Research Article

A CROSS-SECTIONAL STUDY ON ADHERENCE TO LIFESTYLE MODIFICATION AMONG KNOWN HYPERTENSIVE PATIENTS IN UDUPI DISTRICT

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ABSTRACT

Objectives: Hypertension is the more prevalent non-communicable disease and is the major risk factors for the cardiovascular disease. Lifestyle modification plays a very important role in controlling or management of the hypertension. Hence, aim of this study is to assess the adherence and non-adherence to lifestyle modification among known hypertensive patients those who are visiting secondary care hospitals in Udupi District.

Methods: This was a multi-centric hospital based cross-sectional study conducted at three secondary care hospitals. Samples were collected through convenient sampling. Standardized questionnaire used to collect data. Associations are obtained the help of frequencies, prevalence, and mean values, ANOVA test, Chi-square, and binary logistic regression were used for the analysis.

Results: The mean age of the participants was 63.01±11.12 years. Males were 144 (42.2%) and females were 197 (57.8%) of the study population. It was found that the self-assessment is influenced by education level of participant (p=0.003) and time elapsed since diagnosis of hypertension (p<0.001). Majority of the participants from age group of 34 to 48 and 49 to 63 had good adherence to exercise, that is, 70.4% (19) and 74.6% (100), respectively, (p=0.001). Participants with awareness regarding risk factors and complications of hypertension showed good adherence to exercise. The patients, who adhered to exercise, also consumed less quantity of salt.

Conclusion: Instilling positivity in mind of the patient regarding outcome of treatment and lifestyle modifications can help in controlling the high blood pressure and there by prevent cardiovascular and renal disease in the whole population.

Keywords: Life style, Hypertension, Adherence, Risk factors.

INTRODUCTION

A large proportion of deaths and disability around the world is accounted by cardiovascular disease (CVD) and has become a barrier to sustainable human development. CVD accounts for approximately 17.7 million of death per year worldwide. Non-Communicable Disease has been recognized in the third Sustainable Development Goal, that is, reduction in premature mortality due to non-communicable disease [1].

By 2025, it is projected that 29% of the world's population will have hypertension. High blood pressure is ranked as the third most risk factor for attributable burden of disease in South Asia [2]. In India, a recent study has shown that the prevalence of hypertension is 25% in urban adults and 10–15% among rural adults. Hypertension accounts for 17.9% and 34.6% of population attributable risk factors for coronary artery disease and stroke, respectively [3,4]. The dietary approach to stop high blood pressure (DASH) in their study showed that a diet which consists of fruits, vegetables, and low-fat dairy products significantly results in the lower blood pressure [5]. In 1940, Ambard and Beaujard suggested that there was a significant association between salt intake and hypertension. It is one of the behavioral risk factors for hypertension and can be easily modified [6].

The relation between alcohol smoking and hypertension is definite and has been documented in many studies. The persons who smoke have a higher risk of developing hypertension over the time. It is more controllable and preventable risk factors for hypertension [7]. The other risk factor for hypertension is physical inactivity. By increasing the blood flow to the skeletal and cardiac muscles, exercise promotes the angiogenesis [8]. Lifestyle modification helps to improve the risk reduction related to hypertension (HTN) by modifying those factors as; diet, salt intake, alcohol, smoking, and exercise [9].

Hypertensive patients must have the knowledge to be able to define their condition, to evaluate the risk factors, about regular monitoring of blood pressure which helps in adherence to antihypertensive medication. Some of the recent studies have also found that the health-care practitioners did not sufficiently inform patients about the disease, risk factors, and necessary lifestyle modification. Lack of knowledge and awareness among the HTN patients are seen both in rural an urban environment [10]. The adherence to lifestyle modification is neglected due to lack of knowledge and poor awareness and only a few studies conducted to know the adherence to lifestyle modification. Non-adherence is one of the biggest hindrances in controlling HTN.

Hence, aim of this study is to assess the adherence and non-adherence to lifestyle modification among known hypertensive patients those who are visiting secondary care hospitals in Udupi District and also to estimate the prevalence of adherence and non-adherence to lifestyle modification in known hypertensive patient.

