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Research Article

A Survey of Undiagnosed Hypertension among Market Traders in Suva, Fiji Islands

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ABSTRACT

Routine check and optimal control of blood pressure have been recommended to reduce the high cardiovascular disease burden in the Southern Pacific. As demographic profile in the Pacific Island countries continues to transition, the burden of cardiovascular disease is importunately affecting more younger and high stress population. In collaboration with the Healthy Setting Initiative of the Ministry of health, we conducted a survey of blood pressure among market traders in Suva City Central and Nasouri markets of Fiji Islands. Following ethical approval and informed consent, we obtained socio-demographic data, and measured anthropometric indices and blood pressure of asymptomatic adult market traders of Suva City and Nasouri market using standard procedures. Participants comprised of 189 traders (52% females); with mean body mass index of 30kg/m$_2$, weight of 82kg and waist circumference of 101cm. Overall, 152(80%) had sub-optimal blood pressure: elevated 23(12%), stage I: 70(37%), stage II: 57(30) and hypertensive crisis 2(1%). Of these, 30(20%) reported being compliant with medication, 62(41%) non-compliant and 60(39%) were previously unaware of their blood pressure status. Percent body fat (OR: 1.07; 95% CI: 1.02-1.13) and diastolic blood pressure (OR: 1.34; 95% CI: 1.21-1.48) were independently associated with hypertension. Burden of hypertension is high (80%) among study participants, with 39% of these being undiagnosed. There are issues with suboptimal blood pressure control and non-compliance with medication among study participants. There is need for health education, routine screening and sustainable intervention to reduce this burden among this population.

***Keywords**: Cardiovascular disease, hypertension, Fiji Islands, occupational health, market traders*

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INTRODUCTION

Blood pressure is an important measure of cardiovascular function, and when elevated it is associated with cardiovascular disease and renal morbidities. A study by Linhart *et al* (2016), showed that the prevalence of hypertension in Fiji increased from 21.6% in 1980 to 40.3% in 2011; while among women, it increased from 26.7% to 35.1%. This trend has been attributed, in part, to prevalent lifestyle-related factors such as obesity, physical inactivity and high salt intake, and could be contributing to increasing burden of cardiovascular morbidity and mortality. There is growing concern about undiagnosed high blood pressure among asymptomatic adult population. As the burden CVD continues to take its toll on healthcare cost, risk reduction strategies targeting individuals and populations at risk have been advocated (Riley *et al*. 2016). Individuals involved in high stress and sedentary occupation may be at a higher risk of hypertension. Early identification of undiagnosed elevated hypertension may inform strategies to prevent cardiovascular complications among this population. This study aimed at describing blood pressure profile of among and market traders in Suva, Fiji Islands.

MATERIALS AND METHODS

Study Design and Setting: A cross-sectional survey was conducted at the Nasouri and Suva City Central markets in conjunction with the Healthy Workplace Initiatives of the Ministry of Health and Medical Services.

Study Population: Market traders above 18 years at the Suva City Central and Nauori markets in Fiji participated in this study. Individuals with acute illness such as malaria were excluded from this study. All consenting eligible traders were approached to participate in this study.

Data Collection: Variables: Socio-demographic variables (age, gender, ethnicity); anthropometric indices (weight, height, waist circumference, hip circumference and percent body fat) and blood pressure were obtained using standard procedures (Riley *et al*. 2016; Okpechi *et al*. 2013). To enhance reliability of blood pressure measurement, a standard procedure was followed. Blood pressure was taken after 5 minutes rest, with participant in sitting position and the arm supported at heart level. Appropriate cuff sizes were used. Two blood pressure measurements were taken, and the average was recorded. Same blood pressure monitor will be used to take blood pressure readings by a trained assessor.

Case Definition: Blood pressure was classified as Normal (SBP<120mmHg and DBP<80mmHg); Elevated (SBP: 120 – 129mmHg and DBP: <80mmHg); Hypertension Stage I (SBP: 130 – 139mmHg or DBP: 80 – 89mmHg); Hypertension Stage II (SBP: ≥140mmHg or DBP: ≥90); Hypertensive Crisis (SBP: ≥180mmHg and/or DBP: ≥120mmHg) (2017 American heart Association Blood Pressure Guideline) (Whelton *et al*. 2018).

Data Management and Analysis: Data were double-entered daily by two independent study team members and stored in a secured location. Categorical variables were summarized as frequency and percentages, while continuous variables as mean and confidence interval. Independent t-test and Mann-Whitney U test and Fischer-exact test were used to test association between continuous and categorical covariables with blood pressure status. Kruskal-Wallis was used to test for association between covariates and blood pressure categories. Univariable and multivariable regression was conducted to estimate crude and adjusted odds for high blood pressure among participants.

