

Assessing the Prevalence, of Hypertension and Stress among People Living in the Car Nicobar Island, India

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Abstract

WHO states that, "Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. Blood is carried from the heart to all parts of the body in the vessels. Each time the heart beats, it pumps blood into the vessels. The heart continuously pumps the blood against the vessel walls and creates a force known as, 'Blood pressure'. The higher the pressure, the harder the heart has to pump".

Introduction

Hypertension is significantly affecting India as the prevalence shows an ascending trend. The major causes suggested are socio-demographic factors and lifestyle factors that are accelerating the

hypertension epidemic currently in India. Hypertension contributes to 57 million disability-adjusted life years (DALYs) or 3.7 per- cent of total DALYs. Globally, the overall prevalence of hypertension in adults aged 25 or more was around 40 percent in 2008 [1,2]. In India hypertension is a major contributor as a potential risk factor of cardiovascular diseases (CVD's). According to the Global Burden of Disease (GBD) in 2016, "hypertension attributed to 1.63 million deaths in India in the year 2016 alone" [3].

One of the studies conducted in Car Nicobar Island demonstrated a high prevalence of hypertension, which was 50.5 percent [95% CI, 46.1- 54.9 (M: 50.7%; F: 50.3%)] among adults (18 and above age groups). This study further explored the prevalence of risk factors associated with hypertension such as tobacco, alcohol consumption, and overweight which was 88, 54, and 37 percent respectively.

The study also mentioned a high prevalence of smokeless tobacco (almost 94% among the users) consumption and that the majority of alcohol consumers used 'toddy', traditionally made from coconut palm sap. The alcohol and smokeless tobacco consumption as risk factors didn't add to the risk of hypertension in the above-mentioned study because the total alcohol users (77%) fitted into a low risk to moderate category of less than eight, based on the AUDIT scale [4]. Whereas the association between smokeless tobacco usage and the risk of hyper- tension lacks evidence [5].

Stress is a well-known factor and plays a very important role in hypertension. Generally, stress can be defined as our body's response to pressures from a situation or life event, where the body and brain are involved. The hypothalamic-pituitary-adrenal (HPA) axis is stimulated to produce stress hormones (cortisol and catecholamine) that trigger a 'fight' or 'flight' and sometimes 'fear' response [6].

According to Andrew S, psychosocial stress is a potential contributor to the risk of hyper- tension, with other factors such as reduced physical activity, unhealthy diet, obesity and addictions. There are evident changes in the life style in present era, due to population explosion, causing unhealthy competition among peers; feeling of left out, and recurrent demands may add up to accumulate psychosocial stress.

In 2018, a case-control study was conducted at a tertiary care hospital from June 2014 to October 2015(Maharashtra), which shows a significant association between perceived stress and hypertension. Stress was found to be an independent risk factor for hypertension. If stress is persistent and is severe in nature then it could result in diseases of adaptation or even death [7].

The Nicobarese tribal population dwells in circular huts known as 'ma pati tuhet' 'which is made up of indigenous material and vernacular architecture to form an eco-friendly abode. One 'tuhet' generally comprises of 10 to 20 smaller huts or households with ex- tended or close relatives.

At the time of global interaction, these islanders had started bridging themselves with the external world with improvement in literacy level and following the concept of cooking, western attire, motor

vehicle, and trading. The adaption of the prevailing culture is strong evidence of the acculturation of the society and dilution of local tribal beliefs and culture [8].

Methodology

Study designs the proposed study was a community-based cross-sectional survey. Study setting 15 villages in the Car Nicobar Islands capital of Nicobar group of Islands. Study population men and women of age group 18-69, belonging to Nicobarese tribe. The total population as per the census 2011 is 14027. Inclusion criteria: Nicobarese of Car Nicobar Island whose age ranging from 18 to 69 years. Exclusion criteria: Debilitating ill, and bedridden individuals.

Sampling criteria sampling was done using Cluster sampling. In this type of sampling method, the target population is divided into clusters/groups and a subset of each cluster is selected. Here in this study, tribal settlements in 15 villages of the Car Nicobar Tehsil were taken as the cluster units.