METHODS

This study was carried out at three secondary care hospitals in Udupi district, one hospital from each taluk. All the three were a private hospital. They are Dr. T M A Pai Rotary Hospital, Karkala (Udupi), Dr. T M A Pai Hospital, Udupi (Udupi), Vinaya Hospital, Kundapura (Udupi). Approval was obtained from the Institutional Ethics Committee

of Kasturba Medical College, Manipal University [KMC IEC 3/2018]. It was Multi-Centric Cross-Sectional Study and the duration of the study is 6 months, that is, Jan-2018–Jun-2018. A total of 341 adult hypertensive patients attending the OPDs of the department of medicine of the three secondary care hospitals were selected and enrolled. Study variables included socio-demographic factors, knowledge regarding HTN, perception regarding HTN, depression, healthcare support, and lifestyle modifications such as smoking, alcohol, diet, salt intake, and exercise. Inclusion criteria included all the HTN patients above 18 years under antihypertensive medications for at least 6 months before the start of the study. Exclusion criteria included individuals diagnosed of having cerebrovascular accident (Stroke) and comatose individuals self-administered questionnaire. The questionnaire included 43 questions. The dimensions used in the questionnaire were socio-demographic profile, knowledge, and perception about HTN and lifestyle modification with regard to HTN.

The study protocol was submitted to the institutional ethics committee. After obtaining approval from the ethics committee, permission was taken from all the three hospital administrations, unit head of medicine department. OPD is visited with prior appointment and hypertensive patients were approached. The aim and objectives of the study were explained to patients in a language that they can understand. Participant information sheet was provided to participants. A written informed consent form is obtained from the participants. A structured questionnaire was administered to the patient. The questionnaire included about socio-demographic factors, knowledge, and perception regarding HTN and lifestyle modification. Data regarding demographic knowledge, lifestyle modification in HTN, were obtained.

Excel Spreadsheet was used for entering the collected data. Analysis of quantitative data was done using SPSS 27.0 software. It is done by entering coded data and tables were generated in SPSS. Descriptive analysis was done to find out the mean, prevalence, and frequencies of the associated socio-demographic correlates, ANOVA test, Chi-square test, Independent sample t-test, and binary logistic regression were used to find out the association between the socio-demographic correlates, education, knowledge of HTN, education, and lifestyle modification. For all this statistical tests, $p < 0.05$ was taken as significant.

RESULTS

The total sample is composed of 341 participants (known cases of HTN) from Udupi district. The mean age of the participants is 63.01±11.12 years. Single people develop HTN at a much younger age than married people do ($p < 0.001$). There was an association between age and religion, which showed that Hindus and Christians develop HTN at a later age, when compared with Muslims (p=0.023). The more educated a person is, the earlier in life he/she develops HTN ($p < 0.001$). Either this could be due to lifestyle choices of educated people, or it could also indicate an under-diagnosis of HTN in lesser/uneducated people due to lack of awareness. People who are self-employed or laborers were at least 5 years younger than the others were ($p < 0.001$). Participants from the lower-lower class, who had HTN, had a mean age of 42.50 ± 14.85 years, which were significantly lower (p-0.025) than people from other socio-economic strata of society (Tables 1 and 2).

The participants included in the study were those who had been diagnosed with HTN for at least 6 months and were on treatment for the same. Majority of the participants were diagnosed with HTN 5–10 years ago (32.6%), and an almost equal number (31.1%) were diagnosed over 10 years ago. One-fourth the participants were on treatment for 2–5 years, and a small proportion (10.9%) were diagnosed recently (that is <2 years ago). The time elapsed since diagnosis was found to be positively and mildly associated with age of the participants ($p < 0.001$, Pearson's correlation coefficient=0.36) (Table 3 and 4).

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Table 1: Socio-demographic profile of participants (n=341)

Variable	Count	Frequency %
Gender of participant		
Female	197	57.8
Male	144	42.2
Marital status of participant		
Single	6	1.8
Married	291	85.3
Widowed	44	12.9
Religion of participant		
Hindu	265	77.7
Muslim	25	7.3
Christian	51	15.0
Education level of participant		
Illiterate	91	26.7
Completed primary school	140	41.1
Completed high school	70	20.5
Completed graduation/postgraduation	40	11.7
Occupation of participant		
Unemployed	59	17.3
Homemaker	165	48.4
Laborer	35	10.3
Self-employed	58	17.0
Service/Professional	24	7.0
Socio-economic status of participant		
Lower-lower class	2	0.6
Upper-lower class	67	19.6
Lower-middle class	138	40.5
Upper-middle class	126	37.0
Upper class	8	2.3

Table 2: Association between and age and socio-demographic factor in hypertensive patients

