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FACTORS ASSOCIATED WITH UNCONTROLLED HYPERTENSION AMONG REGISTERED HYPERTENSION PATIENTS IN PUBLIC HEALTH FACILITIES OF THANJAVUR DISTRICT, TAMIL NADU, INDIA, 2019:A CASE CONTROL STUDY

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Abstract

BACKGROUND: Hypertension Is a major risk factor for cardio vascular disease.Govt.of Tamil Nadu implemented state wide hypertension screening and management program since 2011. Only half of the hypertension patients treated in public health facilities in Thanjavur district had their blood pressure under control(systolic bloodpressure <140mmHg, Diastolic blood pressure <90mmHg). We determined the risk factors associated with lack of hypertension control among hypertension patients who registered in public health facilities in Thanjavur District, Tamil Nadu, 2018

METHODS : We conducted a case-control study among the hypertensive patients who registered in two different public health facilities of Thanjavur district in Tamil Nadu. Patients who had latest two BP recordings were controlled (BP less than 140/90) in one year reference period were taken as control and patients who had latest two BP recordings or any one of the latest two BP recordings were uncontrolled (BP equal and above 140/90) were taken as a case. We calculated a sample size of 160 for cases and 160 for controls. We used a structured questionnaire to collect information. Crude and adjusted odds ratio with 95%confidence interval were calculated by logistic regression.

RESULTS : We recruited 160cases and160controls in Primary Health Care centres. Spss version 23 software was used for analysis. Age, gender, education, occupation, marital status, smokeless tobacco, duration of missing tablets, drug prescription status and knowledge of complications were not associated with uncontrol hypertension. Missing tablets more than seven days (OR 2.2;95%CI (1.0 − 4.6)) and being male (OR 13.6; 95%CI 1.7 − 106.8) was associated with uncontrolled hypertension.

CONCLUSION : Lack of adherence to medications despite dispensing of drugs for 30 days in the public health facilities was a riskfactor for uncontrolled hypertension.Medical officers and staff nurses should emphasize patient counselling with more focus on males. Systems should be developed to monitor adherence, such as phone call or SMS based reminders.

KEYWORDS : Adherence, hypertension, primary health centre,Uncontrolled.

INTRODUCTION

Noncommunicable diseases (NCDs) are the leading cause of death worldwide. According to the World health organization NCD report, NCD was responsible for 71%(41 million) of the 57 million deaths which occurred globally in 2016.[1] In 2019, major NCDs responsible for the deaths included cardiovascular diseases (17.9 million deaths, accounting for 44% of all NCD deaths and 31% of all global deaths).[2] One of the critical risk factors for Cardio Vascular Diseases (CVD) is Hypertension. Raised blood pressure can cause coronary heart disease, chronic kidney disease, and ischaemic as well as a haemorrhagic stroke. As perthe 2013 WHO report, globally, 9.4 million deaths occurred every year due to hypertension complications.[3]

In India, hypertension led to1.63million deaths in 2016 as compared to 0.78 million in1990.[4] In 2014, about 33% urban and 25% of rural Indians were hypertensive. Among them, 25% rural and 42% urban Indians were aware of their hypertensive status. One-tenth of rural and one-fifth of urban\hypertensive patients had their BP under control.[5]

In Tamil Nadu, the proportion of total disease burden from Noncommunicable diseases was 65.3%, and leading causes of DALYs (2016) due to Ischemic heart disease was 14.3%. The risk factors driving to most of the death and disability are dietary risks, followed by high blood pressure, high body-mass index, high total cholesterol, tobacco use and alcohol and drug use.[6]

In 2018, Lancet published the changing patterns of cardiovascular diseases and their riskfactors in India. Coronary heart disease-related deaths have increased in Tamil Nadu,Karnataka, Punjab and Haryana from 1990 to 2016.[7] Heart disease, stroke and diabetes cause loss of billions of dollars to national income each year in the world's most

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populous nations and rising healthcare expenditures can lead to financial catastrophe, forcing households into poverty or deepening their existing poverty.

