Submitted: 15 March, 2021 Accepted: 30 April, 2021 Published: 30 September, 2021 DOI:10.31083/jomh.2021.059

JOMH Journal of Men's Health

Original Research

Prevalence of risk factors for Non-communicable diseases, work-related health problems and associated factors among male three-wheeler drivers in Gampaha Urban Council area, Sri Lanka

Dissanayake SAIP[1], Kisokanth G[2], Warnakulasuriya SSP[2,*]

[1]Dr. Neville Fernando Teaching Hospital, 10115 Malabe, Sri Lanka
[2]Department of Clinical Nursing, Faculty of Nursing, University of Colombo, 00700 Colombo, Sri Lanka

***Correspondence:** sudath@dcn.cmb.ac.lk (Warnakulasuriya SSP)

Abstract

Background and objective: Driving is associated with various occupational health problems and the nature of the job creates a greater risk for Non-communicable diseases (NCDs) among the drivers. We aimed to determine the prevalence of risk factors for NCDs, work-related health problems and its associated factors among three-wheeler drivers in Gampaha Urban Council area, Western Province, Sri Lanka.

Methods: A descriptive cross-sectional study was carried out among 289 randomly selected three-wheeler drivers. A pre-tested, validated interviewer administered questionnaire was used to collect data. Descriptive and relevant inferential statistics were used to analyze data by using SPSS v20. Binary logistic regression was used to identify the factors associated with common work-related health problems.

Results: Among all participants, 80% were using alcoholic beverages, 35% of them were currently smoking and 39% of them had the habit of betel chewing. The mean body mass index (BMI) and waist circumference (WC) of the participants were 25.28 ($\pm$4.37) kg/m^2 and 92.17 ($\pm$11.61) cm respectively. The prevalence of work-related health problems among the participants were low back pain (35%, 95% CI = 29.78–40.80), hypertension (32%, 95% CI = 33.14–44.37), obesity based on BMI (30%, 95% CI = 24.49–35.03). Working experience of $\geq$10 years (AOR = 2.29, 95% CI = 1.16–4.51), sitting for $\geq$6 hours/day during driving (AOR = 2.23, 95% CI = 1.03–4.82), not following regular exercise (AOR = 2.54, 95% CI = 1.02–6.37), having snacks $\geq$ twice/day (AOR = 3.06, 95% CI = 1.52–6.18) and WC $\geq$90 cm (AOR = 37.00, 95% CI = 11.00–123.99) were the factors associated with obesity.

Conclusion: Tobacco and alcohol use, high BMI, inadequate physical activity, and unhealthy eating habits were found as the major risk factors for NCDs among three-wheeler drivers. The prevalence of work-related health problems was relatively high and job characteristics were the major determinant of most health problems.

Keywords

Three-wheeler drivers; Risk factors; NCDs; Health problems; Sri Lanka

JOMH
Journal of Men's Health

1. Introduction

The optimal, efficient, effective, and environmentally friendly transport services are main challenges in the world and Sri Lanka. Informal Public Transport (IPT) modes are widespread social phenomena in Sri Lanka and have become an integral part of the transport sector. The most common IPT mode in Sri Lanka is the use of three-wheelers [1]. In Sri Lanka, the "three-wheeler" has become one of the key paratransit modes similar to "tuk–tuk" in Bangkok and "rickshaw" in India. These paratransit modes play a major role in the transportation system in Sri Lanka and the other South Asian countries. The non-motorized vehicles such as carts and small cars were the popular paratransit modes in Sri Lanka until the late 1970. However in 1977, then government allowed import of secondhand vehicles to the county which resulted in gradual replacement of traditional modes of transport. Three-wheelers were introduced to Sri Lanka in 1978 and slowly began to penetrate the public transport system in Sri Lanka [2].

A report from Department of Statistics, Sri Lanka, published in 2019, stated that registered three-wheeler driver community has escalated to 1,175,077 by 2019 [3]. Besides, the three-wheelers have become the second most common vehicle on the road after motorcycles. It is the family vehicle of choice to a certain portion of the society. Moreover, there is an increasing popularity among the male school leavers to take up three-wheeler driving as a full-time employment which has already proven to have detrimental impact on the socio-economic development in Sri Lanka. Studies have shown that approximately 5% of all Sri Lankan households own and operate a three-wheeler as their primary source of income [1].

Statistics show that the average age of the three-wheeler driver spans 29–38 years and over 90% of them are in the active working age group. Most of the drivers have started their careers at the ages of 18–21 years. Previous research has shown that choice for this job add up to the difficulties in finding a job with a reasonable source of income [1]. Further, the three-wheeler drivers enjoy a decent daily income while working flexible hours without any supervision. However, it has been reported that three-wheeler drivers tend to work long hours with an average of 12.9 hours almost every day [4]. Even though, drivers are a vulnerable occupational group as they are exposed to environmental stressors and working conditions, the drivers have some protective effect on their health due to their good income as income is strongly influenced on morbidity and mortality.