Socio-demographic variable	Age of participant (in years)		p-value
	Mean	Standard Deviation	
Gender			
Female	62.76	10.42	0.624
Male	63.36	12.04	
Marital status			
Single	47.17	26.16	<0.001
Married	62.53	10.33	
Widowed	68.36	10.60	
Religion			
Hindu	63.49	10.89	0.023
Muslim	57.16	12.56	
Christian	63.39	10.98	
Education level of participant			
Illiterate	67.10	9.21	<0.001
Primary school	63.95	9.85	
Completed high school	59.16	12.88	
graduation/postgraduation	57.20	11.83	
Socio-economic status of participant			
Lower-lower class	42.50	14.85	<0.025
Upper-lower class	62.72	9.15	
Lower-middle class	61.96	10.97	
Upper-middle class	64.40	11.92	
Upper class	66.88	9.92	
Occupation of participant			
Unemployed	70.47	11.98	<0.001
Homemaker	63.04	10.03	
Laborer	58.66	10.27	
Self-employed	57.71	9.99	
Service/Professional	63.71	10.17	

2–5 years, and a small proportion (10.9%) were diagnosed recently (i.e. <2 years ago). The time elapsed since diagnosis was found to be positively and mildly associated with age of the participants (p<0.001, Pearson's correlation coefficient=0.36) (Table 4).

To test patient's knowledge, two questions were asked: One, about the risk factors for HTN, and two, about the complications caused by HTN. Half the patients did not have any idea about the risk factors, and 63.6% patients did not know about the complications of HTN. Participants' knowledge was associated with their age (p=0.036 for risk factors, p=0.017 for complications), marital status (p=0.001 for risk factors, p=0.002 for complications), and education (p=0.001 for risk factors, p<0.001 for complications). Participants' occupation was associated with knowledge of complications of HTN (p=0.002). There was no association between knowledge and gender, religion, socioeconomic status, nor to the time elapsed since diagnosis. Regression analysis (Tables 3 and 4) further revealed that only education level was a definite indicator of knowledge levels, while other factors were confounders. Table 5 describes knowledge of participants, based on their education levels. When asked to self-assess their health, majority said they were in good health (71%), while almost one-fourth of the participants were unable to provide an answer and said they were uncertain. When tested against socio-demographic variables (first using ANOVA for individual variables, followed by regression analysis to eliminate confounding variables), it was found that the self-assessment is influenced by education level of participant (p=0.003) and time elapsed since diagnosis of HTN (p<0.001) (Tables 5.1, 5.2 and 6). Those with lower education or illiterate participants were unable to provide a self-assessment, just as participants who had HTN for than 5 years were unable to.

Education and time elapsed since diagnosis also influenced patients' daily experiences while working. Associations of other variables were found to be insignificant when tested by ANOVA and regression analysis. The higher the education level of the participant, the greater was their disinterest and displeasure experienced while working (p<0.001). Participants who had been recently diagnosed with HTN, experienced higher levels of disinterest in work as compared to those who had been hypertensive for longer duration (p<0.001). These factors influenced patients' concentration while working as well. The higher the education, the lower was their lack of concentration (p<0.001), while as the number of years since diagnosis increased, patients experienced greater lack of concentration (p=0.003) (Tables 5.1 and 5.2).

Majority (70%) patients believed that they were experiencing lack of concentration and disinterest in work due to their HTN, while only 18.2% said this was unrelated to HTN. Participant perception about the cause of their disinterest and lack of concentration was associated with their education (p=0.003) and occupation (p=0.004). Educated people and service professionals were less likely to associate their experiences at work with HTN (Tables 6-8). When asked about their perception about the seriousness of their disease (HTN), most of the patients (57.2%) believed it was a serious problem and 27% said it was not serious. The perceived seriousness among illiterates (75.8%) was dramatically higher than that of graduates and post-graduates (35%), and this difference was statistically significant (p=0.002) (Tables 6-8).

When asked for their perception regarding the medication they take, majority of the patients (88%) said that it helps stabilize their blood

Table 3: Participants' knowledge based on level of education

Participants' knowledge	Education level of participant							
	Illiterate		Completed primary school		Completed high school		Completed graduation/ post-graduation	
	Count	Column n %	Count	Column n %	Count	Column n %	Count	Column n %
Risk factors of hypertension								
Stress	5	5.5	38	27.1	20	28.6	13	32.5
Increasing age	12	13.2	13	9.3	4	5.7	1	2.5
Excessive salt consumption	2	2.2	7	5.0	2	2.9	0	0.0
Family history of hypertension	2	2.2	1	0.7	5	7.1	1	2.5
Smoking	1	1.1	0	0.0	0	0.0	0	0.0
All of the above	1	1.1	4	2.9	20	28.6	18	45.0
Don't know	68	74.7	77	55.0	19	27.1	7	17.5
Complications caused by uncontrolled hypertension								
Cardiovascular diseases	0	0.0	3	2.1	1	1.4	2	5.0
Chronic heart disease	1	1.1	1	0.7	1	1.4	0	0.0
Stroke	6	6.6	29	20.7	23	32.9	7	17.5
All of the above	1	1.1	12	8.6	17	24.3	20	50.0
Don't know	83	91.2	95	67.9	28	40.0	11	27.5