Sample size estimation the sample size was calculated based on the prevalence of hyper-tension (50.5%), precision eight percent, setting significance level of five percent, design effect of 1.5, and by substituting a 10 percent drop-out rate. Final sample size was 250 participants (calculated using Open Epi 3.01).

Sample Selection Procedure

Cluster selection

Seven villages out of fifteen villages in the Car Nicobar were selected randomly (based on the population size, villages were grouped in big and three small villages prior to selection) and from these seven selected clusters 36 sample each were drawn for participation in the study.

Household selection

First household was selected randomly by pen rotation method, thereafter selecting consecutive households, proceeding clockwise till the required sample size from each settlement was achieved.

Subject selection

One eligible participant from each household was selected using the KISH table. KISH grid was carried throughout the study to ensure randomness in selection process.

Data collection procedure

The data collection was deployed over a period Over the period of January-February 2020 due to the restriction under PATA (Protection of Aboriginal Tribes act), 1956. The structured interview schedule was administered by the primary interviewer and was accompanied by two ASHA workers under the RNTCP unit of Bishop John Richardson Hospital, Car Nicobar only for aiding. Due to small geographical area, the targeted 36 individuals per village per day was carried out.

WHO "Step-wise approach for surveillance of NCD risk factors" and measurement of the prevalence of stress among the said tribes was assessed by perceived stress scale (given by S. Cohen, a 10-item inventory). The questionnaire was administered in English, which is the widely accepted language after their own dialect of 'Nicobarese origin'.

Procedures

Blood Pressure Measurement

Blood pressure measurements were made using OMRON HEM – 7120 battery operated automatic blood pressure monitors. Three readings of blood pressure were taken. The first reading was recorded after the participant had rested for 15 minutes. The second reading was done after three minutes of the first reading followed by the third reading after three minutes of the previous reading. The machine was switched off between the readings, after recording the systolic and diastolic blood pressure (mmHg). The mean of three measurements of blood pressure was used for analysis. The participant was informed of the blood pressure reading only after the last reading was obtained.

Height Measurement

The height of the study participants was measured using a SECA 213 stand-alone stadiometer. The interviewer noted the height in centimeters, corrected to the nearest millimeter, taking care to avoid parallax error, and then asked the participant to step away from the stadiometer.

Weight Measurement

A portable SECA 803 battery-enabled electronic weighing scale was used for measuring the weight of the participants. The weighing scale was set on a firm and flat surface. But, since it was difficult to avoid uneven and sloping surfaces because very few huts had cemented and uniform floor, the interviewer used the footpath connecting the huts. Participants were requested to remove footwear and remove heavy objects from their hands or pockets. The interviewer turned on the scale, waited for display to show 0.0, and then made the participant mount on the scale. The weight reading was recorded in kilograms (corrected up to one decimal point).

Perceived Stress Scale by Sheldon Cohen

Items and instructions for the perceived stress scale

The questions in this scale ask about the feelings and thoughts during the last month from the participants enrolled in the study. In each case, the participant was asked to indicate how often he/she felt or thought a certain way. The PSS questionnaire was attached to the last section of the interview schedule and it was the only section which was self-administered. After the first few interviews, the administrator found men and women under the influence of alcohol, and because it wasn't anticipated before, so the interviewer decided not to include the PSS score of such individuals for analysis along with who were unable to read or write.

Statistical Analysis

Data was double-checked for consistency and completeness before leaving each household. It was entered into the Microsoft Excel sheet. Data were organized and presented using the principles of descriptive statistics. Categorical data expressed in proportions and mean with standard deviation was calculated for continuous data. The chi-square and independent t-test were applied as a test of significance for categorical and continuous data respectively. Bivariate analysis entry method was applied for identifying factors associated with hypertension and perceived stress among the participants respectively.

A two-sided p-value of < 0.05 was considered statistically significant. Dataset was analyzed in IBM SPSS statistics for windows version 22.0 (Armonk, NY-IBM corp.)

