and alcohol use (p<0.001), period of driving>5years (p=0.028) and diabetes (P=0.003) were significant predictors of hypertension.

Conclusion:

The prevalence of hypertension among commercial taxi drivers in BCMM is high and associated with ageing and other cardiovascular risk factors. There is a need for interventions aimed at promoting healthy lifestyle and reduction of hypertension among this group, particularly the older ones.

Keywords: Hypertension, Commercial taxi driver, Screening, South Africa, Blood Pressure, Prevalence.

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1. INTRODUCTION

Hypertension, a leading modifiable risk factor for cardiovascular diseases and an independent risk factor for morbidity and mortality, often goes unnoticed as a result of its asymptomatic nature [1 - 3]. Hypertension (HTN) accounts for 9 million annual deaths worldwide [4]. Globally, there is an increasing prevalence of hypertension, even in economically disadvantaged countries [5].

South Africa is not exempted from the growing burden of hypertension and its complications [6]. More than 6.2 million South Africans are hypertensive with about 53 men and 78 women dying daily from the effect of hypertension; with a high likelihood of a future increase as population ages [7]. Several factors are responsible for this; such as epidemiological transitioning resulting from ageing and urbanization, unhealthy dietary practices, sedentary lifestyle, stressful activities [8, 9] and obesity [8].

The nature of commercial taxi drivers' work entails several activities ranging from unhealthy dietary pattern, sedentary lifestyle, work pressure, stress to long duration of work [10, 11]; thus rendering them susceptible to the high burden of hypertension [12 - 14]. Commercial taxi drivers are often relied upon for safe transportation of individuals, goods and services in the country. As such, the economy of several countries somewhat depends on this important group. The health implication of hypertension among commercial drivers should be a concern. Considering the significant role commercial taxi drivers play in a society, the impact of hypertension will not only affect them, but will pose a significant threat to the society at large.

Although several studies have been conducted on the prevalence of hypertension in the general population in South Africa [6, 15 - 18], by contrast, the profiling of hypertension among commercial taxi drivers has not been undertaken. However, studies exist on hypertension among commercial drivers in other countries, such as Nigeria [19 - 21], India [10, 14, 22, 23], Iran [24, 25], Brazil [26], Korea [27], Hong Kong [28] and Taiwan [29]. Understanding the magnitude of this problem among commercial taxi drivers is necessary so as to inform health policy makers who have the capacity to implement appropriate intervention strategies in designing a health program tailored to the needs of this special population. Reliable epidemiological data are vital in crafting effective policies and interventions which are most appropriate for a specific group. Also, information on the burden of hypertension among commercial drivers can also assist in assessing their eligibility in the safe transportation of passengers. This study, therefore, examines the prevalence of hypertension and its determining factors among commercial taxi drivers in Buffalo City Metropolitan Municipality (BCMM), South Africa.

2. METHODS

2.1. Study Area and Design

This was a cross-sectional study involving 403 commercial taxi drivers selected across different taxi ranks in Buffalo City Metropolitan Municipality (BCMM), East London, Eastern Cape Province, South Africa. Buffalo City Metropolitan Municipality is one of the 8 districts in the Eastern Cape Province. It is made up of some towns in the Eastern Cape which include East London, Bhisho, King William's Town and Mdanstane. This municipal area is largely populated by Blacks, 85.2% [30] and transport makes up 12% of its economic sector [31]. The taxi industry is the most available mode of transportation for the public, covering both short and long distance trips, through urban, rural and intercity journeys. It is situated at strategic centers, close to shops, offices and institutions in a city which makes it easily accessible to all.

2.2. Participants and Sample Size

The sample size for this study was based on the estimated number of drivers in the district. According to the statistics at the Department of Transport, the estimated number of commercial taxi drivers was approximately 4000 (Eastern Cape Department of Transport).The appropriate sample size was determined using the Creative Research Systems sample size calculator [32] at a confidence level of 95%. The required sample size was 351participants. However, 403 drivers who were recruited from ten conveniently selected taxi ranks across the district were included in the study. All commercial taxi drivers who were available, willing and met the inclusion criteria were recruited into the study. This study was conducted in March-April, 2017.