Table 4: Patient self-assessment of their health

Variable	Patient self-assessment of their health							
	Poor		Good		Very good		Uncertain/unable to assess	
	Count	Column n %	Count	Column n %	Count	Column n %	Count	Column n %
Education level								
Illiterate	4	50.0	54	22.3	2	28.6	31	36.9
Completed primary school	3	37.5	93	38.4	2	28.6	42	50.0
Completed high school	1	12.5	60	24.8	1	14.3	8	9.5
Completed graduation/postgraduation	0	0.0	35	14.5	2	28.6	3	3.6
Time elapsed since diagnosis of hypertension								
6 months–2 years	0	0.0	33	13.6	1	14.3	3	3.6
2 years–5 years	2	25.0	72	29.8	3	42.9	10	11.9
5 years–10 years	1	12.5	84	34.7	1	14.3	25	29.8
More than 10 years	5	62.5	53	21.9	2	28.6	46	54.8

Table 5.1: Patient experiences and associated factors

Variable	Patient experiences and associated factors							
	None		Low/disinterested on several days		Moderate/disinterested on most days		High/always disinterested	
	Count	Row n%	Count	Row n%	Count	Row n%	Count	Row n%
Education level of participant								
Illiterate	9	9.9	16	17.6	19	20.9	47	51.6
Completed primary school	6	4.3	35	25.0	16	11.4	83	59.3
Completed high school	3	4.3	10	14.3	6	8.6	51	72.9
Completed graduation/postgraduation	1	2.5	3	7.5	1	2.5	35	87.5
Time elapsed since diagnosis of hypertension								
6 months–2 years	1	2.7	3	8.1	1	2.7	32	86.5
2 years–5 years	5	5.7	12	13.8	8	9.2	62	71.3
5 years–10 years	2	1.8	22	19.8	13	11.7	74	66.7
More than 10 years	11	10.4	27	25.5	20	18.9	48	45.3

Table 5.2: Patient experiences and associated factors

Variable	Level of lack of concentration experienced by participant while working							
	None		Low/unable to concentrate on several days		Moderate/unable to concentrate on most days		High/always unable to concentrate	
	Count	Row n %	Count	Row n %	Count	Row n %	Count	Row n %
Education level of participant								
Illiterate	21	23.1	25	27.5	25	27.5	20	22.0
Completed primary school	42	30.0	41	29.3	30	21.4	27	19.3
Completed high school	38	54.3	11	15.7	10	14.3	11	15.7
Completed graduation/postgraduation	27	67.5	2	5.0	8	20.0	3	7.5
Time elapsed since diagnosis of hypertension								
6 months–2 years	23	62.2	6	16.2	2	5.4	6	16.2
2 years–5 years	36	41.4	17	19.5	23	26.4	11	12.6
5 years–10 years	37	33.3	31	27.9	23	20.7	20	18.0
More than 10 years	32	30.2	25	23.6	25	23.6	24	22.6

Table 6: Participant perception and associated factors

Variable	Participant's perception about cause of disinterest and lack of concentration					
	Due to hypertension		Other reason, not related to hypertension		Uncertain/don't know	
	Count	Row n %	Count	Row n %	Count	Row n %
Education level of participant						
Illiterate	75	82.4	8	8.8	8	8.8
Completed primary school	107	76.4	20	14.3	13	9.3
Completed high school	37	52.9	20	28.6	13	18.6
Completed graduation/post-graduation	18	45.0	14	35.0	8	20.0
Occupation of participant						
Unemployed	46	78.0	8	13.6	5	8.5
Homemaker	124	75.2	29	17.6	12	7.3
Laborer	22	62.9	6	17.1	7	20.0
Self-employed	40	69.0	7	12.1	11	19.0
Service/Professional	5	20.8	12	50.0	7	29.2

Table 7: Patient's perception about medication

Perception	Count (n=341)	Frequency (%)
They do not stabilize BP	27	7.9
They stabilize BP and help treat hypertension	273	80.1
Uncertain	41	12.0

pressure and control HTN. This perception was not associated with any socio-demographic variable Table 8. Almost half the patients interviewed believed that lifestyle modification helps control HTN, 44% were unsure about the role, and only 5% said that lifestyle modification does not help control HTN. This perception was found to be associated with time elapsed since diagnosis (p=0.001) (Tables 7-9).