Ethical Consideration

Ethical clearance was obtained from the Institutional Ethics Committee of Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. Participants were informed about the purpose and process of the study and an informed consent was taken in written after the briefing.

Results

The 250 individuals were surveyed and consented to participate in the study. The general analysis was done using anthropometric parameters like weight, height, and blood pressure measurements for all the participants.

Socio-Demographic Factors

In total, 250 adult individuals in the age group of 18-69 years were interviewed [Table 1]. Survey includes 118 (47.2%) males and 132(52.8%) females.

Age

The participants' age ranged between 18 and 67, with a mean and SD of 42.75 and 13.32. For males, the Mean (SD) of age was 42.08 (13.8) and for females 43.13 (12.8).

Educational Status

Among the total participants, 23 percent were reported with no formal education; around 30 percent had attained education up to high school level, whereas 45 percent had received a higher secondary or an above education.

Work status

In total, 46 percent were unemployed and 38.8 percent of them were able to work.

Basic Anthropometric Measurements

Mean \pm Standard deviation, height, and weight among participants were 1.57 ± 0.93 and 63.09 ± 13.11 respectively. Mean and standard deviation of BMI in the whole sample was 25.52 and 4.94 respectively [Table 1 to Table 11].

Socio-Demographic Factors		Male		Female		Total	
		N=118	%	N=132	%	N=250	%
age group	18-43	62	52.5	71	53.8	133	53.2
	44-69	56	47.5	61	46.2	117	46.8
Education	No formal schooling	21	17.8	38	28.8	59	23.6
	Up to High school	40	33.9	37	28	77	30.8
	Higher secondary and above	57	48.3	57	43.2	114	45.6
	Government Employee	18	15.3	10	7.6	28	11.2
Work status	Private employee	15	12.7	6	4.5	21	8.4
	Student	9	7.6	9	6.8	18	7.2
	Homemaker	0	0	60	45.5	60	24
	Retired	5	4.2	3	2.3	8	3.2
	Unemployed- able to work	64	54.2	33	25	97	38.8
	Unemployed- unable to work	7	5.9	11	8.3	18	7.2

Table 1: Socio-demographic factors among the participants.

Measurements	Male	Female	Total
	Mean \pm SD	Mean \pm SD	Mean \pm SD
Height (Meters)	1.58 \pm 0.93	1.57 \pm 0.94	1.57 \pm 0.93
Weight (KG)	63.38 \pm 13.21	62.87 \pm 13.06	63.09 \pm 13.11
BMI (KG/M ²)	25.48 \pm 5.01	25.56 \pm 4.89	25.52 \pm 4.94
SBP (MMHG)	131.43 \pm 22.86	135.29 \pm 20.71	133.47 \pm 21.79

Table 2: Mean values of height, weight, BP, and BMI among the participants.

In table 3, it is reported that only a small proportion was underweight and 48 percent were either overweight or obese.

BMI categories	Male	Female	Total
	N=118(%)	N=132(%)	N=250(%)
Underweight	4 (3.4)	4 (3.0)	8 (3.2)
Normal	57 (48.3)	65 (49.3)	122 (48.8)
Overweight	39 (33)	40 (30.3)	79 (31.6)
Obese	18 (15.3)	23 (17.4)	41 (16.4)

Table 3: Body mass index (BMI) of the participants.

Description of Outcome variables

Hypertension Prevalence

The prevalence of hypertension among the Nicobarese tribe was found out to be 62.4 per- cent. Mean \pm standard deviation of systolic blood pressure (SBP) and diastolic blood pressure (DBP) among Nicobarese tribe was 133.47 ± 21.79 and 81.96 ± 13.16 respectively (Chart 1).

