Original Article

Is High Blood Pressure Associated with Hypothyroidism? A Community based Study among Adult Women in a Rural Area of West Bengal

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How to cite this article: Amal Titto V Augustine, Biswabinod Sanfui, Abhishek Mahajan et. al. Is High Blood Pressure Associated with Hypothyroidism? A Community based Study among Adult Women in a Rural Area of West Bengal. Indian Journal of Public Health Research and Development / Vol. 15 No. 4, October-December 2024.

Abstract

Background: Hypothyroidism has also been considered as a causative factor of hypertension. Dislipidaemia, early atherosclerotic process, increased peripheral vascular resistance, and low cardiac output has been considered to be the causative link among hypothyroidism and high blood pressure. It was in this context that the present study was undertaken to determine the risk factors of high blood pressure with special emphasis on hypothyroidism.

Methods: An observational, community based cross-sectional study was conducted over a period of 2 years in a rural area of West Bengal, India. A total of 315 adult women (> 18 years) residing in the study area and who had agreed to give informed consent were enrolled in the study. The association between high blood pressure and different variables was estimated in univariate and multivariable logistic regression.

Results: Multi variable binomial logistic regression analysis revealed that high blood pressure was significantly associated with hypothyroidism (AOR=1.78, CI=1.16,3.48), hypercholesterolemia (AOR=1.99, CI=1.06,3.78) ,high BMI(>25 kg/m2) (AOR=1.87, CI=1.12, 3.61) and advancing age (AOR=1.05, CI=1.02,1.09)

Conclusion: From this study it is clear that there is interplay between high blood pressure, hypothyroidism and other metabolic risks. So stringent steps must be taken at all levels for screening of thyroid dysfunction along with hypertension.

Key words: Adult Women, High blood pressure, Hypothyroidism

Introduction

Hypertension, a chronic non communicable disease is a global public health problem. Populations in low and middle income countries are disproportionately affected as they have got prone health systems. Globally 41 million deaths, equivalent to 74% of all deaths are due to Non-communicable diseases.[1] According to a region specific systematic review and meta-analysis (north, south, east, west, rural, urban) overall prevalence of hypertension

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Submission date: December 1, 2023 **Revision date:** January 28,2024 **Published date: September 20 , 2024**

was 29.8%.[2] Hypertension is answerable for at least 45% of deaths because of coronary coronary heart diseases and 51% of deaths because of stroke. [2] According to NFHS-5(2019-2020) prevalence of hypertension among adult women in rural area of West Bengal is 10.1%. [3]It contributes to the burden of cardiovascular disease, stroke and kidney failure and leads to premature mortality and disability[4]

Hypertension is generally asymptomatic in the initial ranges so many go undiagnosed. Those who are diagnosed won't have get right of entry to to remedy and might not be able to efficiently control their illness over the long term. As the disorder has long latent period before it manifests as a clinical entity, and generally being asymptomatic throughout its clinical course, its detection in addition to control is a primary public health challenge in each developed and developing countries.

For prevention of long term deleterious effects of high blood pressure, knowledge of its risk factors is important. Due to fast urbanization and social modifications new risk factors of high blood pressure are also rising.[5] The major risk factors include ethnicity, age, sex, sedentary lifestyle, obesity, alcoholism, diabetes, diet (including salt intake), and family history of hypertension. Life style modification and medical management can decrease the effects of some of these risk factors.[6]

Hypothyroidism has also been recognized as a causative factor of hypertension. Dislipidemia, increased peripheral vascular resistance, early atherosclerotic process and low cardiac output has been suggested to be the possible link between hypothyroidism and high blood pressure. The hypothyroidism prevalence in the developed world is about 4-5% and subclinical hypothyroidism is about 4-15%.[7,8] According to a study conducted by Raman Kumar Marwaha et al. prevalence of hypothyroidism is 24%.[9]

Hypothyroidism can be clinically presented as overt state of myxedema, multisystem failure and end-organ effects and to an subclinical or symptomatic condition with normal levels of triiodothyronine(T3) and thyroxine(T4)and mildly elevated levels of thyrotropin(TSH).[10,11,12]

The hypothyroid population is characterized by significant volume changes, initiating a volume-dependent, low plasma renin activity mechanism of blood pressure elevation. A study conducted by Saito et al among adult females in Tokyo found that there is significant association between hypothyroidism and high blood pressure. [13]

Plenty of studies have been conducted to elicit the demographic (age, sex) and lifestyle (diet, addiction, physical activity and obesity) risk factors of high blood pressure but very few studies have been done especially in this part of the country on the association of high blood pressure and hypothyroidism and almost none at community level. It was in this context that the present study was undertaken among adult females in a rural area of West Bengal to determine the risk factors of high blood pressure with special emphasis on hypothyroidism.