Patient's feelings about their diagnosis were recorded, and majority (43.7%) were worried because of their HTN. These feelings of worry were influenced by education level of participant (p=0.001) and their socio-economic status (p=0.034). Participants' feelings about the prognosis of their disease was influenced by gender (p=0.003) and socio-economic status (p=0.012) (Tables 9-12). None of the patients felt that HTN cannot be cured.

Three hundred and twenty-three (94.7%) participants told that they were getting enough support from the health care providers. Two hundred and eighty-two (82.7%) participants told that their physician strictly advised to take medication. According to this study, it shows that only 7 (2.1%) were not advised to follow lifestyle modifications by the health-care providers. Three hundred and thirty-four (97.9%) respondents said that physician is friendly with them while treating. And 327 (95.9%) people told physician treats them with respect. Two hundred and sixty-one (76.5) participants said that health-care providers other than physician always treat them with respect, but only once said that they never treat with respect (Table 11).

Almost half of the participants, that is, 186 (54.5%) travel 3 to 5 km to reach the health-care facility and 38 (11.1%) participants need to travel 1–3 km. Sixty-four (18.8%) and 53 (15.5%) respondents needs to travel 5–10 km and more than 10 km, respectively (Tables 12 and 13). Very small participants, that is, 6.5% (22) were smokers and did not adhere to lifestyle modification advice they received in regards to smoking. Only one participant told that he smokes more than 1 packet of cigarettes

daily. Maximum, that is, 81.8% (18) participants told that they smoke less than half packet of cigarettes per day. About 40.9% (9) participants were aware of consequences of smoking. Nineteen (86.4%) participants told that they were advised to quit smoking by physician but 45.5% (10) smokers tried to quit smoking (Tables 14 and 15).

Almost two-third of the patient (61.9 %) count-211 told that they exercise. However, out of this only 70 % participants exercise daily. Approximately half the numbers of all participants are non-adherent to the lifestyle modifications advised in regards to exercise. Around 91% (192) participants exercise for <½ h. Only 6 (2.8%) participant practiced Yoga while all the remaining participants went walking as a form of exercise. Majority, 295 (86.5%) were advised by their physician to exercise and explained the importance of exercise in HTN (Tables 16 and 17).

Adherence to exercise is seen in the age group of 34–48 years and 49–63 years, that is, 70.4% (19) and 74.6% (100), respectively, (p=0.001). Higher the education level better adherence to exercise (p=0.001) was seen. Majority (92.5%) graduates and 84.3 % of high school passed participants had good adherence to exercise. Professionals had good adherence in regards to exercise 91.7 % (22) which was followed by participants with own business 75.9% (44). Hundred and three (81.7%) participants from the upper middle class have the high adherence to exercise (Table 18).

Participants with awareness regarding risk factors of HTN had good adherence to exercise, that is, 40 (93.0%). Patient with awareness

Table 8: Patient's perception about lifestyle modification, categorized by time elapsed since diagnosis

Perception	6 months–2 years		2 years–5 years		5 years–10 years		More than 10 years	
	Count	Column %	Count	Column %	Count	Column %	Count	Column %
Helps control hypertension	23	62.2%	54	62.1%	52	46.8%	45	42.5%
Does not help control hypertension	2	5.4%	5	5.7%	5	4.5%	5	4.7%
Uncertain	12	32.4%	28	32.2%	54	48.6%	56	52.8%

Table 9: Patient's feelings on diagnosis and associated factors

Associated variables	Worried because of hypertension		Not worried by hypertension		Uncertain	
	Count	Row n %	Count	Row n %	Count	Row n %
Education level of participant						
Illiterate	56	61.5	15	16.5	20	22.0
Completed primary school	65	46.4	36	25.7	39	27.9
Completed high school	17	24.3	30	42.9	23	32.9
Completed graduation/postgraduation	11	27.5	21	52.5	8	20.0
Socio-economic status of participant						
Lower-lower class	0	0.0	1	50.0	1	50.0
Upper-lower class	34	50.7	14	20.9	19	28.4
Lower-middle class	59	42.8	38	27.5	41	29.7
Upper-middle class	53	42.1	47	37.3	26	20.6
Upper class	3	37.5	2	25.0	3	37.5

Table 10: Patient's feelings: On prognosis and associated variables

Socio-demographic variable	Hypertension cannot be cured		Hypertension can be cured		Uncertain	
	Count	Column %	Count	Column %	Count	Column %
Gender of participant						
Female	0	0.0	55	48.7	119	63.3
Male	0	0.0	58	51.3	69	36.7
Socio-economic status of participant						
Lower-lower class	0	0.0	0	0.0	2	1.1
Upper-lower class	0	0.0	16	14.2	39	20.7
Lower-middle class	0	0.0	43	38.1	80	42.6
Upper-middle class	0	0.0	51	45.1	64	34.0
Upper class	0	0.0	3	2.7	3	1.6

