RESEARCH ARTICLE

DETERMINATION OF RISK FACTORS LEADING TO HIGH BLOOD PRESSURE AMONG SCHOOL TEACHERS

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ABSTRACT

Hypertension or high blood pressure is considered to be a major public health problem throughout the world. It is an independent risk factor for cardiovascular diseases, stroke and renal diseases. Women are employed in different working sectors to support their families financially and teaching is one among them. Teachers represent one of the most important, large and growing sector of workforce in many countries. Teachers are also at a risk of developing non-communicable diseases due to certain factors such as stress, being physically inactive along with unhealthy dietary habits. The objective of the present study was to determine various risk factors leading to high blood pressure among female school teachers. A cross-sectional survey was conducted among 730 female school teachers. Anthropometric measurements such as height, body weight and waist circumference were measured. BMI was calculated. Blood pressure was measured and categorized according to the seventh report of Joint National Committee for Prevention, Detection, Evaluation and Treatment of blood pressure. Data analysis was done using Statistical Package for Social Sciences software. Results indicated that 15.21% of the teachers were pre-hypertensive and 19.86% had hypertension. Factors such as age, BMI, increased waist circumference, maternal history of hypertension and intake of salty foods were significantly associated with high blood pressure. The study therefore recommends the need to promote healthy lifestyle for school teachers that can be achieved through appropriate health education and interventional measures.

Keywords: Teachers, Prehypertension, Hypertension, Risk Factors, Health Intervention

INTRODUCTION

Hypertension or elevated blood pressure is an independent risk factor for cardio- vascular mortality and morbidity. Hypertension doubles the risk of acute myocardial infarction and triples the risk of congestive heart failure as well as stroke (Lip *et al.*, 2000). On the other hand, lowering systolic blood pressure by 10 mmHg and diastolic blood pressure by 5 mmHg reduces the risk of stroke by 30-40% times and acute coronary events by 16% times (Perk *et al.*, 2012). Currently, there has been an increase in the number of women being employed due to increase in women's literacy rate, women's empowerment and the need to support the family members financially. Women are employed in different working sectors, and teaching is one among them. Teachers represent an important and elite growing segment of any community. Development of diabetes and hypertension is seen in occupations involving sedentary behaviour coupled with high level of stress (Ford *et al.,* 2005). Teachers are often exposed to stress due to various reasons such as managing student's aggressive behaviour in classroom, heavy workload, pressure to finish portions on time, differential concerns for student learning, conducting remedial classes to improve student's academic performance and are also involved in certain government duties such as election and census enumeration (Manjula *et al.,* 2016). Occupational stress is significantly associated with hypertension (Chetia *et al.,* 2018).Occurrence of chronic stress for a long period of time not only leads to hypertension but also damages the hypothalamic pituitary axis. Workplace screening programs are considered imperative for preventing and treating non-communicable diseases as they provide an opportunity to reach a large number of working personnel and their families in an organized manner. Therefore the present study was carried out to determine risk of high blood pressure among female school teachers along with various factors associated with it

MATERIALS AND METHODS

The study protocol was approved by the Independent Institutional Ethics Committee, Women's Christian College, Chennai for the conduct of the study. Permission from school principals and management authorities was obtained from the respective schools before commencement of the study. Written informed consent was obtained from each participant.

Study design

A descriptive, cross sectional design was used to elicit information pertaining to socio demographic profile, occupation related details, physical activity pattern and dietary habits using a questionnaire. Data pertaining to physical activity and food frequency consumption pattern was assessed using standard tools. The physical activity level of the subjects was assessed using the physical activity index tool given by Sharkey and Gaskill (2007). A score of 40 is an indicator that the individual is actively involved in regular physical activity. Food frequency questionnaire developed by Shin *et al.* (2009) was used to elicit information on frequency of food consumed by the subjects. Based on the frequency of food consumption, the subjects were further classified into low, medium and high consumers.