2.3. Eligibility Criteria

Participants were included in the study if they were commercial drivers, aged 20 years and above, a member of a recognized taxi association; had worked for at least six months and had fasted eight hours preceding recruitment into the study. Participants were excluded from the study if ill or disabled in such a way that obtaining anthropometric measurements was difficult.

2.4. Study Instrument

The participants were interviewed using the previously validated WHO STEPwise questionnaire [33] which comprises three major items; demographic, behavioural data, and measurements. The instrument was modified to suit the study settings. A pilot study was conducted on 20 commercial taxi drivers to test its suitability in the settings and the effectiveness of the research process. The results of the pilot study were not included in the main study.

2.5. Ethical Approval

Ethical approval for the study was obtained in accordance with Helsinki II Declaration from the University of Fort Hare Research Ethics Committee (Reference number: GOO121SADE01) and the Eastern Cape Department of Health. The Director of the District Department of Health as well as the rank heads gave permission prior to data collection. All participants provided their written informed consent to participate in this study. Their rights to confidentiality and anonymity were ensured throughout the study.

2.6. Data Collection Procedure

Data on demographic and behavioural characteristics were obtained by personal interviews and measurements of blood pressure, blood glucose and anthropometric parameters were obtained using the WHO STEPwise approach. Socio-demographic variables included items on gender, age, race, level of education, marital status, and occupational history. The socioeconomic factors were measured by assessing the level of education and occupational history. Participants' occupational histories were categorized as periods of driving below two years; within 2-5 years; within 6-10 years and above 10 years. Levels of education were obtained by self-reporting of the highest grade level attained in school and were categorized as, no formal education; primary (grade 1-7); secondary (grade 8-12) and tertiary education. Behavioural variables, such as smoking, alcohol use and consumption of sweet drinks, were obtained through self-reporting.

2.7. Measurements

Blood pressure was measured in accordance with standard protocols [34] with a Medic+ Digital Blood Pressure Monitor. Pre-hypertension was defined as systolic BP of 120-139 mmHg and diastolic blood pressure of 80-89 mmHg and hypertension was defined according to JNC-8 criteria as the average of two systolic blood pressures of $\geq$ 140mmHg and diastolic of $\geq$ 90mmHg or history of hypertension and current medication use [35]. Fasting blood glucose of each participant was measured with a validated ACCU-CHEK glucose monitoring apparatus in fasting state. Participants were diagnosed as having diabetes if the fasting plasma glucose (FPG) was $\geq$ 126mg/dl or 7.0mmol/L [36].

Body weight was measured in light clothes to the nearest 0.01kg in the standing position using a SECA Scale and height was measured to the nearest 0.1cm by a SECA stadiometer in standing position, with closed feet (without shoes) [37]. The waist circumference was taken at the level of the umbilicus by using a non-elastic tape. Body mass index (BMI) was calculated as weight in kg divided by height in square metres (kg/m^2). The body mass index (BMI) was categorized in accordance with the World Health Organization's classification [38], underweight BMI < 18.5 kg/m^2, normal (18.5 kg/m^2– 24.9 kg/m^2), overweight (25.0 kg/m^2–29.9 kg/m ^{2}) or obese ($\geq$ 30 kg/ m ^{2}). Abdominal obesity was defined as having a waist circumference of WC $\geq$ 94 cm for men and WC $\geq$80 cm for women [39].

3. STATISTICAL ANALYSIS

Data were expressed as mean values ± standard deviations (SD) for continuous variables. Counts (frequencies=n) and proportions (%) were reported for categorical variables. Bivariate and multivariate logistic regressions were used to identify the significant associated factors of hypertension and their 95% confidence interval (95% CI). The logistic regressions were also adjusted for confounding factors. Variables included in the bivariate and multivariate analysis model were considered statistically significant at p-value < 0.05. The Statistical Package for Social Science (SPSS) version 22 was used for data analysis.

4. RESULTS

A total of 403 participants with complete information were used for the study. The age of the participants ranged from 20 to 74 years with a mean age of 43.3 ± 12.5 years. About ninety-nine percent of the participants were male, 30.5% were above the age of 50 years, the majority (73.7%) had a secondary education (grade 8-12); were black (93.3%), were married and had been driving for more than 10 years (47.1%) (Table **1**).