Because three-wheeler drivers maintain a sitting position during working hours, their joints are under constant stress throughout the day as the nature of the job demands them to be target oriented and competitive. These drivers are constantly exposed to prolonged bodily vibrations during working hours because the three-wheeler is a less comfortable light vehicle [5]. Further, while waiting for fares, they must crouch in one position for extended periods of time. It has been reported that most three-wheeler drivers suffers from lower back pain [6, 7]. When considering the health hazards and nature of the job among this population, they are more prone to substance abuse, physical inactivity, and unhealthy food habits. It has been shown that nearly 68% of drivers have had consumed alcohol and 87% had a habit of smoking. Surprisingly, 66% of the drinking drivers had operated their vehicle under the influence of liquor [4].

There is a growing trend of increasing Non-communicable diseases (NCDs) globally and many research have been carried out to determine the prevalence of risk factors for NCDs among various populations and occupational groups. According to the World Health Organization (WHO), NCDs including heart disease, stroke, cancer, diabetes, and chronic lung disease, are collectively responsible for almost two-thirds of all global deaths. Further, the rise of NCDs is closely associated with four major risk factors such as tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets [8]. Future cost of diagnosis and treatments are likely to be unaffordable and the World Economic Forum estimates that over the next 20 years, NCDs would cost more than US$ 30 trillion for its diagnosis and treatments alone [9].

All the driving jobs have some common occupational risks factors for developing NCDs and has been reported that upper respiratory tract infection, hypertension, short sightedness and road traffic accidents were common occupational problems among long distance professional drivers in Western Nigeria [10]. Although the three-wheeler provides door-to-door services and helps to reduce the unemployment problem in Sri Lanka for decades, their operations have failed to get credit from society, and very little emphasis has been given to identify their work-related health problems [1]. In addition, without a proper understanding of the health concerns of three-wheeler drivers, Sri Lanka's health care system can scarcely hope to properly serve members of this widespread occupation. If drivers' ability to work becomes impaired due to poor health, Sri Lankan road users may have increasingly limited access to this vital mode of informal public transport [11].

This area is not well studied and only a few studies have been done in Sri Lanka to understand the health problems among three-wheeler drivers. Thus, the study was aimed to determine the prevalence of common risk factors for non-communicable diseases, work related health problems and associated factors among three-wheeler drivers in Gampaha Urban Council area, Western Province, Sri Lanka.

2. Methods

2.1 Participants

A descriptive cross-sectional study was conducted at the selected three-wheeler parks in the Urban Council area, Gampaha. The study population was the three-wheeler drivers in Urban Council, Gampaha. About 25 registered three-wheeler parks in Urban Council, Gampaha. The sample size was calculated by using Win Pepi Software, with a 95% confidence interval, acceptable difference of 1 per 1000, assumed rate of 0.5 per 100, population size of 300 with design effect

of 2. Accordingly, the required sample size was 278. Cluster sampling was used in this study to recruit the participants. Each three-wheeler park was considered a cluster. Among 25 registered parks, only Nineteen (19) (parks) clusters were selected and six (06) were excluded in which there were only three-wheelers (some parks consisted of only 4–5). Fifteen (15) three-wheeler divers were recruited through a simple random sampling method using the list of registration of the drivers from each cluster ($19 \times 15 = 285$). Finally, 289 drivers were recruited for the study.

Drivers of three-wheelers in each park site were approached and asked if they were willing to participate in Sinhala speaking Nursing graduates' study. Drivers who were older than 18 years and working as a full-time driver (more than 30 hours a week) of a three-wheeler for a minimum of six months with no other competing job that exceeded 30 hours a week were included in the study. Written informed consent was obtained from all the eligible participants who gave consent to participate in the study.

2.2 Data collection

Data collection was carried out using a pre-tested and validated interviewer administered questionnaire (IAQ). IAQ was validated through judgmental validity, of face validity and content validity by occupational experts. The questionnaire was developed initially in English. Back translation method was used to translate the IAQ [12]. Initially, English IAQ was translated to Sinhala and Tamil language by two independent language experts, where they were requested by the principal investigator (PI) to retain the original structure and content as much as possible. The PI discussed some variations with the two experts and consensual alterations were made. Finally, the agreed Sinhala and Tamil version of the IAQ was back translated to English by other two bilingual English—Tamil experts. The back translated version was again rechecked with the original version of IAQ by the PI for consistency and accuracy of the information. However, only a few minor discrepancies were found and were corrected again after discussions with the expert translators.