Sample size

The sample size for the present study was determined using power analysis. For calculating the sample size, precision was set at 5%, the conventional Z value was taken as 1.96 for level of confidence of 95% and prevalence rate among school teachers was taken from earlier research. Based on the calculation, the required sample size considered was 730.

Sampling technique

A multi stage sampling technique was adopted in the present study.

Criteria for sample selection

Inclusion criteria

- ➢ Women working as a school teacher for at least 2 years and in the age group of 23 – 60 years
- ➢ Willingness to participate in the study.

Exclusion criteria

- ➢ Teachers working on a part time basis were excluded from the present study.

Anthropometric measurements

Height: Height was measured using a roll ruler wall mounted stature meter to the nearest 0.5cm (Gadget hero stature meter: 200 cm).

Body weight: Body weight was measured to the nearest 0.1 kg using a portable electronic weighing scale after adjusting to zero (Omron, HBF-375).

Body Mass Index: Body Mass Index (BMI) also known as Quetlet's Index was calculated using the following formula

$$\text{Body Mass Index} = \frac{\text{Weight in kg}}{\text{Height in m}^2}$$

Waist circumference:

Waist circumference was obtained by measuring the distance around the waist half inch above the umbilicus (belly button) using a non-stretchable measuring tape to the nearest 0.1cm. BMI classification as per Asian Pacific region given by WHO (2000) and cut off values for waist circumference given by Misra *et al.* (2009) based on the consensus statement for diagnosis of obesity, abdominal obesity and metabolic syndrome for Asian Indians was used in the present study.

Blood pressure

In a clinical setup, mercury sphygmomanometer is used for measuring blood pressure. Recently, automated digital electronic blood pressure devices are used for measuring blood pressure in many epidemiological studies (Pradeepa *et al.,* 2015; Tripathy *et al.,* 2017). Blood pressure was measured after the subjects had rested for at least 5 minutes in a sitting position with the arm rested on a table using the electronic OMRON device (Omron Corporation, Tokyo, Japan). Blood pressure was measured twice and the average was considered as the final reading. Blood pressure was classified according to the classification given by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (Chobanian *et al.,* 2003).

Statistical analysis

Analysis of all data was performed using Statistical Package for Social Sciences software (SPSS version 15.0). Descriptive variables are presented as frequency and percentage. Continuous variables are presented as mean ± SD. Chi-square test was used to find the association between two categorical variables. A p value <0.05 was considered statistically significant.

RESULTS

General information
Socio-demographic profile and occupation related details

The age of the subjects who participated in the study ranged from 23 to 60 years and the mean age was 40.03±9.64. About 35.9 percent of the subjects belonged to the age group of 36-45 years and 26.3 percent of the subjects were between 46 and 55 years. With regard to marital status, majority of the subjects (88.9%) were married. Greater percent of the subjects (84.1%) belonged to the middle class group with an annual income of Rs 2, 00,000 – Rs 10, 00,000. All the subjects who participated in the study were graduates. Nearly 44 percent of the subjects were primary school teachers, 20.2 percent were middle school teachers and the remaining 35.8 percent were high and higher secondary school teachers. With regard to teaching experience, 24.9 percent of the subjects had teaching experience of 6 to 10 years, while 6.7 percent of the subjects reported that they were in teaching profession for 26 to 30 years.

Physical activity pattern

Though 83.2 percent of the subjects responded that they were involved in physical activity, majority of the subjects (76.1%) obtained a physical activity index score below 20 thereby indicating that the subjects led a sedentary type of life.

Dietary habits

Majority of the subjects (84.4%) were non vegetarians followed by vegetarians (14.5%). 45.1 percent of the subjects had the habit of skipping meals. Among meals skipped, breakfast was found to be the most common meal that was skipped by 41.1 percent of the subjects. Majority of the subjects (82.3%) had the habit of eating out, of which 6.3 percent had the habit of eating out on alternate days. Three fourth of the subjects surveyed (75.5%) had the habit of snacking once a day while 24 percent of them were found to have snacks two times a day.