In Tamil Nadu, the NCD intervention programme was implemented in 2011, in all public health facilities. The programme aimed at early diagnosis, counselling and treatment for hypertensive patients. In this programme, opportunistic screening is done for NCDs namely hypertension, diabetes, cervical and breast cancer for individuals aged 30 years and above who are visiting public health facilities and medicines are given for 30 days free of cost.

This NCD programme was evaluated in 2012 in Thanjavur district public health facilities for hypertension screening and management. The evaluation indicated that 49% of hypertension patients who had treatment in public health facilities in Thanjavur district had their blood pressure under control (systolic blood pressure <140mmHg, Diastolic blood pressure <90mmHg). There are limited studies in India to understand the factors associated with hypertension awareness, treatment and control; however, no such study has been done in Tamil Nadu state so far.

The objective of the study was to determine the factors associated with uncontrolled hypertension among registered hypertension patients in public health facilities in Thanjavur district of Tamil Nadu.

METHODOLOGY

STUDY DESIGN: We conducted a case-control study (1:1) to identify the factors associated with uncontrolled blood pressure among patients with hypertension. Hypertension registered in selected public health facilities for one year from January1,2018, to December 31,2018.

STUDY AREA: We conducted this study in Thanjavur district, which is located in the mid-eastern part of Tamil Nadu. The study population includes patients with hypertension who were registered in two block-level primary health centres in Thanjavur district. 2 block primary health centres were purposefully selected by based on maintenance of records keeping well. Kabisthalam is a block primary health centre located in Cauvery river bed area, in the northern part of Thanjavur district and has a population of 1,10,748(census 2011) and Thamarankottai is a block primary health centre which is located in coastal area, in the south-east part of Thanjavur district with a population of 1,13,231(census 2011).

STUDY POPULATION: The study participants were hypertension patients aged 30years and above registered and

on follow up for treatment in the two selected primary health care facilities from January1, 2018, to December 31 2018. Patients were identified from patient clinic cards maintained in the health facilities with details on treatment and follow up for hypertension. We generate the line list of all uncontrolled hypertension patients and hypertension under control patients As per case definition, case and control selected by simple random sampling from the line list Cases and controls equally distributed in the two primary health centres. The patient clinic card contains a complete patient medical record including demographics, medical history, BP measurements and drug prescription.

INCLUSION CRITERIA: The patient cards with at least three follow up BP recordings between January 1, 2018, and December 31 2018, and the two latest BP recordings at the one-month interval were included in the study.

EXCLUSION CRITERIA: The patient cards with less than three BP recordings during follow up visits in 2018, incomplete data, hypertension diagnosis less than four months and the latest two BP. Recordings, not at the one-month interval were Excluded.

OPERATIONAL DEFINITIONS

HYPERTENSION: Hypertension was diagnosed as systolic blood pressure ≥140 mmHg or diastolic bloodpressure ≥ 90 mmHg in two different measurement half an hour apart as per the programme protocol.

HYPERTENSION UNDER CONTROL: Based on two consecutive BP measurement, if the two recordings had systolic bloodpressure<140mmHg and diastolic blood pressure<90mmHg.

UNCONTROLLED HYPERTENSION: Based on two consecutive BP measurements, if one or both the recordings had systolic blood pressure≥140mmHg or/and diastolic blood pressure≥90mmHg

In a case-control study, case were patients with uncontrolled hypertension and control were patients with hypertension under control.

SAMPLE SIZE: We calculated the sample size based on the following assumptions: Non-adherence among the control group as 38%(program evaluation data), level of significance as 5%, power as 80%, the ratio of controls & cases as 1, the expected odds ratio of 2 and 10% as non-response.The estimated sample size was 160cases and160controls.

SAMPLING PROCEDURES: We collected all available hypertension patient clinic cards from two primary health centre's for the reference period of January 1, 2018, to December 31 2018. We created the line list of all hypertension

patients with BP under control and BP not under control. We randomly selected the cases and controls as per the desired sample size from the line list. Selection of cases and controls were equally distributed in the two primary health centres.