IAQ was pretested among ten three-wheeler drivers who were living in a different area of the Western Province. The modifications were made in the questionnaire by improving the clarification of questions, dropping some questions, and changing the technical depth of some sentences based on the pre-testing.

2.3 Measurements

Anthropometric measurements such as weight, height and abdominal circumference and blood pressure were also measured among all participants using standard equipment. Those who reported vigorous physical activity, tobacco chewing, smoking, or drinking coffee or tea within 30 minutes prior to the blood pressure measurements were excluded from the study [13]. The same digital weighing scale, stadiometer, measuring tape and digital blood pressure monitor were used at each park site to take specific measurement. Body weight was measured twice with light clothes without shoes to the nearest 100 g using a SALTER 920 digital weighing scale and average weight was obtained. Height was measured using a stadiometer without shoes with the participant looking straight ahead. Waist circumference (WC) was measured by positioning the non-elastic measuring tape midway between the lower rib margin and the iliac crest, at the end of a normal expiration. Blood pressure (BP) was measured in the seated position after the participants had rested for at least 5 minutes. The measurement was taken using the supported left arm at the heart level, using a digital blood pressure monitor. Two recordings were taken, and the mean was used for analysis. In the event of variation of over 20 mmHg between recordings, a third reading was taken and the mean of the last two recordings was used [14]. Participants were approached and all the readings were obtained in the morning.

2.4 Statistical analysis and definitions

Data analysis was done using Statistical Package for Social Science (SPSS) version 20. Descriptive statistics were used to determine the prevalence of risk factors for NCDs and health problems and the chi-square test was used to determine the associations between two categorical variables. Unadjusted odds ratio with 95% confidence interval (95% CI) was used to check the significance of the differences observed. Binary logistic regression was used to identify the factors associated with common work-related health problems. A probability level of $p < 0.05$ was accepted as statistical significance. According to World Health Origination Expert Consultation on appropriate Body Mass Index (BMI) for Asian populations, obesity is defined as $\geq$27.5 kg/m^2 [15]. The threshold of waist circumference to obesity in most Asian males is $\geq$90 cm [16]. In addition, hypertension was defined as systolic BP of $\geq$140 mmHg and/or diastolic BP of $\geq$90 mmHg or current pharmacological treatment for hypertension [17]. Low back pain was defined as pain and discomfort, localized below the costal margin and above the inferior gluteal folds, with or without leg pain [18] or who has been already diagnosed by a medical practitioner and is currently on medication (crossed check with diagnosed card).

Ethical approval for the study was obtained from the Ethics Review Committee, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka. Written informed consent was obtained from each participant prior to the study. Anonymity of the participants and confidentiality of the data were maintained throughout the study. Results of abnormal BMI and blood pressure were communicated to the respective participants and they were instructed to consult a suitable medical practitioner. Results of the associated factors with common health related problems were communicated with President of Three-Wheeler Drivers Association. The results of the study have been communicated and discussed in detail during the monthly meeting held by the association with its member of three-wheeler drivers.

JOMH
Journal of Men's Health

3. Results

Nearly one third (36%) of participants were from the age group of 36–45 years with the mean age of 41.7 (SD ± 11.25) years and 77.2% of them were married. About one half of them (47%) had completed up to GCE ordinary level education and 38% of three-wheeler drivers had two dependent children. The mean daily income was LKR 1526.30 (SD ± 414.74). The mean working experience in years was 9.48 (±6.89) among all participants. The mean BMI of the participants was 25.28 (±4.37) kg/m^2 and the mean systolic and diastolic blood pressure of the participants were 128.95 (±18.66) mmHg and 186.64 (±12.10) mmHg respectively (Table 1). The majority (83%) had chosen three-wheeler driving as the only job and 57.1% were satisfied with their job. In addition, 62.3% had moderate stress related to their job and 34.6% had been caught by the police for violating a traffic law during the last year (Table 2).

TABLE 1. Sociodemographic and other characteristic of the participants.

Characteristic	Frequency (n = 289)	Percentage (%)
Age category (years)		
20–35	87	30.1
36–45	102	35.3
46–55	64	22.1
56–65	29	10.0
65–80	7	2.5
Civil status		
Married	223	77.2
Single	47	16.3
Divorced	7	2.4
Widowed	12	4.1
Education level		
Up to grade 10	66	22.8
GCE O/L pass	136	47.1
GCE A/L pass	30	10.4
Others	57	19.7
Number of dependents		
No	94	32.5
One	52	18.0
Two	109	37.7
More than two	34	11.8
Mean ± SD		
Daily income (Rs)	1526.30 (±414.74)	
Monthly income (Rs)	45564.01 (±13045.46)	
Years of experience	9.48 (±6.89)	
Working days	6.44 (±0.99)	
Working hours per day	11.37(±2.73)	
Sitting duration per day (hours)	6.34 (±2.12)	
BMI (kg/m^2)	25.28 (±4.37)	
Systolic blood pressure (mmHg)	128.95 (±18.66)	
Diastolic blood pressure (mmHg)	186.64 (±12.10)	
Waist circumference (cm)	91.49 (±13.63)	

GCE (O/L), General Certificate of Education (Ordinary Level); GCE (A/L), General Certificate of Education (Advanced Level); SD, Standard Deviation; BMI, Body mass index.