Food frequency pattern

With regard to yellow coloured vegetable consumption, 72.5 percent of the subjects were low consumers(consumed less than 2 times a week). It was found that 60.7% of the subjects were moderate consumers of fruits (consumed fruits 2-3 times a week). 32.1 percent of the subjects were found to be high consumers of sweets (consumed sweets 1-3 times a week).About 51.9 percent of the subjects were found to be low consumers of green leafy vegetables (consumed greens once a month). Only a small percent of the subjects (2.8%) were high consumers of salty foods (consumed salty foods more than 2 times a day).Majority (70%) of the subjects had the habit of drinking either tea or coffee more than 2 times a day.

Anthropometric measurements

Results of the study indicate that teachers had a higher mean of anthropometric measurements like BMI and waist circumference when compared to the normal cut off values. The mean Body Mass Index and mean waist circumference was found to be 27.42± 4.76 kg/m^{2}and 86.34±11.08 cm respectively. Out of the 730 female school teachers surveyed, majority of them (73.7%) had a waist circumference greater than 80cms.Based on Asia Pacific region BMI cut offs, 42.7 percent and 19.9 percent of the subjects had grade I and grade II obesity respectively while only 13 percent of the subjects were in the normal weight category.

Table 1.Percent distribution of subjects based on blood pressure levels

Blood pressure cut off values**			N=730	Percent
Mean systolic blood pressure	Normal	<120	497	68.1
116.11±17.50 mmHg	Pre hypertension	120 – 129	93	12.7
	Stage I	130 – 139	74	10.1
	Stage II	>140	66	9
Mean diastolic blood pressure	Normal	<80	573	78.5
73.30±11.46 mmHg	Pre hypertension	80 – 89	111	15.2
	Stage I	90 – 99	30	4.1
	Stage II	>100	16	2.2

**Cut off value based on JNC 7, Report (Chobanian*et al.,* 2003)

Results indicated that 15.21percent of the subjects were pre-hypertensive. With regard to hypertension, 10.68 percent of the subjects had stage I hypertension and 9.18 percent of the subjects had stage II hypertension (Figure 1). Blood pressure was categorized according to the classification given by Joint National Committee (Chobanian*et al.,* 2003). As per this classification, with regard to systolic blood pressure, 12.7 percent had pre hypertension, 10.1 percent came under stage I hypertension and 9 percent in stage II hypertension. With regard to diastolic blood pressure, pre hypertension, stage I hypertension and stage II hypertension was observed among 15.2 percent, 4.1 percent and 2.2 percent of the participants respectively (Table 1).

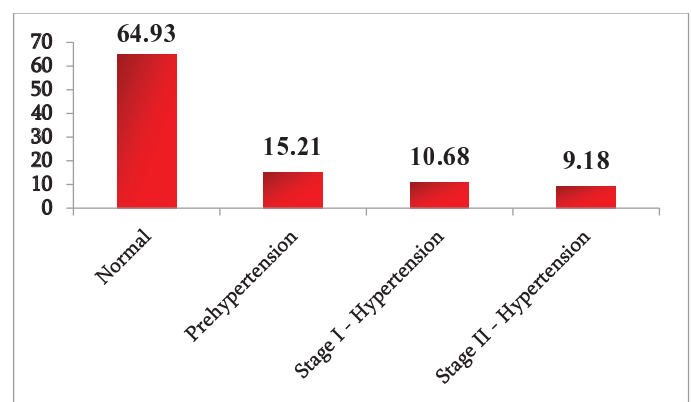**Fig.1. Percent distribution of subjects based on stages of blood pressure**

Table 2.Factors associated with high blood pressure

Risk factor		Normal	High blood pressure	p value
Age (years)	<25	53	4	0.000**
	25-35	151	29	
	36-45	181	81	
	46-55	72	120	
	56-60	17	22	
BMI kg/m^2	<18.5	20	-	0.000**
	18.5-22.9	83	12	
	23-24.9	90	17	
	25-29.9	187	125	
	30-34.9	75	70	
	≥35	19	32	
Maternal history of hypertension	Yes	80	152	0.002**
	No	394	104	
Waist circumference (cm)	<80	150	42	0.000**
	≥80	324	214	
Type of diet	Non-vegetarians	442	182	0.495NS
	Vegetarians	32	74	
Intake of salty foods	Low consumers	419	175	0.030*
	Moderate consumers	42	66	
	High consumers	13	15	