DATA COLLECTION

DATA EXTRACTION FORM: The patient clinic cards were reviewed to collect data for variables namely age, gender, address, phone number, education, occupation, risk factors like BMI, comorbidities, smoking, alcohol, BP measurement values and prescription details.

INTERVIEW OF PATIENTS: The patients were interviewed by well-trained paramedical staff using a semi-structured questionnaire. The information on socio demographic characteristics, treatment adherence,a ccessibility to health facilities, lifestyle modification, health-seeking behaviour and knowledge on hypertension were collected. Interviews were conducted in the local language, Tamil. We measured the blood pressure of patients at the time of interview.

ANALYSISPLAN: Based on patient treatment card, we calculated the descriptive statistics for various factors. We analyzed the frequencies of various risk factors among cases and controls.We did the univariate analysis to find the crude odds ratio with 95% CI for various riskfactors. We did the logistic regression to determine the independent predictors foruncontrolled hypertension. We did the analysis using Epi info version 7. A P-value of lessthan 0.05 is taken as statistically significant. We computed the proportion of reasons fornot taking medicines regularly among hypertension patients who were not taking medicines regularly.

HUMAN SUBJECTS PROTECTION: Approval from the NIE Ethics Committee was obtained before the commencement of study. Permissions were obtained from the Deputy Director of Health services before the commencement of the study. Every hypertension patient selected as case and control was informed about the purposeof the study by information sheet which was provided in the local language Tamil andwritten consent for participation in the study was obtained. The patient information was kept confidentially and not used for analysis or dissemination. All the study participants were counselled regarding the importance of taking drugs regularly without missing as per prescription and creating awareness about the consequences of hypertension to prevent cardio vascular disease, stroke and premature death. The care takers of some patients were encouraged to giving moral support to elderly patients.

RESULTS

We reviewed the available patient's cards in two PHC to estimate the total number of patients. PHC Kabisthalam and PHC Thamarankottai had 1200 and 820 cards respectively. After applying the eligibility criteria, 600 (50%) and 460 (56%) were eligible for the study. Among the eligible patients, we reviewed the blood pressure to classify the cases and controls. (Figure1)
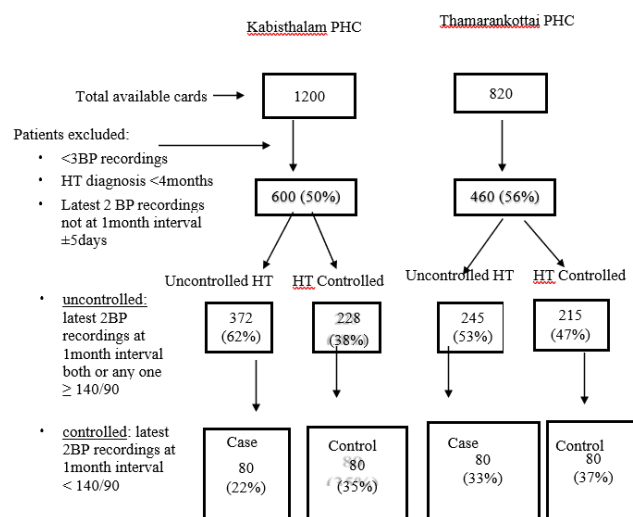

Figure 1: Patients selection for cases and controls

We recruited 160 case patients and 160 control patients. More than half of the (63%)cases were above 60 years of age (median 60 years, IQR 55 – 67 years) and 58 %(median 60 years, IQR 51 – 69) in controls. 56 per cent of cases and 68 per cent of controls were females.