Nearly 45% of participants were currently smoking, and the mean number of cigarettes used per day was 2.58. A majority (80%) of the participants accepted that they consume any type of alcohol beverages currently and 39% had the habit of betel chewing. Only 17% of them had the habit of doing regular exercises. Nearly half (45%) of the participants have had their main meals all the time from their home. In addition, 35% of them have had snacks from outside more than twice a day (Table 3).

Among all participants, 35% reported that they were suffering from low back pain and 30% were obese. Nearly 32% had hypertension (Table 4) and among them, 24.2% (n = 22/91) were previously diagnosed with hypertension (Table 3).

Those who had working experience of ≥10 years (AOR = 2.40, 95% CI = 1.35–4.27), and who were sitting for ≥6 hours/day during driving (AOR = 2.50, 95% CI = 1.32–4.70) were observed to have a significant association with lower back pain (Table 5).

Therefore, among those who had working experience of ≥10 years (AOR = 2.29, 95% CI = 1.16–4.51), sitting for ≥6 hours/day during driving (AOR = 2.23, 95% CI = 1.03–4.82), while not following any regular exercise (AOR = 2.54, 95% CI = 1.02–6.37), having snacks for ≥ twice/day (AOR = 3.06, 95% CI = 1.52–6.18), and had a waist circumference of ≥90 cm (AOR = 37.00, 95% CI = 11.00–123.99) were significantly associated with obesity. In addition, those who were over the age of ≥50 years (AOR = 2.29, 95% CI = 1.16–4.51) and having a waist circumference of ≥90 cm (AOR = 3.41, 95% CI = 1.84–6.30) have shown a significant association with hypertension (Table 6).

4. Discussion

Non-communicable diseases would most definitely emerge as one of the major public health challenges in Sri Lanka which is evident with the high prevalence of NCD risk factors among the population. Exposure to a single risk factor or a combination of several risk factors can substantially increase the risk of developing multiple NCDs. The present study has provided rich information on the prevalence of key NCD risk factors among three-wheeler driving community in a selected region of the Western province of Sri Lanka. The results revealed that high rates of tobacco and alcohol use, high BMI, inadequate physical activity, unhealthy eating habits, and significant levels of work-related stress as the major NCD risk factors. Moreover, 30% of the participants were obese (≥27.5 kg/m^2) and 57% had high waist circumference (≥90 cm). In addition, 32% had the blood pressure of more than 140/90 mmHg. Obesity and waist circumference are considered the better maker of abdominal adiposity, and high waist circumference and blood pressure are strongly associated with cardiovascular diseases [19]. Increased fat mass and visceral adiposity which affect insulin sensitivity causing insulin resistance in obese, leads to the development of diabetes [20].

TABLE 2. Work characteristics of the participants.

Working characteristic	Frequency (n = 289)	Percentage (%)
Doing any other job		
No	239	82.7
Yes	50	17.3
Reason for choosing the job		
As much an easy job	19	6.6
As a good income	83	28.7
Freedom in the job	112	38.7
Had no other choice	75	26.0
Owner of the three-wheeler		
Own	283	97.9
Rented	6	2.1
Job satisfaction		
Very much satisfied	16	5.5
Satisfied	165	57.1
Not satisfied	106	36.7
Not satisfied at all	2	0.7
Job related stress		
Very high stress	32	11.0
Moderate stress	180	62.3
No stress	73	25.3
No stress at all	4	1.4
Experienced following situations		
Caught by the police due to road rule violation	100	34.6
Paid a fine to the police due to road rule violation	76	26.3
Customer refused to pay the hire	118	40.8
Verbally abused by the customer	48	16.6
Assaulted by the customer	2	0.7
History of accidents during the past year		
Met with an accident	53	18.3
Had physical injuries after accident	20	37.7

In addition, only 17% of the study participants engage in the regular exercise which is remarkably less. Physical activity is proven to prevent NCDs such as heart disease, stroke, diabetes, and cancers. In addition, it helps prevent hypertension, maintain healthy body weight, and improve mental health, quality of life and well-being [21]. A minimum of 150 minutes of moderate intensity aerobic physical activity per week is recommended by WHO [22]. This finding highlights the need for conducting more awareness programs on risk factors of NCDs and the need for engaging in physical activity. Further, it is noteworthy to report the significantly high percentage of alcohol consumption and smoking found among the participants. Similarly, a study conducted in Sri Lanka among three-wheeler drivers found that 68% of them were alcoholic and 87% had smoking habits [4]. However, in contrast to these findings, a national survey conducted in Sri Lanka had reported that only 34.8% Sri Lankan males were consuming alcohol [22]. Participants might opt for alcohol due to social pressure, for personal enjoyment, and for stress relief [23]. These findings highlight the need for new strategies to strengthen preventive measures to reduce the habits of smoking and alcohol consumption.