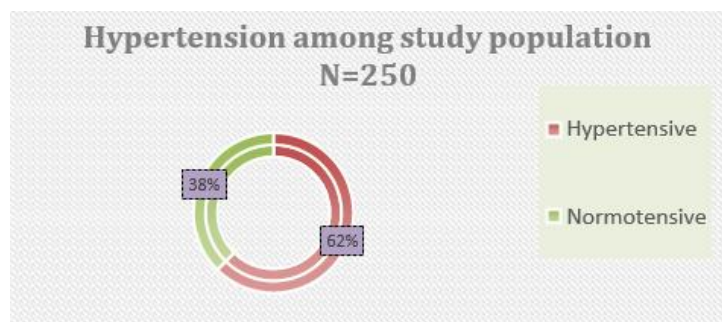


Figure 1: Prevalence of hypertension among the participants.

Perceived Stress Prevalence

PSS score was calculated and categorized for low, medium, and high-stress levels among the study population. Total 171 individuals (68.4%) took up the scale measurement and remaining did not answer because of the following reasons:

Unable to read or write- as this section was for self-scoring, it excluded those who were unable to read or write and people who were under the influence of alcohol during the time of the interview. Out of 171 individuals taken up the self-scoring scale, 167 (66.8%) individuals reported a moderate level of stress, and rest were percent including low and high- stress level respectively (Chart 2). The average PSS score among participants was 19.6 (Figure 1 and Figure 2).

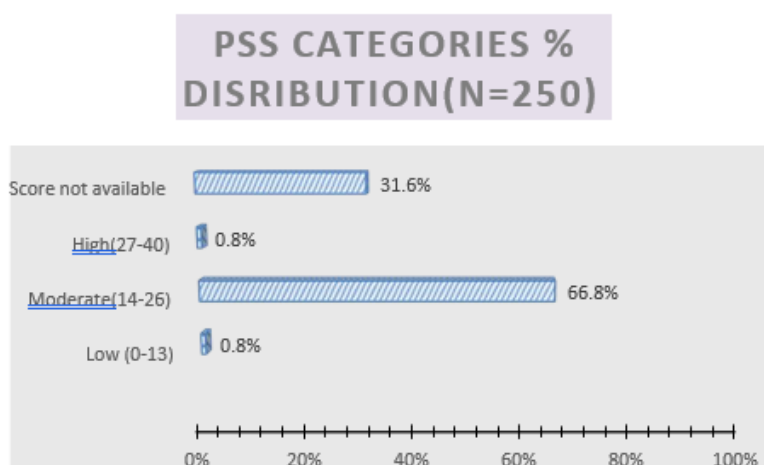


Figure 2: Distribution of PSS level among the participants.

Risk Factors Related to Hypertension and Stress among Study Participants

Socio-Demographic Factors and Hypertension

	Total participants	Hypertensive	Non-hypertensive	P-Value
	-	n (%)	n (%)	-
Sex	-	-	-	-
Male	118	68 (57.6)	50 (42.4)	0.141
Female	132	88 (66.6)	44 (33.4)	-
Age group	-	-	-	-
18- 43	133	61 (45.8)	72 (54.2)	<0.01
44-69	117	95 (81.2)	22 (18.8)	-
Education	-	-	-	-
Up to high school level	136	84 (61.8)	52 (38.2)	0.821
Higher sec. And above	114	72 (63.1)	42 (36.9)	-

Table 4: Socio-Demographic Factors and hypertension.

Variables	Total participants	Hyper-tensive	Non-hypertensive	P-value
	-	156	94	-
current smoking	-	-	-	-
yes	53	37 (69.8)	16 (30.2)	0.21
no	197	119 (60.4)	78 (39.6)	-
daily smoking	-	-	-	-
yes	32	23(71.9)	9 (28.1)	0.236
no	218	133(61)	85 (39)	-
current smokeless tobacco products	-	-	-	-
yes	198	129 (65.2)	69(34.8)	0.08
no	52	27 (52)	25(48)	-
daily smokeless tobacco products	-	-	-	-
yes	133	93(70)	40 (30)	<0.01
no	117	63 (54)	54 (46)	-
ever consumed alcohol	-	-	-	-
yes	149	102 (69)	47 (31)	<0.05

	no	101	54 (53)	47 (46)	
current alcohol use	-	-	-	-	-
yes	104	72 (69.2)	32 (30.8)	0.06	
no	146	84 (57.5)	62 (42.5)	-	

Table 5: Tobacco and Alcohol use and hypertension.