We compared socio demographic characters like age, gender, educational status, occupation and marital status among cases and controls. There was a significant difference in the proportion of males among cases and controls. Other risk factors were similar among cases and controls. (Table: 1) We did univariate analysis for various risk factors. Among the socio-demographic characters, age (OR- 1.0; 95%CI 0.9 – 1.0), education (OR-1.6; 95%CI 0.8 – 3.1),occupation(OR-1.3; 95%CI0.8–2.1) and marital status(OR-0.7; 95%CI 0.4 – 1.1) were not associated with uncontrolled hypertension. Being male (OR- 1.7; 95%CI 1.6 – 2.6)was significantly associated with uncontrolled hypertension. (Table: 2)

Among the risk factors, currently tobacco smoking (OR-1.1; 95%CI 0.4 – 3.2), currentlysmokeless tobacco use (OR-0.7; 95%CI 0.4 – 1.2), current alcohol consumption (OR-0.9;95%CI 0.4 – 2.2), BMI (OR-0.9; 95%CI 0.5 – 1.4) and physical activity (regular walk forat least 3days/week, playing sports at least twice a week and doing yoga at least twice aweek) (OR-0.8; 95%CI 0.5 – 1.3) were not significantly

associated with uncontrolled hypertension.(Table:2)

System-related factors like distance from their places to health facility more than five kilometres (OR-1.1; 95%CI 0.6 – 2.1) and drugs prescription with more than one drug(OR-1.1; 95%CI 0.8 – 3.3) were not significantly associated with uncontrolled hypertension.(Table: 2)

A patient who were not taking medicines regularly, the duration of missing tablets being more than seven days (OR-2.2; 95%CI 1.0 – 4.6) were significantly associated with uncontrolled hypertension.

Treatment duration for more than three years (OR - 1.2; 95% CI 0.8 – 1.9) and presence of comorbidity condition (OR-1.1; 95%CI 0.7 – 1.7) were not significantly associated with uncontrolled hypertension. (Table: 2) Knowledge related variables such as lack of knowledge on hypertension, lack of knowledge on consuming medicines daily (OR-1.0; 95%CI 0.62 – 16.1), lack of knowledge on consequences of hypertension(OR-0.6; 95%CI0.3–1.2) and lackof knowledge regarding need for treatment despite absence of any hypertensive symptoms (OR-1.2; 95%CI 0.7 – 2.3) were not significantly associated with uncontrolled hypertension.(Table:2)

We did stratified analysis to identify confounders and effect modifiers. Lack of adherence to medications for 7 or more days was modified by gender with significant difference in the stratum specific OR, odds being higher among males(OR13.6; 95%CI1.7– 106.8)as compared to females (OR 0.8; 95%CI 0.3 – 2.3). Since gender was effect modifier, we did not adjust for gender in the multivariate analysis. (Annexure-Table)

Table1: Socio demographic characteristics of hypertensive patients who registered in public health facilities in Thanjavur District of Tamil Nadu, 2019

Socio demographic characteristics		Uncontrolled HT N=160		HT under control N=160		P-value
		n	**%**	**n**	**%**	
Age (in year)	30 - 39	4	3	2	1	0.316
	40 - 49	17	10	29	18	
	50 -59	38	24	36	23	
	≥ 60	101	63	93	58	
Gender	Male	69	43	50	31	0.028
	Female	91	57	110	69	
Education	Illiterate	56	35	71	44	0.393
	Primary	47	29	41	26	
	Middle	31	20	27	17	
	High school & above	26	16	21	13	
Marital status	Married	111	69	123	77	0.13
	Others(Unmarried widow/separate)	49	31	37	23	
Occupation	Employed	10	6	7	4	0.395
	Daily Wage labour	57	36	68	43	
	Others (Retired, Home maker, Unemployed)	93	58	85	53	

Table 2: Univariate analysis for factors associated with uncontrolled hypertension among the registered hypertension patients in public health facilities in Thanjavur district

Socio demographic Characteristic		Uncontrolled HT N=160		HT under control N=160		Crude OR	95%CI
		n	**%**	**n**	**%**		
Age(in year)		160	100	160	100	1	(0.9-1.0)
Gender	Male	69	43	50	31	1.7	(1.6 -2.6)
Education	Illiterate	56	35	71	44	1.6	(0.8-3.1)
	Primary	47	30	41	26	1.1	(0.5-2.2)
	Middle	31	19	27	17	1.1	(0.5-2.3)
Occupation	Daily Wage labour	57	36	68	43	0.8	(0.3-2.1)
	Others (Retired, Home maker, Unemployed)	93	58	85	53	1.3	(0.8-2.1)
Marital status	Married	111	69	123	77	0.7	(0.4-1.1)