The most frequent health complaint among the participants (35%) was musculoskeletal pain especially low back pain which lasted at least an hour per day in the past 12 months. Similarly, a Sri Lankan study has shown that the most common health concern among three-wheeler drivers as musculoskeletal pain (primarily backpain) [11]. Another study conducted among a group of bus drivers in Colombo, Sri Lanka found that 35% of the bus drivers experienced musculoskeletal pain [13]. A study conducted in Malaysia among taxi drivers found that nearly half of the respondents (48.5%) had lower back pain in the past year [7]. Low back pain could be a result of joints being under constant stress throughout the day and the exposure to prolonged bodily vibrations while driving on bumpy roads of Sri Lanka, sitting prolonged durations having to crouch in one position for extended periods of time while awaiting fares. Immediate interventions should be implemented among the drivers to educate them regarding proper ergonomic practices such as maintaining a correct posture, stretch and walk around regularly while waiting for the next customer, and refrain from carrying heavy items with awkward posture.

Obesity and hypertension were found to be the other common work-related health problems among the participants. It was found that nearly 30% of participants were obese which was considerably similar to the general population of Sri Lanka where 34.4% of adults were either overweight or obese [24]. Further, a study conducted among a group of bus drivers in Colombo, Sri Lanka found that only 13.3% of

JOMH
Journal of Men's Health

TABLE 3. Health habits and diagnosed medical conditions of the participants.

Health behaviors/habits	Frequency (n = 289)	Percentage (%)
Currently smoking	131	45.3
Uses of alcohol beverages	231	79.9
Frequency of using alcohol		
Daily	20	8.6
Weekend	35	15.2
Occasionally	176	76.2
Betel chewing habits	112	38.8
Regular exercise	48	16.6
Frequency of exercise		
Daily	8	16.7
Weekly	5	10.4
Occasionally	35	72.9
Have the breakfast from		
All the time from the home	129	44.7
Normally from the outside	92	31.8
All the time from the outside	68	23.5
Have the lunch & dinner from		
All the time from the home	154	53.3
Normally from the outside	121	41.9
All the time from the outside	14	4.8
Frequency of having snacks from the outside		
Not at all	37	12.8
Once a day	150	51.9
$\geq$ Twice a day	102	35.3
Already diagnosed diseases		
Gastritis	72	24.9
Diabetes mellitus	41	14.2
Hypertension	22	7.6
Heart disease	12	4.2
Other diseases	18	6.2

TABLE 4. Prevalence of common work-related health problems among participants.

Common health problems	n (%)	95% CI
Low back pain	102 (35.3)	29.78–40.80
Obesity ($\geq$27.5 kg/m^2)	86 (29.8)	24.49–35.03
Hypertension (>140/90 mmHg)	91 (31.5)	33.14–44.37

the bus drivers were obese and 48.3% of them were either overweight or obese [13]. This is primarily due to factors such as unhealthy diet, inadequate physical activity, and having a sedentary lifestyle, which leads to a positive energy balance and weight gain. Not surprisingly, as highlighted by WHO [8], obesity, long working hours, sedentary lifestyle, inadequate physical activity and unhealthy diet are the common risk factors for NCDs. In addition, it is noteworthy to report that the majority (83%) has reported "no" for active participation in physical activity. The tendency for increasing obesity needs urgent attention. Programs focusing on physical activities to drivers must be arranged at the community level.

Further, nearly 32% of the three-wheeler drivers were hypertensive and among them, 24.1% (n = 22) were previously diagnosed to have been suffering from hypertension. These findings are in accordance with the prevalence of hypertension conducted among drivers in Sri Lanka and India [13, 25]. Also, participant's age and waist circumference were associated with hypertension in the present study. According to a study conducted in Sri Lanka, the prevalence of hypertension in male population was 28% [26]. This finding indicates that the prevalence of hypertension was higher among participants compared to the male population of Sri Lanka. A study conducted in India among bus drivers reported that hypertension was associated with the age and obesity of the participants [25]. These variables reflected the sedentary behavior of the three-wheeler drivers which leads to higher prevalence of hypertension. Further, the increasing age contribute to changes in endothelial dysfunction, thickening of vessel walls, reduced flexibility and arterial stiffening, leading to increased peripheral resistance [27]. Central obesity (higher waist circumference) related hypertension can be traced to leptin, an adipokine enzymes found in higher levels in obese individuals, which acts in the hypothalamus to increase blood pressure through activation of the sympathetic nervous system [28].