Table 11: Health care support

Variable	Always		Sometimes		Never	
All the health workers other than physician n treat with respect	323	94.7%	18	5.3%		
Advice to take medicine strictly by physician	282	82.7%	59	17.3%		
Advice to follow lifestyle modification by health care providers	334	97.9%	7	2.1%		
Physician is friendly	334	97.9%	7	2.1%		
Physician treats with respect	327	95.9%	14	4.1%		
Health care workers treats you with respect	261	76.5%	79	23.2%	1	0.3%

Table 12: Distance to travel to health-care center

Variables	Frequency	Percentage
Kilometers range		
1–3 km	38	11.1
3–5 km	186	54.5
5–10 km	64	18.8
More than 10	53	15.5
Total	341	100.0

Table 13: Frequency of alcohol consumption

Alcohol variable	Frequency	Percentage
Use of alcohol		
Yes	82	24.0
No	259	76.0
	16	19.5
Drinking frequency		
Weekly once	23	28.0
Occasionally	43	52.5
Quantity consumed		
60 ml	4	4.9
90 ml	50	61.0
180 ml	28	34.1
Awareness of consequences on hypertension		
Yes	21	25.6
No	61	74.4
Physician advice to quit alcohol		
Yes	42	51.2
No	40	48.8
Tried to quit		
Yes	11	13.4
No	71	86.6

Table 14: Smoking status and awareness

Variables	Frequency	Percentage
Smoking status		
Yes	22	6.5
No	319	93.5
Cigarette consumption per day		
1–3 cigarettes	7	31.8
<half pack	11	50.0
Up to 1 pack	3	13.6
>1 pack	1	4.5
Physician advice on the consequences		
Yes	19	86.4
No	3	13.6
Tried to quit smoking		
Yes	10	45.5
No	12	54.5
Awareness on the consequences		
Yes	9	40.9
No	13	59.1

Table 15: Awareness on dietary habits on hypertension

Variables	Frequency	Percentage
Type of diet		
Mixed	46	13.5
Vegetarian	295	86.5
Knows that salt intake increases blood pressure		
Yes	302	88.6
No	39	11.4
Physician advice to take less salt		
Yes	309	90.6
No	32	9.4
Quantity of salt intake		
Less	133	39
Moderate to excess	208	61
Eats more sweet food		
Yes	57	16.7
No	284	83.3
Eats more fatty food		
Yes	65	19.1
No	276	80.9

Table 16: Exercise pattern

Variables	Frequency	Percentage
Exercise		
Yes	211	61.9
No	130	38.1
Exercise pattern		
Daily	148	70.1
Occasionally	63	29.9
Duration of exercise		
<30 min	101	47.9
½–1 h	91	43.1
1–2 h	18	8.5
>3 h	1	0.5
Type of exercise		
Yoga	6	2.8
Walking/jogging	205	97.2
Physician advise to exercise		
Yes	295	86.5
No	46	13.5
Physician advise Importance of exercising		
Yes	201	95.3
No	10	4.7

regarding the complications caused by the uncontrolled HTN also adhered to lifestyle modification in terms of exercise (p=0.001). Majority, 96% (48), of respondent adhered to exercise. The participants who perceived their own health as good and very good had better adherence to exercise (p=0.001). The patients, who adhered to exercise, also consumed less quantity of salt (Table 19). Many patients who are smokers are also alcoholic (p=0.001). Alcoholic participants mostly followed a mixed diet (p=0.001) (Table 20).

DISCUSSION

The current study was undertaken in three secondary care hospitals of Udupi district among hypertensive patients to study the level of awareness, knowledge regarding HTN, and adherence to lifestyle modification. A standardized questionnaire was used which included socio-demographic factors, knowledge, perception, and lifestyle modifications. The level of knowledge and perception regarding the health is analyzed. The prevalence of adherence and non-adherence to

lifestyle modification advised in HTN is found separately for each factor such as smoking, alcohol, diet, salt intake, and exercise.

Single people develop HTN at a much younger age than married people do (p<0.001) and it may be because of low social support and stress [11]. According to study conducted by Lipowicz *et al.*, single men's systolic blood pressure and diastolic blood pressure were higher than married men. Single men were at higher risk of HTN in comparison to married. The difference between married and single was chronic stress, low community support, and food habits such as potassium

and sodium consumption, and loneliness, these above factors can be considered as factors [12,13]. There was an association between age and religion, which showed that Hindus and Christians develop HTN at a later age, when compared with Muslims (p=0.023). This may be because of high red meat intake [14].