** Significant at p<0.01
* Significant at p<0.05
NS – Not significant

Findings of the study indicate that apart from age and maternal history of hypertension, other modifiable risk factors such as waist circumference, BMI, and intake of salty foods were significantly associated with high blood pressure

Table 3.Distribution of subjects withpre-hypertension/hypertension based on BMI

BMI (kg/m²)	Prehypertension/hypertension
<18.5	-
18.5-22.9	12
23-24.9	17
25-29.9	125
30-34.9	70
≥35	32

Excess weight has reached epidemic proportions globally. Obesity is constantly associated with hypertension and increased risk of cardiovascular diseases. Results of the present study indicate that subjects with high blood pressure were either overweight or obese (Table 3).

DISCUSSION

Hypertension is a major risk factor for cardiovascular diseases that continues to affect about one billion people worldwide. Hypertension enormously affects the working groups. Teaching at school level is stressful as it is the period of transition from childhood to adolescence. Teachers' tress adversely affects their health status. Constant job related stress and strain activates the sympathetic nervous system and the hypothalamic pituitary adreno cortical axis thereby resulting in hypertension. In the present study, 10.68 percent of the subjects had prehypertension and 19.86 percent of the subjects had hypertension.

Darbastwar et al. (2015) reported the prevalence of hypertension among school teachers in central Telangana to be 23.84 percent. A study conducted among Bengaluru schoolteachers by Manjula et al. (2016) showed that 36 percent of teachers were in pre –hypertensive stage, 24 percent of teachers had stage I hypertension followed by 12 percent of teachers with stage II hypertension. Developing countries like India are seeing growing numbers of people who suffer from heart attacks and strokes due to undiagnosed and uncontrolled hypertension. Conducting regular screening programs help in identifying individuals who are at a higher risk of developing chronic diseases in their later life.

In the present study, 21.92 percent of the subjects were newly diagnosed with either prehypertension or hypertension. Findings of the study indicate that apart from age and maternal history of hypertension, other modifiable risk factors such as waist circumference, BMI, and intake of salty foods was significantly associated with high blood pressure.

The results of the present study are in line with findings of Ali and Asadi (2009) who reported prevalence of lifestyle risk factors leading to hypertension among teachers were overweight (40.9%), physical inactivity (67%), obesity (37.7%) and consumption of salty foods (18.1%).In a study regarding hypertension among primary school teachers of Tumkur, Karnataka, 28.7 percent of school teachers had

hypertension. Reduced sleep, inadequate physical activity and family history of hypertension contributed to hypertension (Girish and Majgi, 2017).

Ibrahim et al. (2008) evaluated the risk of pre hypertension and hypertension on 1476 preparatory and secondary school teachers in Jeddah, Egypt and reported the prevalence of pre-hypertension and hypertension to be 43 percent and25.2 percent. Linear regression showed that for every 4 kg increase in weight, there was an increase in systolic blood pressure and diastolic blood pressure by 1 mmHg and 0.87 mmHg respectively. Findings of the present study indicate that most of the subjects with hypertension were either overweight or obese. Apart from hypertension, obesity is also implicated in the pathogenesis of coronary artery disease, congestive heart failure, dyslipidemia and type 2 diabetes. Hence, effective lifestyle interventions are needed in bringing about weight loss and decrease in the risk of developing chronic illnesses.

CONCLUSION

In order to prevent the onset of high blood pressure and its subsequent impact on cardiovascular system and renal system, proactive preventive strategies needs to be carried out. The workplace can serve as an important place for screening, preventing and controlling various lifestyle disorders. Schools are considered to be an ideal place where screening program for major modifiable risk factors along with planning of health and nutrition intervention program can be carried out effectively.

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