Although this study was conducted for a smaller sample size, it revealed a significantly high prevalence of occupational health problems such as obesity and hypertension. Large scale nationwide studies are recommended to be conducted among all drivers in order to find out the common

TABLE 5. Factors associated with low back pain.

Factors	Low back pain							
	Yes (n, %)	No (n, %)	*p	OR	95% CI	**p	AOR	95% CI
Age (years)			0.15	1.50	0.86–2.63	0.66	0.87	0.46–1.64
≥50	29 (28.4)	39 (20.9)						
<50	73 (71.6)	148 (79.1)						
History of accident			0.92	1.03	0.55–1.92	0.60	0.84	0.43–1.64
Yes	19 (18.6)	34 (18.2)						
No	83 (81.4)	153 (81.8)						
Working experience			0.00	3.31	2.00–5.47	**0.00**	**2.40**	**1.35–4.27**
≥10 years	61 (59.8)	58 (31.0)						
<10 years	41 (40.2)	129 (69.0)						
Sitting duration/day			0.00	3.41	1.92–6.07	**0.00**	**2.50**	**1.32–4.70**
≥6 hours	83 (81.4)	105 (56.1)						
<6 hours	19 (18.6)	82 (43.9)						
Work related stress			0.00	2.36	1.29–4.32	0.12	1.67	0.86–3.20
Yes	85 (83.3)	127 (67.9)						
No	17 (16.7)	60 (32.1)						
Regular exercises			0.75	1.11	0.57–2.14	0.44	1.31	0.65–2.65
No	86 (84.3)	155 (82.9)						
Yes	16 (15.7)	32 (17.1)						
Waist circumference			0.02	1.74	1.06–2.86	0.41	1.26	0.73–2.16
≥90 cm	67 (65.7)	98 (52.4)						
<90 cm	35 (34.3)	89 (47.6)						

OR, Unadjusted odd ratio; AOR, Adjusted odd ratio; *, Chi-square test; **, Binary logistic regression test.

TABLE 6. Factors associated with obesity and hypertension.

Factors	Obesity								Hypertension							
	Yes (n, %)	No (n, %)	*p	OR	95% CI	**p	AOR	95% CI	Yes (n, %)	No (n, %)	*p	OR	95% CI	**p	AOR	95% CI
Age (years)			0.82	1.07	0.59–1.93	0.37	0.70	0.32–1.52			0.01	2.07	1.18–3.63	**0.01**	**2.29**	**1.16–4.51**
≥50	21 (24.4)	47 (23.2)							30 (33.0)	38 (55.9)						
<50	65 (75.6)	156 (76.8)							61 (67.0)	160 (80.8)						
Currently smoking			0.02	1.82	1.10–3.04	0.24	1.50	0.76–2.98			0.46	1.22	0.72–2.07	0.21	1.47	0.81–2.67
Yes	48 (55.8)	83 (40.9)							47 (51.6)	126 (63.6)						
No	38 (44.2)	120 (59.1)							44 (48.4)	72 (36.4)						
Consuming alcohol			0.00	3.19	1.45–7.05	0.29	1.68	0.63–4.49			0.09	1.76	0.89–3.46	0.79	1.11	0.51–2.42
Yes	78 (90.7)	153 (75.4)							78 (85.7)	153 (77.3)						
No	8 (9.3)	50 (24.6)							13 (14.3)	45 (22.7)						
Working experience			0.00	2.89	1.72–4.86	**0.01**	**2.29**	**1.16–4.51**			0.04	1.63	1.00–2.71	0.74	1.10	0.61–2.00
≥10 years	51 (59.3)	68 (33.5)							45 (49.5)	74 (37.4)						
<10 years	35 (40.7)	135 (66.5)							46 (50.5)	124 (62.6)						
Sitting duration/day			0.00	3.86	2.04–7.29	**0.04**	**2.23**	**1.03–4.82**			0.46	1.22	0.72–2.07	0.39	0.76	0.40–1.43
≥6 hours	72 (83.7)	116 (57.1)							62 (68.1)	126 (63.6)						
<6 hours	14 (16.3)	87 (42.9)							29 (31.9)	72 (36.4)						
Regular exercises			0.06	2.03	0.94–4.41	**0.04**	**2.54**	**1.02–6.37**			0.16	1.67	0.81–3.45	0.38	1.41	0.65–3.05
No	77 (89.5)	164 (80.8)							80 (87.9)	161 (81.3)						
Yes	9 (10.5)	39 (19.2)							11 (12.1)	37 (18.7)						
Taking snacks			0.00	5.89	3.40–10.19	**0.00**	**3.06**	**1.52–6.18**			0.03	1.72	1.03–2.87	0.35	1.33	0.72–2.45
≥Twice a day	55 (64.0)	47 (23.2)							40 (44.0)	62 (31.3)						
<Twice a day	31 (36.0)	156 (76.8)							51 (56.0)	136 (68.7)						
Waist circumference			0.00	40.8	12.76–133.59	**0.00**	**37.00**	**11.00–123.99**			0.00	3.61	2.06–6.34	**0.00**	**3.41**	**1.84–6.30**
≥90 cm	83 (96.5)	82 (40.4)							70 (76.9)	95 (48.0)						
<90 cm	3 (3.5)	121 (59.6)							21 (23.1)	103 (52.0)						