Ethical Considerations: Ethical approval was obtained from the College of Medicine Health Research Ethics Committee and permission from Ministry of Health and Market Managers and Office Supervisors. The nature and purpose of the study was explained to prospective participants and their questions answered. Data collection procedure was done in accordance with the Declaration of Helsinki. Participants were informed that their participation is voluntary and that they reserve the right to withdraw from continuing in the study at any point. No data collection instrument contained personal identifier. All participants were educated about implications of having elevated/high blood pressure and were also informed of their blood pressure reading. Individuals with elevated or high blood pressure were referred to the nearest health center to seek immediate medical attention.

RESULTS

Participants comprised of 48% males and 50% iTaukei ethnic group (Table 1). Twenty percent had normal blood pressure; 64% had excess abdominal adiposity by waist-hip ratio. The average body mass index was 30kg/m$_2$, with average weight of 82kg and waist circumference of 101cm.

Table 1
Participants' characteristics by hypertension status

Parameters	Total (n = 189) Mean (95% CI	Normal (n = 37) Mean (95% CI	Hypertensive n = 152)	p-value
Age (yrs)	50 (48–52)	44 (40-48)	52 (50-53)	0.008
SBP (mmHg)	132 (129-134)	110 (108-112)	137 (135-139)	0.000
DBP (mmHg)	82 (81–84)	70 (68-71)	85 (84-87)	0.000
Weight (kg)	82 (79–85	75 (70-80)	84 (80-87)	0.017
W.Circ. (cm)	101 (99-103)	94 (89-98)	103 (100-105)	0.001
BMI (kg/m$_2$)	30 (29–31)	27 (25-29)	30 (29-31)	0.009
WHt-ratio	0.61 (0.60–0.62	0.56 (0.54-0.59)	0.62 (0.60–0.63)	0.002
WHip-ratio	1.01 (0.89–1.12	1.20 (0.56-1.8)	0.96 (0.95-.97)	0.111
PBF (%)	33 (32–35)	29 (25-32)	34 (33-36)	0.003
	N (%)	N (%)	N (%)	
Gender				
Male	90(48%)	18(10%)	72(38%)	0.889
Female	99(52%)	19(10%)	80(42%)	
Ethnicity				
Itaukei	94(50%)	19(10%)	75(40%)	0.826
Indo_F	95(50%)	18(10%)	77 (40%)	
BMI Category				
Underwt	2(1%)	0(0%)	2 (1%)	
Normal	42(22%)	10(5%)	32 (17%)	
Overwt.	60(32%)	20(11%)	40(21%)	
Obese I	50(26%)	5(2%)	45(24%)	
Obese II	20(11%)	0 (0%)	20(11%)	
Obese III	15(8%)	2 (1%)	13(7%)	0.004
WHt-ratio				
Normal	16(9%)	6(3%)	10(5%)	
Obese	173(91%)	31(16%)	142(75%)	0.059
WHip-ratio				
Normal	68(36%)	20(11%)	48(25%)	
Obese	121(64%)	17(9%)	104(55%)	0.011

95% CI:95% confidence interval, yrs: years, SBP: systolic blood pressure, DBP: diastolic blood pressure, mmHg: millimeter of mercury, cm: centimeters, BMI: body mass index, W.Circ: waist circumference, WHt-rato: waist height ratio; WHip-rato: waist hip ratio; PBF: percent body fat; n=number, %:percentage, Indo_F: Indo-fijian, Underwt: underweight, BMI category (underwt: <18.5kg/m$_2$, normal: 18.5- 24.9kg/m$_2$, overwt: 25 – 29.9kg/m$_2$, obese I: 30 – 34.9kg/m$_2$, obese II: 35 – 39.9kg/m$_2$, obese III: >40kg/m$_2$)

There were significant associations between hypertension and body mass index and waist-height-ratio. Participants with normal blood pressure were significantly younger (p=0.008), and had statistically significant lower systolic and diastolic blood pressures (p=0.000), weight (p=0.017), body mass index (p=0.009), waist height ratio (p=0.002), and percent body fat (p=0.003). The hypertensive group, on the average had 22mmHg and 12mmHg higher systolic and diastolic blood pressures than normotensive participants. Over three-quarter (77%) of the participants were either overweight or obese, while the majority (91%) had waist-height-ratio >0.5.

Risk of high blood pressure was 7% higher among participants with abnormal body mass index compared to those with healthy body mass index. Participants with abdominal obesity (Waist-hip-ratio >1.0 in men and >0.8 in women) had 1.21 times higher risk of hypertension compared to those without abdominal obesity.