Materials and Methods

An observational, community based cross-sectional study was conducted over a period of 2 years in a rural area of West Bengal, India, which is the service area of Rural Health Unit and Training Centre under All India Institute of Hygiene and Public Health, Kolkata. Ethical clearance from the institutional Ethics Committee was obtained. A total of 315 adult women (> 18 years) residing in the study area and who had agreed to give informed consent were enrolled in the study. 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 it was approved by Institutional Ethics Committee of All India Institute of Hygiene and Public Health. Socio-demographic and behavioral characteristics were assessed by interview method. Thyroid dysfunction, Hypercholesterolemia and Impaired glycemic status assessed by blood examination. BMI assessed by anthropometric measurement. High blood pressure assessed by sphygmomanometer. Measures of central tendency and dispersion were used to summarize numerical data and proportions to summarize categorical variables. The association between high blood pressure and different variables was estimated in univariate and multivariable logistic regression. Odds ratio with 95% confidence

interval was computed. Explanatory variables found to be statistically significant in univariate logistic regression were entered into multivariable binomial logistic regression. We considered two-tailed p values of lower than 0.05 to be statistically significant. All methods used for analyses were performed with SPSS Statistics for Windows, Version 20.

Results

Table 1: Socio-demographic characteristics of Study Participants (N=315)

Variables	No(%)
Age in completed years	
18-33 years	86(27.3)
34-49 years	134(42.5)
50-65 years	74(23.5)
>=66 years	21(6.7)
Mean: 44.19 years, SD: 13.68; Median: 42.0; IQR: 33– 51; Range: 60 years (18-78)	
Religion	
Hindu	272(86.3)
Muslim	43(13.7)
Total	315(100%)
Caste	
Others	183(58.1)
SC/ST	51(16.2)
OBC	81(25.7)
Marital Status	
Currently married	292(92.7)
Never married	9(2.9)
Widow	14(4.4)
Education (Highest qualification achieved)	
Illiterate	24(7.7)
Below primary(1-3)	71(22.5)
Primary(4-7)	104(33)
Middle(8-9)	80(25.4)
Secondary(10-11)	19(6)
Higher secondary	12(3.8)
Graduates and above	5(1.6)
Mean: 5.59 years of schooling; SD: 3.41; Median:5.00; IQR: 3 – 8; Range: 15 years of schooling	
Occupation	
House wife	237(75.2)
Work for pay	47(14.9)
At home	31(9.9)
Total	315(100%)
Type of family	
Joint	249(79.0)
Nuclear	66(21)
Socio-economic status (Modified B.G Prasad scale 2017)	
Class I (≥ Rs. 6254)	2(0.6)
Class II (Rs. 3127 - 6253)	42(13.3)
Class III (Rs. 1876 -3126)	123(39.0)
Class IV (Rs. 938 - 1875)	132(41.9)
Class V (< Rs. 938)	16(5.2)

Table 2: Assessment of Blood Pressure of the Study Participants (n=315)

Blood pressure	**No (%)**	**High Blood Pressure No (%)**
Normal	194 (61.6)	
Prehypertensive	55(17.4)	
Hypertensive as detected by researcher	11(3.5)	121(38.4)
Known hypertensive(not controlled)	28 (8.9)	
Known hypertensive (controlled)	27 (8.6)	

Proportion of women with High blood pressure= 121 (38.4%)

Pre hypertensive (55)+ Hypertensive as detected by researcher(11)+Known hypertensive not controlled(28)+ Known hypertensive controlled (27)

Table 3: Factors associated with High blood pressure: Univariate and Multivariable binomial logistic regression (N=315)

Variables		OR(95% CI)	P value	AOR(95 % CI)	P value
Age	↑	1.09(1.05, 1.26)	0.001	1.05(1.02, 1.09)	0.005
Religion	Hindu	1.53(0.77-3.99)	0.273	-	-
	Muslim	1			
Education	↑	0.79(0.70, 0.88)	0.002	0.88(0.77,0.97)	0.018
Family type	Joint	1.98(0.98, 3.89)	0.078	-	-
	Nuclear	1		-	-
PCI	<50th percentile	1.26(0.66, 2.02)	0.591	-	-
	>50th percentile	1	-	-	-
Chewing tobacco	Yes	2.53(1.39, 4.29)	0.007	1.22(0.57, 2.37)	0.43
	No	1		1	
Physical activity	Low	1.77(0.88, 2.76)	0.231	-	
	High	1			
Stress	↑	1.78(0.86, 3.36)	0.24	-	-
Hypercholestrolemia	Yes	2.54(1.36-4.72)	0.005	1.99(1.06,3.78)	0.046
	No	1			
Menopause	Yes	6.75 (4.87, 12.76)	<0.001	1.76(0.76, 3.49)	0.25
	No	1		1	
BMI	≥25kg/m^2	2.31(1.36, 3.83)	0.026	1.87(1.18, 3.61)	0.041
	<25kg/m^2	1		1	
Hypothyroidism	Yes	2.14(1.27, 3.72)	0.035	1.78(1.16,3.48)	0.043
	No	1		1	

Negelkerke R^2 = 0.346 Hosmer-Lemeshow= 0.67

Inference:

Table 1: The mean age of the study participants was 44.19 years (SD: 13.68 years) with minimum age of 18 years and maximum age of 78 years. Most of the study participants were in the age group of 34-49 years. Majority of them belonged to Hindu religion (86.3%) and most of them belonged to general caste (58.1%) followed by OBC (25.7%). Among all the participants 92.7% were currently married, 4.4% were widows, 2.9% were never married. Majority (88.6%) had education below secondary level, the mean years of schooling being 5.59 years (SD: 3.41 years). Most of the study participants (75.2%) were homemakers. Majority (79.0%) were living in joint family. According to modified B.G Prasad scale 2017 the study participants were classified according to their per-capita income which shows 0.6 % belonged to upper class, 13.3% belonged to upper-middle class, 39.0% belonged to middle class, 41.9% belonged to lower middle class and 5.2% belonged to lower class

Table 2: 61.6% had normal blood pressure, 17.4% were prehypertensives, 8.9 % were known hypertensive but not controlled, and 8.6% were known hypertensive with controlled BP status. About 11(3.5%) of the study participants were newly detected hypertensives**.**

Table 3: The binomial distribution of the dependent variable was considered as with or without high blood pressure. In univariate logistic regression high blood pressure was significantly associated with chewing tobacco habit (OR=2.53, CI=1.39, 4.29) and menopause (OR= 6.75,CI=4.87, 12.76) but they lost their significance in multivariable binomial logistic regression. Multi variable binomial logistic regression analysis revealed that high blood pressure

was significantly associated with hypothyroidism (AOR=1.78, CI=1.16, 3.48), with hypercholesterolemia (AOR=1.99, CI=1.06,3.78) , with high BMI(>25 kg/ m2) (AOR=1.87, CI=1.12, 3.61) and advancing age (AOR=1.05, CI=1.02,1.09)

Non- significant Hosmer-Lame show (0.68) explained that model is fit. About 34.6 % of the variance of high blood pressure can be explained by this model.

Discussion

Among the study participants 61.6% had normal blood pressure, 17.6% were pre-hypertensive, 8.9% were known hypertensive but had uncontrolled blood pressure status and 8.6% were known hypertensive with controlled blood pressure status. The main reasons for uncontrolled blood pressure status in previously detected known hypertensive women were their poor compliance and adherence to medicine and their negligence in regularly monitoring the status of their blood pressure. They were counseled by the researchers for better treatment compliance and regular assessment of their BP status. Similar advice was imparted to 11 (3.5%) of the study participants with uncontrolled blood pressure status. So active screening programmes are required in the community for detection and early management of hypertension. A similar study conducted in West Bengal by Biswas M . revealed that the prevalence of prehypertension, hypertension, ISH and IDH in the study population was 19.28%, 17.93%, 8.07% and 6.72%, respectively. Prevalence results are somewhat similar to our study.[14]

In multivariable binomial logistic regression high blood pressure was significantly associated with advancing age (AOR=1.05, CI=1.02, 1.09), many studies reported that as age increases incidence of high blood pressure increases. High blood pressure was significantly associated with hypercholesterolemia in multivariable binomial logistic regression (AOR= 1.99,CI=1.06,3.78). A study conducted by Krishna TVM et al. found out that statistically significant difference was observed in total cholesterol, LDL cholesterol, TC/HDL ratio and LDL/HDL ratio between obese and non obese as well as in CVA, IHD among hypertensive patients .[15]

High blood pressure was significantly associated with High BMI (>25 kg/m2) in multivariable binomial logistic regression (AOR=1.87(1.12, 3.61). A study conducted by Dua S et al found out that there was a significant positive correlation between BMI, fat percentage, and blood pressure in both SBP as well as DBP. Odds ratio showed that overweight/ obese subjects were more likely to have hypertension than those with normal BMI.[16]

High blood pressure was significantly associated with Hypothyroidism in multivariable binomial logistic regression (AOR=1.78, CI=1.16, 3.48). A study conducted by Saito et al among 477 adult females in Tokyo found that there is significant association between Hypertension and hypothyroidism.[13] A study conducted by Rakesh K. among metabolic syndrome patients also reported positive correlation between hypothyroidism and hypertension.[17]

Conclusion and Recommendations

From our study it is clear that there is strong interplay between high blood pressure, hypothyroidism and other metabolic risks. So experimental and large-scale multi centric studies are warranted to study the interplay about high blood pressure, obesity, type 2 diabetes mellitus, hypercholestrolaemia, hypothyroidism and other metabolic risks. It was observed in the present study that 38.4 % of the sample population was suffering from high blood pressure. This calls for an urgent massive public health initiative for its control and prevention. To increase the awareness, need a mass campaign in our community regarding high blood pressure and its consequences. With due consultation of field experts, proper and appropriate Information, Education, and Communication (IEC) material in local language should be developed and displayed. Regular screening and monitoring of blood pressure should be encouraged. Uninterrupted availability of drugs for hypertension and thyroid dysfunction must be ensured in all government health care facilities. In this study hypothyroidism which has been considered as the primary explanatory variable for the occurrence of high blood pressure has largely been neglected in the public health forum; so stringent steps must be taken at all levels for screening of thyroid dysfunction along with hypertension.

Ethical Clearance: This study is approved from All India Institute of Hygiene and Public Health, Kolkata dated 16/11/16.

Conflict of interest: We declare that there is no conflict of interest

Source of funding: Self

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