OR, Unadjusted odd ratio; AOR, Adjusted odd ratio; *, Chi-square test; **, Binary logistic regression test.

NCDs. Majority of participants who chose the career as a three-wheeler driver are school dropouts and their education level is relatively low. Therefore, low level of comprehensibility of health-related questions and their responses might have led to possible information bias. Further, there would have been a possibility to data contamination as the duration

of data collection differed significantly from one person to another as data were collected respecting the participants' privacy and convenience without disturbing their day-to-day occupation.

Furthermore, three-wheeler drivers have their own subculture and, in which they have concerns and grievances related to their job. Therefore, there might have been some extreme responses for certain work-related issues that can contribute to possible information bias.

5. Conclusions

The exist a high prevalence of risk factors for NCDs among three-wheeler drivers in Sri Lanka, such as alcohol consumption, smoking, betel chewing, and sedentary lifestyle. The highlighted work-related health problems among them were low back pain, hypertension, and obesity. Working duration and prolonged sitting per day were the major determinants of back pain. Factors such as working duration, sitting duration per day, physical inactivity, number of snacks and waist circumference had a significant association with obesity. High blood pressure was closely associated with the age and the waist circumference of the participants. Hence, further strengthening the current awareness programs on healthy lifestyles including prevention and control activities focusing on smoking cessation, reducing alcohol consumption, engaging physical activities among three-wheeler drivers would contribute to bring down the NCD risk factors significantly.

Abbreviations

BP, Blood pressure; BMI, Body mass index; CI, Confidence interval; IAQ, Interviewer administered questionnaire; IPT, Informal Public Transport; NCDs, Non-communicable diseases; WC, Waist circumference; WHO, World Health Organization.

Author contributions

All authors had full access to the data, approved the final version for publication, and take responsibility for its accuracy and integrity. Concept or design: SAIPD, SSPW; Acquisition of data: SAIPD; Analysis or interpretation of data: SAIPD, GK, SSPW; Drafting of the manuscript: GK, SSPW; Critical revision for important intellectual content: all authors.

Ethics approval and consent to participate

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Review Committee, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

Acknowledgment

Authors convey their sincere thanks to the individuals who participated in this study.

Funding

This research received no external funding.

Conflict of interest

The authors declare no conflict of interest.

References

[1] Kumarage AS, Bandara MS, Munasinghe D. An Analysis of the Socio-Economic Aspects of Three Wheeler Market as an Informal Public Transport (IPT) Mode; Moratuwa Case Study. 2009. Available at: http://dl.lib.mrt.ac.lk/handle/123/11880 (Accessed: 22 August 2020).

[2] Somasundaraswaran AK. Results of survey among drivers and customers of for-hair three wheelers in five small towns in Sri Lanka. Journal of Asia-Pacific Development. 2008; 15: 119–135.

[3] Department of Statistics, Sri Lanka. Transport and Communication. 2019. Available at: http://www.statistics.gov.lk/pocket%20book/chap08.pdf (Accessed: 17 April 2021).

[4] Somasundaraswaran AK, Kumari MBIT, Siriwardana DHSDA. Proceedings of the Third Academic Sessions. Three-wheel drivers view in small cities in Sri Lanka. 2006. Available at: https://www.ruh.ac.lk/research/academic_sessions/2006_mergepdf/182-184.PDF (Accessed:20 January 2021).

[5] Kirkorowicz JM, Sapukotana P, De Silva PV, Noda M, de Oliveira JS, Østbye T. Work-Related Stress and Substance Use as Risk Factors for Chronic Disease Among Three-Wheel Drivers in Galle, Sri Lanka: a Qualitative Study. International Journal of Occupational Safety and Health. 2014; 3: 21–24.

[6] Noda M, Malhotra R, DeSilva V, Sapukotana P, DeSilva A, Kirkorowicz J, *et al.* Occupational risk factors for low back pain among drivers of three-wheelers in Sri Lanka. International Journal of Occupational and Environmental Health. 2015; 21: 216–224.