Table 1. Demographic characteristics of the participants.

Variables	Frequency (n)	Percentage (%)
Sex		
Male	398	98.8
Female	5	1.2
Age (years)		
20 to 30	72	17.9
31-40	103	25.6
41-50	105	26.0
Above 50	123	30.5
Level of Education		
No Formal Education	15	3.7
Grade 1-7	59	14.6
Grade 8-12	297	73.7
Tertiary	32	7.9
Race		
Black	376	93.3
Coloured	27	6.7
Marital Status		
Married	190	47.1
Separated	8	2.0
Divorced	16	4.0
Widowed	6	1.5
Single	183	45.4
Duration of Driving		
<2 years	30	7.4
2-5 years	103	25.6
6-10 years	80	19.9
> 10 years	190	47.1

As shown in Table (**2**) in the bivariate analysis, age, marital status, level of education, duration of driving, obesity, alcohol use, consumption of sweet drinks, diabetes and abdominal obesity were significantly associated with the prevalence of hypertension.

Table 2. Bivariate analysis showing determinants of hypertension.

Variables	HTN n (%)	No HTN n (%)	p-value
Age (years)			
>35	179 (64.9)	97 (35.1)	<0.001
≤ 35	49 (38.6)	78 (61.4)	
Marital Status			
Ever Married	140(63.6)	80(36.4)	0.002
Never Married	88(48.1)	95(51.9)	
Level of Education			
No Formal School	12(80.0)	3(20)	0.003
Grade 1-7	44(74.6)	15(25.4)	
Grade 8-12	155(52.2)	142(47.8)	
Tertiary	17(53.1)	15(46.9)	
Income			

(Table 2) contd.....

Variables	HTN n (%)	No HTN n (%)	p-value
2000 and below	99(58.9)	69(41.1)	0.420
Above 2000	129(54.9)	106(45.1)	
Race			
Black	212(56.4)	164(43.6)	0.771
Coloured	16(59.3)	11(40.7)	
Period of Driving			
5 Years and Below	56(42.1)	77(57.9)	<0.001
Above 5years	172(63.7)	98(36.3)	
Smoking			
Yes	115(57.8)	84(42.2)	0.627
No	113(55.4)	91(44.6)	
Obesity			
Obese	114(75.5)	37(24.5)	<0.001
Not Obese	114(45.2)	138(54.8)	
Diabetes			
Yes	52 (82.5)	11 (17.5)	<0.001
No	176 (51.8)	164 (48.2)	
Abdominal Obesity			
Yes	176 (71.0)	72(29.0)	<0.001
No	52(33.5)	103(66.5)	
Have you Ever Consumed any Alcoholic Drink			
Yes	153(63.7)	87(36.3)	<0.001
No	75(46.0)	88(54.0)	
How Often Do You Take Sweet Drinks			
Never	16(94.1)	1(5.9)	0.006
Rarely	22(66.7)	11(33.3)	
Sometimes	46(55.4)	37(44.6)	
Often	144(53.3)	126(46.7)	

HTN- Hypertension

In the logistic regression, after adjusting for confounding variables, only age, duration of driving, alcohol use, obesity and diabetes were the significant and independent predictors of hypertension (Table **3**).

Table 3. Binary logistic regression showing predictors of hypertension.

Variables	Beta	Wald	Odd Ratio (CI)	p-value
Obesity				
Obese	1.212	24.649	3.4(2.1-5.4)	<0.001
Non Obese (Reference)				
Age				
> 35 Years	0.775	8.490	2.2(1.3-3.7)	0.004
≤ 35 Years (Reference)				
Diabetes				
Diabetes	1.121	8.995	3.1(1.5-6.4)	0.003
Non Diabetic (Reference)				
Duration of Driving				
> 5 Years	0.561	4.853	1.8(1.1-2.7)	0.028
≤ 5 Years (Reference)				
Alcohol Use				
Alcohol Users	1.022	18.417	2.8(1.7-4.4)	<0.001
Non-alcohol Users(Reference)				