Education	Illiterate	56		71		3.1)
	Primary	47		41		2.2)
	Middle	31		27		2.3)
Occupation	Daily Wage labour	57		68		2.1)
	Others (Retired, Home maker, Unemployed)	93		85		2.1)
Marital status	Married	111		123		1.1)

Risk factors		Uncontrolled HT N=160		HT under control		Crude OR	95% CI
		n	**%**	**n**	**%**		
current smoking		9	6	9	6	1.1	(0.4-3.2)
current smokeless tobacco use		49	31	39	24	0.7	(0.4-1.2)
Currently using		13	8	12	7	0.9	(0.4-2.2)
BMI	Underweight	17	11	18	11	1	(0.5-2.1)
	Overweight	66	41	60	38	1.2	(0.7-1.9)
	Obese	17	10	18	11	1	(0.5-2.1)
Do Physical activity		41	26	49	31	0.8	(0.5-1.3)
System related characteristic							
Drugs prescription with >1drug		50	31	53	33	1.1	(0.8-3.3)
distance from their places to health facility >5km		25	16	28	17	1.1	(0.6-2.1)
Patient related Characteristic							
Treatment duration >3yrs		68	42	75	47	1.2	(0.8-1.9)
Presence of comorbidity		51	32	53	33	1.1	(0.7-1.7)
duration of missing tablets >=7days		22	14	11	7	2.2	(1.0-4.6)
Knowledge related factors							
lack of knowledge on consuming medicines daily		1	1	1	1	1	(0.1-16.1)
Lack of knowledge on complication of hypertension		19	12	28	18	1.6	(0.8-2.9)
Lack of knowledge regarding need for treatment despite absence of any HT symptoms		24	15	20	12	1.2	(0.7-2.3)

We did a multivariate analysis, including variables with a statistically significant P valueof<0.05. After adjusting for age, duration of missing tablets being more than seven days was significantly associated with uncontrolled hypertension (OR 2.2; 95%CI 1.0 – 4.6)(Table:3)

We inquired the reasons for not taking tablets for patients who missed tablets for one or more days (n=149). Nearly one third missed their drugs due to work, and another one third forgot to take pills. Other reasons quoted by patients as reasons for missing drugs were being out of the station, lack

of help in reaching the health facility, distance, relative death, feel sick, due to other illness, drugs not prescribed if their blood pressure was under control, took Siddha medicine and drugs not working.(Fig.2).

Table 3: Multivariate analysis for factors associated with uncontrolled hypertension among the registered hypertension patients in public health facilities in Thanjavur district

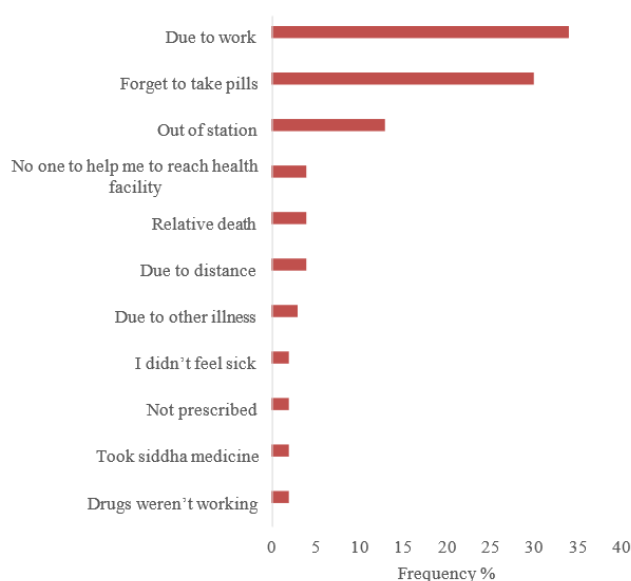| Characteristic	Crude OR	Adjusted OR	
		Estimate	95% CI
Duration of missing tablets >=7days	2.2	2.2	(1.0- 4.6)
Age	1	1	(0.976 -1.02)

Figure 2: Frequency of reasons for missing drugs among the hypertension patients who are missing drugs

DISCUSSION

In our study, an attempt has been made to find out the association between different risk factors with uncontrolled hypertension.