[7] Dubai SARA, Qureshi AM, Ismail NH, Gopal K, Rampal. Prevalence and determinants of low back pain among taxi drivers in Malaysia; A cross sectional study. Journal of Advance Medical Research. 2012; 2: 129–143.

[8] World Health Organization. Noncommunicable diseases. 2018. Available at: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases (Accessed: 3 August 2020).

[9] Bloom DE, Cafiero ET, Jane-Llopis E, Abrahams-Gessel S, Bloom LR, Fathima S, *et al.* The global economic burden of Non-communicable diseases. A report by the World Economic Forum and the Harvard School of Public Health. 2011. Available at: http://www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf (Accessed: 2 February 2021).

[10] Amoran OE, Salako AA, Jeminusi O. Screening for common occupational health disease among long distance professional drivers in Sagamu, Ogun State, Negeria. International Journal of Preventive Medicine. 2014; 5: 516.

[11] Kirkorowicz JM. Health concerns of three wheel drivers in Galle Sri Lanka. 2012. Available at: https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/6193/Kirkorowicz_duke_0066N_11657.pdf?sequence=1&isAllowed=y (Accessed: 22 February 2020).

[12] Wang W, Lee H, Fetzer SJ. Challenges and strategies of instrument translation. Western Journal of Nursing Research. 2006; 28: 310–321.

[13] Jayarajah U, Jayakody AJ, Jayaneth JM, Wijeratne S. Prevalence of Hypertension and its Associated Factors among a Group of Bus Drivers in Colombo, Sri Lanka. The International Journal of Occupational and Environmental Medicine. 2017; 8: 58–59.

[14] Wijewardene K, Mohideen MR, Mendis S, Fernando DS, Kulathilaka T, Weerasekara D, *et al.* Prevalence of hypertension, diabetes and obesity: baseline findings of a population based survey in four provinces in Sri Lanka. The Ceylon Medical Journal. 2005; 50: 62–70.

[15] World Health Organization Expert Consultation. Appropriate Body Mass Index (BMI) for Asian populations and its implication for policy and intervention strategies. Lancet. 2004; 363: 157–163.

[16] Misra A, Vikram NK, Gupta R, Pandey RM, Wasir JS, Gupta VP. Waist circumference cutoff points and action levels for Asian Indians for identification of abdominal obesity. International Journal of Obesity. 2006; 30: 106–111.

[17] Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, *et al.* Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003; 42: 1206–1252.

[18] Vrbanić TS. Low back pain–from definition to diagnosis. Reumatizam. 2011; 58: 105–107.

[19] Fan H, Li X, Zheng L, Chen X, Lan Q, Wu H, *et al.* Abdominal obesity is strongly associated with Cardiovascular Disease and its Risk Factors in Elderly and very Elderly Community-dwelling Chinese. Scientific Reports. 2016; 6: 21521.

[20] Kamuhabwa AR, Charles E. Predictors of poor glycemic control in type 2 diabetic patients attending public hospitals in Dar es Salaam. Drug, Healthcare and Patient Safety. 2014; 6: 155–165.

[21] World Health Organization. Physical activity. 2020. Available at: https://www.who.int/news-room/fact-sheets/detail/physical-activity (Accessed: 1 March 2021).

[22] STEPS survey, Sri Lanka. 2015. Available at: https://www.who.int/ncds/surveillance/steps/STEPS-report-2015-Sri-Lanka.pdf (Accessed: 2 February 2021).

[23] Perera B, Torabi M. Motivations for alcohol use among men aged 16–30 years in Sri Lanka. International Journal of Environmental Research and Public Health. 2009; 6: 2408–2416.

[24] Katulanda P, Jayawardena MAR, Sheriff MHR, Constantine GR, Matthews DR. Prevalence of overweight and obesity in Sri Lankan adults. Obesity Reviews. 2010; 11: 751–756.

[25] Lakshman A, Manikath N, Rahim A, Anilakumari VP. Prevalence and Risk Factors of Hypertension among Male Occupational Bus Drivers in North Kerala, South India: a Cross-Sectional Study. ISRN Preventive Medicine. 2014; 2014: 318532.

[26] Katulanda P, Ranasinghe P, Jayawardena R, Constantine GR, Rezvi Sheriff MH, Matthews DR. The prevalence, predictors and associations of hypertension in Sri Lanka: a cross-sectional population based national survey. Clinical and Experimental Hypertension. 2014; 36: 484–491.

[27] Harvey A, Montezano AC, Lopes RA, Rios F, Touyz RM. Vascular Fibrosis in Aging and Hypertension: Molecular Mechanisms and Clinical Implications. The Canadian Journal of Cardiology. 2016; 32: 659–668.

[28] Rahmouni K, Correia MLG, Haynes WG, Mark AL. Obesity-Associated Hypertension. Hypertension. 2005; 45: 9–14.