5. DISCUSSION

Undiagnosed and uncontrolled hypertension contributes significantly to the burden of cardiovascular diseases and their complications. It is also an independent risk factor for morbidity and mortality [40]. We found an alarmingly high

prevalence of hypertension among commercial taxi drivers in this study. To the best knowledge of the authors, no study has been conducted on hypertension among commercial taxi drivers in South Africa. Thus, the findings of this study could only be comparable to studies conducted elsewhere. The prevalence of hypertension found in this study is higher than the reported prevalence of hypertension among commercial taxi drivers across Africa [19 - 21] and several developing countries [10, 22 - 25, 27 - 29] which ranged from 9.0% to 46%. The prevalence recorded in this study is only comparable to the study among commercial drivers in two developed countries, Hong Kong and Taiwan, 57% and 56%, respectively Table (**4**). Also, the prevalence of hypertension found among the sample in this present study is higher than the reported prevalence (49.2%) among the general population in the same district [18]. The finding in this study affirms the assumed higher risk for hypertension among commercial taxi drivers. A thorough comparison of prevalence across various studies might be difficult as a result of variation in study settings and methodology. However, the findings of this study mirror the notion of an epidemiological transition and the increasing hypertension burden currently sweeping across developing countries. Moreover, commercial drivers are particularly at a higher risk given their unhealthy lifestyle behaviour, in terms of sedentarism, excessive alcohol consumption, smoking and other illicit health behaviours. Also, the high prevalence of pre-hypertension found among this group is a cause for concern. Pre-hypertension indicates a high risk for hypertension [41, 42] thus, there is a possibility of a future increase in hypertension burden if appropriate interventions are not implemented. There is an urgent need to create health awareness, frequent health screening and implementation of effective interventions targeting hypertension among this neglected group, as their health is very crucial to society at large.

Table 4. Prevalence hypertension among South African commercial taxi drivers compared with the literature.

Country	Design/ Sample Size	Mean Age (Years)	Percentage	Author
Abuja, Nigeria	Cross- sectional; 389	39.0 ±10.0	9.0%	Olusegun *et al.* [21],
Chittoor, India	Cross-sectional; 204	41.38 ±10.45	14.21%	Udayar *et al.* [14],
Bangalore, India	Cross- sectional; 500	-	16.0%	Satheesh *et al.* [22],
Iran	Cross-sectional;1903	41.55 ±10.43	16.4%	Izadi *et al.* [25],
South-South, Nigeria	Cross-sectional; 112	37.49 ±9.3	21.4%	Tobin *et al.* [19],
Sokoto, Nigeria	Cross-sectional; 213	47.48 ±10.18	33.5%	Erhiano *et al.* [20],
India	Cross-sectional; 587	46.9 ±6.69	34.8%	Borle *et al.* [43],
Brazil	Retrospective observational; 659	41.7 ±6.9	38.2%	Hirata *et al.* [13],
South India	Cross- sectional;179	36.5 ±8.4	41.3%	Lakshman *et al.* [10],
Iran	Cross- sectional; 429	36.6 ±10.7	42.9%	Saberi *et al.* [24],
South Brazil	Cross-sectional; 250	41.9 ±10.0	45.2%	Sangaleti *et al.* [26],
India	Cross-sectional comparative; 50	-	46.0%	Nayak *et al.* [23],
Korea	433	-	53.3%	Shin *et al.* [27],
Hong Kong	3376	50.9 ±7.6	57.0%	Siu *et al.* [28],
Taiwan	Cross-sectional; 1761	-	56.0%	Wang *et al.* [29],
South Africa	**Cross-sectional; 403**	**43.3 ±12.5**	**57.0%**	**Present study.**

Age, duration of driving, alcohol use, abdominal obesity and diabetes were significant predictors of hypertension among the study participants. This corroborates several studies [10, 14, 19, 22]. Consistent with other studies [10, 15, 22], a higher prevalence of hypertension was found among participants older than 35 years compared to those below 35 years. Age is an independent risk factor for cardiovascular disorders, especially hypertension [43, 44]. Ageing is often accompanied by changes in the body systems, including the cardiovascular system and degeneration of cells [45] which increases susceptibility to cardiovascular disorders, including hypertension [44]. This might also be the plausible reason for the higher prevalence found among drivers with a longer duration of driving as they constitute those in the higher age group.