The more educated a person is, the earlier in life he/she develops HTN (p<0.001). Either this could be due to lifestyle choices of educated people, or it could also indicate an under-diagnosis of HTN in lesser/uneducated people due to lack of awareness. According to study conducted by Rakesh Ranjan *et al.*, there was difference which is significant was seen in the prevalence of high blood pressure with respect to educational level [15]. In the present study, the prevalence of HTN was comparatively much lower among those who were educated up to graduation and above. According to Wang *et al.*, patients who are educated may be more aware about the disease condition and preventive methods. These may be the reasons for the above said variation [16].

The participants included in the study were those who had been diagnosed with HTN for at least 6 months and were on treatment for the same. Majority of the participants were diagnosed with HTN 5–10 years ago (32.6%), and an almost equal number (31.1%) were diagnosed over 10 years ago. The time elapsed since diagnosis was found to be positively and mildly associated with age of the participants (p<0.001, Pearson's correlation coefficient=0.36). According to Pinto *et al.*, the risk of having high blood pressure increases with age of participants [17]. Occurrence of HTN increased by age ranging from

Table 17: Frequencies of lifestyle modifications

Variables	Frequency	Percentage (%)
Smoking		
Yes	22	6.5
No	319	93.5
Alcohol		
Yes	82	24
No	259	76
Diet		
Mixed	295	86.5
Vegetarian	46	13.5
Salt intake		
Less	133	39
Moderate to excess	208	61
Exercise		
Yes	211	62
No	130	38

Table 18: Association between exercise and socio demographic factors

Socio-demographic factors	Exercise				p-value
	Yes		No		
	Frequency	Row n%	Frequency	Row n %	
Age (years)					
18–33	4	66.7	2	33.3	0.001
38–48	19	70.4	8	29.6	
49–63	100	74.6	34	25.4	
64–78	79	50.3	78	49.7	
79–93	9	52.9	8	47.1	
Education					
Graduates or post graduate	37	92.5	3	7.5	0.001
High school	59	84.3	11	15.7	
Illiterate	81	37.4	59	62.6	
Primary school	34	57.9	57	42.1	
Occupation					
House wife	101	61.2	64	38.8	0.001
Labor	17	48.6	18	51.4	
Own business	44	75.9	14	24.1	
Professional	22	91.7	2	8.3	
Unemployed	27	45.8	32	54.2	
Socio-economic status					
Upper class	4	50.5	4	50.0	0.001
Upper middle class	103	81.7	23	18.3	
Lower middle class	77	55.8	61	44.2	
Upper lower class	26	38.8	41	61.2	
Lower class	1	50.0	1	50.0	

Table 19: Salt intake and hypertension

SAL intake	Less quantity		Moderate to excess quantity		p-value
	Frequency	Row n%	Frequency	Row n%	
Hypertension diagnosed					
2–5 years	44	50.6	43	49.4	0.001
5–10 years	47	42.3	64	57.7	
6 months-2 years	13	35.1	24	64.9	
>10 years	29	27.4	77	72.6	

Table 20: Association between alcohol with smoking and diet

Alcohol	Yes		No		p-value
	Frequency	Row N%	Frequency	Row N%	
Smoking					
Yes	15	18.3	67	81.7	0.001
No	7	2.7	252	97.3	
Diet					
Yes	82	27.8	213	72.2	
No	0	0.0	46	10.05	

5.4% in below 20 years age group to 80% in ≥70 years age group seen in the study conducted by Ulasi *et al.* [18].

To test patient's knowledge, risk factors of HTN and complications of HTN were asked. Half the patients did not have any idea about the risk factors, and 63.6% patients did not know about the complications of HTN. The awareness level seen less in other studies compared to this study. In study conducted by Carroll *et al.*, patients with stroke or transient ischemic attack, 43% of the high blood pressure participants had awareness regarding risk factors. Samsa *et al.*, in his study interviewed 1261particiipants with increased risk of stroke, in that 41% of participants were aware of risk factors [19].

Eighty-two (24.0%) were alcoholic and are considered in the group of participants that do not adhere to the lifestyle modification advice given to them. Study conducted by Tibue *et al.*, 23.8% of the study population were alcoholic and 74.8% of the participants were adherent to lifestyle modification in regard to alcohol intake [20]. Out of them 52.5% (43) were occasional drinkers and 19.5% (16) of alcoholic participants are drinking alcohol dally. Fifty (61.0%) were taking 90 ml of alcohol and 28 (34.1%) were drinking 180 ml alcohol per sitting. Maximum number of alcoholic participants had no awareness regarding consequences caused by the alcohol in HTN. Half of the participants were not advised to quit alcohol by their physician. In the study of Tibeu *et al.*, 56.9% the patients were given advice to quit consumption of alcohol by the physician and patients relatives [21]. Only 11 (13.4%) participants tried to quit drinking in this current study.