Table 2:
Distribution of blood pressure (mmHg) categories among participants

Blood Pressure Category	Female (n=99)	Male (n=90)	Total (n=189)
Normal: (SBP<120; DBP<80)	19 (10%)	18 (10%)	37 (20%)
Elevated: (SBP120 - 129; DBP<80)	12 (6%)	11 (6%)	23 (12%)
Hypertension Stage I (SBP130 - 139; DBP 80- 89)	39 (20%)	31 (16%)	70 (37%)
Hypertension Stage II (SBP≥140 or DBP: ≥90)	29 (15%)	28 (15%)	57 (30%)
Hypertensive Crisis (SBP≥180 and/or DBP ≥120)	0 (0%)	2 (1%)	2 (1%)

(Classification according to 2017 Blood pressure guideline)(Whelton et al. 2018). Blood pressure category was not different by gender; (p=0.742).

Twenty percent had normal blood pressure, and another 12% had elevated blood pressure (Table 2). Prevalence of hypertension in the study participants was 68%. Prevalence of high blood pressure was not different between gender (p=0.742). About a third (37%) had hypertension Stage I and another 30% had stage II hypertension. There were two cases of hypertensive crisis.

Of the 152 participants with suboptimal blood pressure, 92(61%) were on medication: 32% of these reported being compliant with their medication (Table 3). Among those complaint with medication, 67% of them had stage I hypertension, and another 23% have stage II hypertension. Forty-one percent of participants with suboptimal blood pressure reported being non-compliant with their medication, with the majority of them (53%) having stage I hypertension. Thirty-nine percent of participants with elevated or high blood pressure were previously not aware of their blood pressure status; more than half of these have stage II hypertension.

Univariate analysis showed that increasing age, diastolic blood pressure, weight, waist circumference, body mass index and percent body fat were associated with increased odds of being hypertensive (Table 4). Controlling for other variables, diastolic blood pressure and percent body fat were independently associated with increased odds of hypertension. An increase of 1mmHg in diastolic blood pressure was associated with 34% (95% CI: 21%-48%) increase in the odds of being hypertensive. One percent increase in percent body fat is associated with a 7% (95% CI: 2%–13%) increase in the odds of hypertension among study participants.

Table 3:
Medication status among individuals with hypertension

Medication status	Elevated N = 23 n (%)	Stage 1 N = 70 n (%)	Stage 2 N = 57 n (%)	Htn Crisis N = 2 n (%)	Total N =152 n (%)
On medication (compliant)	3 (2%)	20 (23%)	7 (5%)	0 (0%)	30 (20%)
On medication (not compliant)	8 (5%)	33 (22%)	19 (13%)	2 (1%)	62 (41%)
Not aware	12 (8%)	17 (11%)	31 (20%)	0 (0%)	60 (30%)

Htn Crisis: hypertension crisis.

Table 4:
Association between covariates and hypertension

Parameters	Adjusted		Unadjusted	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	1.05 (1.02, 1.08)	0.001	1.03 (0.99, 1.07)	0.15
Gender	1.05 (0.51, 2.16)	0.889	0.98 (0.29, 3.03)	0.97
DBP	1.31 (1.20, 1.44)	0.000	1.34 (1.21, 1.48)	0.00
Weight	1.02 (1.00, 1.04)	0.019	1.03 (0.95, 1.11)	0.47
WC	1.04 (1.02, 1.08)	0.002	1.01 (0.98, 1.05)	0.44
BMI	1.09 (1.02, 1.16)	0.011	0.83 (0.66, 1.04)	0.12
PBF (%)	1.05 (1.01, 1.09)	0.004	1.07 (1.02, 1.13)	0.01

OR: Odds ratio, BMI: body mass index; PBF: percent body fat

DISCUSSION

We surveyed the burden of undiagnosed hypertension among market traders in Fiji. Among 189 asymptomatic adult participants, 20% had normal blood pressure, 12% had elevated blood pressure while 68% had hypertension. More than a third (39%) of individuals with elevated blood pressure or hypertension were previously unaware. Blood pressure category was not significantly associated with gender, but hypertension status was independently associated with percent body fat among study participants (p=0.01).

Hypertension is reported to be the most prevalent non-communicable disease (NCD) and unfortunately mostly asymptomatic at its initial stages, hence individuals may be unaware of their status (Ulasi *et al*. 2011). In low and middle-income countries, high prevalence of undiagnosed high blood pressure could be driven by socio-cultural patterns, unequal access to health and poor health-seeking behaviours (Riley *et al*. 2016).

Fiji Islands, which is a small island nation with population less than 900, 000, is faced with one of the highest CVD related-mortality in the world (Mendis, Puska, and Norrving 2011). Eighty-two percent of all deaths in 2007 were attributed to hypertension, stroke, heart failure and other heart diseases (Usamate, n.d.). Taylor *et al* (2013), reported CVD-related morality in Fiji has increased from 20% in 1960 to 45% in 2010. The productive workforce is disproportionately affected by this trend, thus extending the impact of CVD burden beyond health to socio-economic and demographics of the nation. To tackle this problem in a sustainable way, the Wellness Unit of the Ministry of Health and Medical Services launched "The Health Settings Initiatives", which targets various workplaces, as certain job predispose individuals to high risk of NCD, hence making them vulnerable. This study was done in collaboration with the Initiative.