Tamil Nadu was the first state in the country to initiate state wide hypertension screening and management in the primary care facilities under Tamil Nadu Health Systems Projectin 2011. We documented the risk factors for uncontrolled hypertension in the primary care setting in Thanjavur, Tamil Nadu. Males and patients who missed medications for 7 or more days had higher odds of uncontrolled hypertension. We observed high odds of poor control among males. Most of the studies have shown that females had hypertension under control than males.[8] A study done in Kaiser Permanente Southern California for identifying risk factors for uncontrolled hypertension shows that females had their blood pressure under control.[9] Another study done in Iran

reported higher odds of poor control among males [odds ratio (OR) = 2.31; 95 % confidence interval (CI) = 1.64-3.24].[10] In contrast, a large cohort study reported from Kaiser Permanente Southern California no association between gender and BP control (OR,0.99; 95% CI, 0.98-1.01).[11]

Despite increased awareness, poor adherence to treatment for chronic diseases remains a global problem. Uncontrolled systolic and diastolic blood pressure are important riskfactors for increased cerebrovascular events, cardiovascular events, and all-causemortality. Adherence issues are common in patients taking antihypertensive therapy and are associated with increased risk of coronary and cerebro vascular events. A hospital-based cross-sectional study was done in Ethiopia, in 2018 which showed that hypertensive patients who were non-adherent to antihypertensive medication had 2.062more risks of uncontrolled hypertension (adjusted odds ratio [AOR] = 2.062, 95%confidence interval[CI]:1.030–4.129).[12] A case-control study was done in similar settings at Harare central hospital; Zimbabwe reported low adherence to drugs was independently associated with uncontrolled blood pressure (adjusted odds ratio [AOR] =22.03, 95% confidence interval [CI]: 9.10–53.5).[13] A systematic review and meta-analysis for non-adherence to antihypertensive drugs, showed non-adherence to antihypertensive medications was higher among uncontrolled hypertension patients(83.7% [95% CI = 59.9–117.0]) than patients with blood pressure control (59.7% [95%CI = 37.7–81.7]).[14] Patients should be counselled regarding the need for takingmedications regularly and providers should take detailed history during clinic visits tounderstandthepatient's compliance to prescribed treatment. The knowledge regarding complications of hypertension and behavioural risk factors has been reported as one of the risk factors in various studies. However, it was not a riskfactor in our study. An institution-based cross-sectional study from Ethiopia in 2017, showed that participants who did not know at least two complications were more likely tohave uncontrolled hypertension than those who knew at least two complications(AOR=2.140, 95%CI=1.272–3.600, p=0.004).[15] Another study was done by Decoste et al. in similar settings, identified obesity, sedentary lifestyle and type2diabetesas risk factors for uncontrolled hypertension.[16]

LIMITATIONS

Our study was conducted in two primary health centres and thus may not be representative of all hypertensives. There might be recall bias since the risk factors and adherence were self-reported. Recall bias may have affected the results. So we reducedthe recall bias by high-quality questionnaire and

trained the interviewers well. Theresponse may be influenced if the doctor or nurse do the interview. Therefore patients were interviewed by the well-trained person not known to the patient.

CONCLUSION AND RECOMMENDATION

Lack of adherence to medications has been widely recognized as a critical issue inachieving blood-pressure control. In Tamil Nadu, all the public health facilities dispensing drugs for 30 days free of cost. Despite the availability of drugs, hypertension patients are not taking drugs regularly, and it is associated with lack of control. Patients didnot take medicines regularly due to other priorities or forgetfulness.

To improve their medication adherence, medical officers and staff nurses should emphasize patient counselling with more focus on males. Systems should be developed tomonitor adherence, such as phone call or SMS based reminders. Nurses should do pillcountduring clinic visitsto estimate compliance in the previous month.

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