Additionally, both generalized and abdominal obesity and diabetes were found to be independently associated with hypertension in the study setting. This is similar to other studies [20, 21]. The association between hypertension and obesity has long been established [46]. Obesity increases the risk of developing hypertension [47] due to the activation of the sympathetic nervous system, renin-angiotensin system, sodium retention among other abnormalities [8, 48]. Obesity, particularly abdominal obesity, exerts a deleterious health effect in the development of insulin resistance and glucose metabolism [49], which predisposes toward diabetes, later, hypertension and ultimately, cardiovascular diseases [50]. Also, hypertension and diabetes share similar metabolic pathways and risk factors such as genetics, physical inactivity, dyslipidemia, insulin resistance and obesity. These factors collectively contribute to the development of

arterial stiffness, which promotes the development of hypertension [51, 52]. Thus, the associative link between obesity, diabetes and hypertension among the study participants is expected. This calls for joint intervention programmes targeting all the cardio-metabolic risk factors among commercial taxi drivers in the study setting.

Finally, alcohol usage was significantly associated with hypertension among the study participants. This finding agrees with Udayar et al, study [14], but is in contrast with other studies [19, 22]. Although, controversies exist on the impact of alcohol on health, while moderate alcohol drinking has been shown to improve cardiovascular function, especially among younger age groups, heavy consumption (more than three at a sitting) impacts negatively on cardiovascular health, especially hypertension and atrial fibrillation [53, 54]. Heavy alcohol consumption increases blood pressure [55, 56]. Thus, the high prevalence of hypertension found in this study is not surprising. Anecdotally, most commercial motor drivers in South Africa consume alcohol excessively, smoke and indulge in illicit health behaviours, which tend to compromise their health status. Sadly, South Africa is even reported to be a hard drinking country [57]. Given that the majority of the factors contributing to the high burden of hypertension among commercial taxi drivers are modifiable, and 'prevention is better than cure', intervention strategies are needed to safeguard the health of this special population.

5.1. Strengths and Limitations

This study is the first survey conducted to screen for hypertension among commercial taxi drivers in South Africa. Besides, it is a unique study, because it provides important baseline information about the significant correlates of hypertension among commercial taxi drivers. Additionally, multiple BP readings were obtained; and all the measurements were done in the field. Participants with abnormal BP were advised regarding appropriate medical care. Notwithstanding the strengths of this study, the limitations are worth noting. Using a convenience sampling method with 403 drivers is not representative of all of the commercial taxi-driving population. Also, the cross sectional nature of the study does not allow one to determine cause and effect. Lastly, the participants self-report of information may be inaccurately reported due to social desirability (*e.g.*, reporting being physically active or eating fruits and vegetables), or embarrassment (*e.g.*, under-reporting alcohol use) [58].

CONCLUSION

The prevalence of hypertension among commercial taxi drivers in BCMM is alarmingly high. The high prevalence is associated with age, duration of driving and other cardiovascular risk factors such as obesity, diabetes and alcohol use. There is a need for continual awareness creation and screening for cardiovascular risk factors among commercial taxi drivers across the country. Finally, effective interventions targeted at the reduction of modifiable lifestyle behaviours should be implemented among this high risk group.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval for the study was obtained in accordance with Helsinki II Declaration from the University of Fort Hare Research Ethics Committee (Reference number: GOO121SADE01) and the Eastern Cape Department of Health.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2008 (http://www.wma.net/en/20activities/10ethics/10helsinki/.

CONSENT FOR PUBLICATION

Not applicable

AUTHORS' CONTRIBUTIONS

Aanuoluwa Odunayo Adedokun, Daniel Ter Goon, Eyitayo Omolara Owolabi and Oladele Vincen Adeniyi contributed to study conception and manuscript preparation. Aanuoluwa Odunayo Adedokun and Eyitayo Omolara Owolabi contributed in the collection of data, Anthony Idowu Ajayi contributed to data analysis and manuscript preparation. All authors read and approved the final manuscript before submission.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the supporting drivers who participated in the study.

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