Self-Reported Physical Activity and Hypertension

Variables	Total participants	Hyperten- Sive	Non hyper- Tensive	P- Value
	-	n (%)	n (%)	-
No physical activity	159	106 (66.7)	53 (33.3)	0.082
Moderate intensity	49	24 (49)	25 (51)	-
Vigorous- intensity	42	26(62)	16 (38)	-

Table 6: Self-reported physical activity and hypertension.

BMI and Hypertension

VARIABLES	TOTAL PAR- TICIPANTS	HYPERTEN- SIVE	NON- HYPER- TENSIVE	P-VALUE
		n (%)	n (%)	
underweight	8	4 (50)	4 (50)	0.725
normal	122	74 (60.7)	48 (39.3)	
overweight	79	50 (63.3)	29 (36.7)	
obese	41	28 (68.3)	13 (31.7)	

Table 6: BMI and Hypertension.

Pattern of consumption of fruits and vegetables

Intake of fruits and vegetables/day	Male	Female	Total
	N = 118	N = 132	N = 250
	N (%)	N (%)	N (%)
≤ 2 servings of fruit and vegetables/day	100 (84.8)	112 (84.9)	212 (84.8)
≥ 3 servings of fruit and vegetables/day	18 (15.2)	20 (15.1)	38 (15.2)

Table 7: Mean values for fruits and vegetable consumption among the participants.

Criteria	Male	Female	Total
	Mean \pm SD	Mean \pm SD	Mean \pm SD
number of days of vegetable intake in a week	± 1.45	2.56 ± 1.29	2.58 ± 1.37
number of servings of vegetables on those days	1.10 ± 0.37	1.10 ± 0.35	1.10 ± 0.36
number of days of fruit intake in a week	1.74 ± 1.0	1.53 ± 0.82	1.63 ± 0.91
number of servings of fruits on those days	1.03 ± 0.25	1.0 ± 0.23	1.02 ± 0.24

Table 8: Mean and SD of fruits and vegetables intake among the participants.

Pattern of Consumption of Cooking Oil/Fat

Among total participants, 54.4 percent used only vegetable oil for their cooking purpose, followed by palm oil in 26.4 percent of participants. 14.4 percent used both vegetable oil and palm oil.

The main type of oil used	Male	Female	Total
	N=118(%)	N=132(%)	N=250(%)
Vegetable oil	59 (50.0)	77 (58.3)	136 (54.4)
Coconut oil	1 (0.8)	9 (6.8)	10 (4.0)
Palm oil	38 (32.2)	28 (21.2)	66 (26.4)
Vegetable and palm oil	20 (16.9)	16 (12.1)	36 (14.4)
Coconut and palm oil	0	2 (1.5)	1 (0.8)

Table 9: Oil consumption among the participants.

Practice of adding salt to rice while cooking/serving

The practice of adding salt to the rice while cooking or serving it with raw fish meat is a traditional practice. Among total participants, almost 75 percent reported adding salt to the prepared or served rice during meal time.

	Male	Female	Total
Salt Addition	N=118(%)	N=132(%)	N=250 (%)
Yes	87 (73.7)	100 (75.8)	187 (74.8)
No	31 (26.3)	32(24.2)	63(25.2)

Table 10: Practice of adding salt.

Self-Reported Physical, Recreational, Sports and Fitness Activities

The study participants were asked to self-report about doing any physical activity. Based on the various activities such as running, brisk walking, swimming, tree climbing, boat racing, and cycling, the physical activities were categorized in three groups namely:

(i) **Moderate intensity:** sports, fitness activities that cause a small increase in breathing or heart rate like (walking, cycling, and swimming).

(ii) **Vigorous-intensity:** sports, fitness activities that cause an increase in large breathing or heart rate (running) for at least 10 minutes continuously.

(iii) **No physical activity:** people who reported none of the above mentioned two categories of physical activities. In total, 159 (63.6%) reported doing no physical activity, 91(36.4%) individuals reported doing physical activity, out of which nearly 20 per- cent had moderate-intensity physical activity, and remaining had vigorous fitness activities.