Very small number of participants, that is., 6.5% was smokers and did not adhere to lifestyle modification advice they received in regards to smoking. In the study conducted by Tibeu *et al.*, 14.1% of participants were smokers. About 40.9% participants were aware of consequences of smoking. Nineteen (86.4%) participants told that they were advised to quit smoking by physician but 45.5% smokers tried to quit smoking. According to Tibeu *et al.*, 57 (41%) participants were still smoking and 26 (45.6%) participants did even tried to stop smoking [22].

Maximum number of participants, that is, 295 (86.5%) was practicing mixed diet pattern and only 13.5% were vegetarian. The prescribed diet in HTN is DASH diet. Red meat, diet with high cholesterol, and salts are restricted in HTN. The DASH diet contains vegetables, fruits, and low fat milk products, which included grains, fish, and nuts with reduced red meat, fat, and sweets helped in controlling high blood pressure in 70% of patients according to study conducted by Conlin *et al.* In this current study, maximum participants are practicing mixed diet pattern which included non-vegetarian diet, which may had adverse effect on control of HTN [23,24].

Three hundred and two (88.6%) patients had awareness that more salt intake will increase blood pressure. In the study conducted by Mochizuki *et al.*, 80.9% of the participants aware that salt intake has adverse effect on HTN control [25]. Three hundred and nine (90.6%) participants told that they were advised by the physician to take less salt. Only 39% (133) patients had reduced their salt intake and thus were adherent to lifestyle modification in regard to salt intake. A large proportion of patients (284 in number -83.3%) told that they eat lesser sweet now than before, it may be because HTN associated with co-morbidities like diabetes and 80.9% said that they have reduced the consumption of fatty food [26].

Almost two-third of the patient (61.9 %) count-211 told that they exercise. However, out of this only 70 % participants exercise daily. Around 91% participants exercise for <½ h [27]. Only six (2.8%) participant practiced Yoga while all the remaining participants went walking as a form of exercise. In the study conducted by the Tibeu *et al.* adherence to exercise seen in 65.1% of the participants, in these, maximum people (90.1%) do exercise at least weekly 3 times. Almost same number of respondents does the exercise atheist for 30 min [27]. The most common type of exercise performed was walking (55.3%), followed by jogging (28.4%) and aerobics (16.3%). More than half of participants (193–56.5%) participants are non-adherent to the lifestyle modifications in regard to exercise in this current study. In the study conducted by Tibeu *et al.*, adherence exercise was 31.4%. Majority, 295 (86.5%) were advised by their physician to exercise and explained the importance of exercise in HTN [28]. According to the study conducted by Alsairafi *et al.*, participants who are not doing exercise had uncontrolled high blood pressure compared to the one-fourth of who are practicing [29].

Adherence to exercise is seen in the age group of 34–48 years and 49–63 years, that is, 70.4% and 74.6%, respectively, (p=0.001). Higher the education level better adherence to exercise (p=0.001) was seen. Majority (92.5%) graduates and 84.3% of high school passed participants had good adherence to exercise. Professionals had good adherence in regard to exercise 91.7% which was followed by participants with own business 75.9%. Hundred and three (81.7%) participants from the upper middle class have the high adherence to exercise [30,31].

The study had limitations like the questionnaire would have included about co-morbidities of the participants by which the confounding factor would have been reduced.

CONCLUSION

The study conducted in secondary care hospitals of Udupi district to know the adherence to life style modification in hypertensive patients visiting medicine OPD. The study found that adherence to exercise, less salt intake, alcohol, and smoking was 43.5%, 39.0%, 76.0%, and 93.5%, respectively. There was very less adherence seen in less salt intake and exercise. Adherence to smoking and alcohol was seen comparatively less in this study. The education level and occupation of the participant are associated with the awareness regarding HTN. Education level, occupation, duration of the disease, and awareness regarding risks and complications of HTN are significantly associated with adherence to lifestyle modification. It was found that there was less knowledge about risks and complications of HTN. There was less awareness regarding importance of lifestyle modification in management of HTN. Very low adherence is seen to the advised lifestyle modification in the study population Education regarding the risks and complications of HTN was very low among the participants which also associated with the adherence to lifestyle modifications. Hence, awareness regarding the HTN should be created. Physicians should spend more time in explaining the recommended lifestyle modifications to patients in detail. Each lifestyle modifications should be explained with its importance in control of disease.

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CONFLICT OF INTEREST

Nil.

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