This study focused on traders in Suva and Nasouri markets as an informal work setting. The burden of hypertension among our participants is high (68%), of which 39% were previously undiagnosed. This may be attributable to the prolonged sedentary nature of market traders with attendant cumulative repetitive stress (Bosu 2015). Long sitting working hours, which alone is associated with 2-fold increased CHD risk (Virtanen *et al*., 2012), coupled with high sodium intake, low level of knowledge and awareness about CVD among traders may contribute to the observed high hypertension burden(Ulasi *et al*. 2011; Bosu 2015).

Previous studies reported similar high prevalence of hypertension in different working population in Nigeria. Odugbenmi *et al* (2012), reported 35% among urban traders, Lagos, Nigeria; Ulasi *et al* (Ulasi *et al*. 2011), reported prevalence of 42%, of which 71% were previously undiagnosed in Enugu; Awosan (Awosan, *et al*. 2014) reported 29% in Sokoto, Nigeria. Similarly, Okpechi et.al (2013), reported that 31% prevalence of hypertension among a population of urban and rural dwellers, with 59% of hypertensive participants being previously unaware.

Level of non-compliance to medication among participants with hypertension is high (41%). Non-compliance with antihypertensives has been associated with uncontrolled blood pressure and increased risk of stroke (Whelton *et al*. 2018). Previous studies have suggested that barriers to easy access and poor health seeking behaviors could contribute to medication non-compliance (Wang *et al*. 2002; Jokisalo *et al*., 2002). In the two markets were the study was conducted, there were no on-site or close by clinics where the traders could easily and routinely check their blood pressure or monitor the effect of their medication. The presence of on-site clinic may help the traders become more conscious and proactive about their health. In addition to routine checks, the presence of such a clinic could offer daily medication reminders to traders.

Among the 30 participants who reported being compliant, 27 still had stage I or stage II hypertension. This raises the issue of proper monitoring of blood pressure control even among those who are compliant with their medication. The traders usually must be in their stall very early to catch early customers and often stay with their wares till late evening around 6:00pm when the markets are closed. Early morning rush, inability to leave their wares for a long time, forgetting to take their medication or not having time to go for check and drug re-fill might contribute to non-compliance and or poor blood pressure control among those on medication. This lack of time and asymptomatic nature of the hypertension may also explain, in part, the high burden of undiagnosed hypertension among study participants.

Our findings of higher risk of hypertension among individuals with normal body mass index, though not statistically significant, could be due to others contributory factors such as differential salt intake, physical activity levels and sleep quality, which we did not assess. Future studies will attempt to explore the inter-relationship between these factors.

The average difference in systolic (+22mmHg) and diastolic (+12mmHg) pressure between individuals with normal blood pressure and those with hypertension is quite worrisome. These further stresses the need for an urgent intervention. We observed an independent association between percent body fat and hypertension status. This is suggestive that adiposity rather than body mass may be a better and early indicator for hypertension in this population.

Suva and Nasouri market traders play a huge role in urban life in Fiji. Some of these commute long hours early in the morning from the rural areas to trade their fresh produce daily. A comprehensive multi-level workplace strategy to promote healthy behaviors, such as adequate physical activity, low sodium intake and smoking cessation among the traders may help improve their cardiovascular health. Routine blood pressure assessment could be an effective step in early detection and management of hypertension among this population. On-site clinic or monthly mobile clinic visits to the market may help overcome potential barriers, and help mitigate future risk of stroke and other cardiovascular diseases.

This is the first effort at estimating burden of undiagnosed high blood pressure among market traders in Fiji. We were able to provide individual feedback about blood pressure status to all participants, and where necessary we made referral to seek medical attention. The two markets, which are housed in enclosed structures within the urban areas, have limited number of registered traders as opposed to the open markets in rural settings, hence we were able to survey more than 70% of the traders. Efforts are on-going to explore lifestyle and health-seeking behaviors of the traders. The "Workplace Wellness Initiatives' of the Ministry of Health is considering working with the market masters to explore ways the health needs of the traders can be better served.

In conclusion, The burden of suboptimal blood pressure (80%), hypertension (68%) and undiagnosed hypertension (21%) are high among study participants. Among those who are aware of their blood pressure status and on medication, self-reported non-compliance is high (67%). These results could inform "Workplace Wellness Initiatives' strategies on the need for routine CVD risk monitoring and management among this population. These findings also highlight the need for further investigation to identify factors driving this trend among market traders in Fiji.

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