	Male	Female	Total
	N=118(%)	N=132(%)	N=250 (%)
No physical activity	72 (61)	87 (66)	159 (63.6)
Moderate intensity	24 (21)	25 (19)	49 (19.6)
Vigorous-intensity	22 (18)	20 (15)	42 (16.8)

Table 11: Self-reported physical activities.

Summary of the Results

Prevalence of hypertension was higher (62.4%) among Nicobarese tribe when compared to overall prevalence for hypertension in India 29.8 percent (95% CI: 26.7–33.0- 2014) as stated by [9] in a systematic review. Prevalence of hypertension was higher among the elder age group (44-69, in which 81% were hypertensive), daily smokeless tobacco users (70% of daily smokeless tobacco users were hypertensive). Among the Nicobarese tribe, the fruits and vegetable consumption were found to be insufficient. Smokeless tobacco use (79.2%), alcohol use (41.6%), and self-reported physical inactivity (63.6%) were reported. 48 percent of overall participants were obese or overweight. Perceived stress level among the participants was calculated with 171 respondents, out of which 66 percent reported moderate PSS level. The mean PSS is significantly higher in the younger age group.

Discussion and Conclusion

The present study has revealed a high prevalence of hypertension among the Nicobarese tribe in Car Nicobar Island, India. Among 250 participants the prevalence of hypertension was found to be much

higher than the general population. The perceived stress level among the participants was largely distributed at a moderate level (14-26 out of 40). In my knowledge, this study is one of the first studies using the WHO step-wise approach to find out the prevalence of hypertension and this has also introduced a Global measure of perceived stress in the Nicobarese tribe.

The prevalence of hypertension estimated in the study is 62.4% (95% CI; 56.2% to 68.4%), compared to the earlier study in the same population which showed 50.5 % (95% CI; 46.1 to 54.9) in the year 2009 [4]. In another such cross-sectional study conducted in a rural tribe of Darjeeling, showed that the overall 22.1 percent were hypertensive and 41.3 percent were pre-hypertensive [10]. A study conducted in the Kani tribe of Kerala showed 48.3 percent prevalence of hypertension. Same study reported insufficient consumption of fruits and vegetables in the Kani tribe which is similar to the findings of this study [11].

Strengths

There are limited studies on hypertension and stress levels among Nicobarese tribe from India, especially from Car Nicobar Islands which is remotely accessible from mainland India. The study has used standard tools with contextual modification as much as possible. To my knowledge, this is the first study from Car Nicobar assessing perceived stress and second study from Car Nicobar to assess the prevalence of NCD risk factors among Nicobarese tribe. Data collection was done by single investigator therefore chances of inter-observer bias were eliminated. Due to its geographical positioning and isolation from mainland India, the predominate population belongs to Nicobarese tribe and lives in confined Island with a total area of 126.9 km², length, and width of 15km and 12km respectively. One of the biological studies conducted on the four different tribes namely Great Andamanese, Onges, Jarwas, and Nicobarese reveals mitochondrial DNA molecular diversity data which suggests that the genetic pool of 'Nicobarese' is different from the rest of the tribes of South East Asia [12]. Good response rate. Male participants were 48 percent in the study. The adoption of the Kish method avoided the chance of random error.

Limitations

Self-reported information on perceived stress score, physical activities might have resulted in an overestimation of the results. Occupation categories in WHO STEP wise surveillance were broad and non-specific to capture the Nicobarese tribe's traditional working or vocational activities.

Implications

This study calls for a focused intervention to address increasing hypertension and mental health conditions among the Nicobarese tribe in Car Nicobar Island, as these tribes are limited to only this part of the world and their population had already seen shrinkage during the mega-tsunami of 2004 in South East Asia.

Exploratory ethnographic research is needed to understand the contextual, behavioral and traditional way of doing things. The disease modelling for attributable risk factors and hypertension needs to be carried out for in-depth explanation.

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