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 Beaufard 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.

Keywords: Life style, Hypertension, Adherence, Risk factors.
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 the 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                    | 41    | 12.0        |
| Completed primary school      | 140   | 41.1        |
| Completed high school         | 79    | 23.2        |
| 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          | 25    | 7.3         |
| Socio-economic status of participant|   |             |
| Lower-lower class             | 2     | 0.6         |
| Upper-lower class             | 67    | 19.6        |
| Lower-middle class            | 138   | 40.6        |
| 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) | Mean | Standard Deviation | p-value |
|----------------------------|-------------------------------|------|--------------------|---------|
| Gender                      |                               |      |                    |         |
| Female                      |                               |      |                    |         |
| Male                        |                               |      |                    |         |
| Marital status              |                               |      |                    |         |
| Single                      |                               |      |                    |         |
| Married                     |                               |      |                    |         |
| Widowed                     |                               |      |                    |         |
| Religion                    |                               |      |                    |         |
| Hindu                       |                               |      |                    |         |
| Muslim                      |                               |      |                    |         |
| Christian                   |                               |      |                    |         |
| Education level             |                               |      |                    |         |
| Illiterate                  |                               |      |                    |         |
| Primary school              |                               |      |                    |         |
| Completed high school       |                               |      |                    |         |
| graduation/postgraduation   |                               |      |                    |         |
| Socio-economic status of participant |               |      |                    |         |
| Lower-lower class           |                               |      |                    |         |
| Upper-lower class           |                               |      |                    |         |
| Lower-middle class          |                               |      |                    |         |
| Upper-middle class          |                               |      |                    |         |
| Upper class                 |                               |      |                    |         |
| Occupation of participant   |                               |      |                    |         |
| Unemployed                  |                               |      |                    |         |
| Homemaker                   |                               |      |                    |         |
| Laborer                     |                               |      |                    |         |
| Self-Employed               |                               |      |                    |         |
| Service/Professional        |                               |      |                    |         |
2–5 years, and a small proportion (1.9%) 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-third of the patients were unable to provide a self-assessment and said they were uncertain. When tested in good health (71%), while almost one-fourth of the 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 (34%), 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 (68%) said that it helps stabilize their blood

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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 %              |
| 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 |                          | 0          | 0.0                    | 3                    | 2.1                                | 1                         | 1.4                    | 2                     | 5.0                  |
| Cardiovascular diseases |                                | 1          | 1.1                    | 1                    | 0.7                                | 1                         | 1.4                    | 0                     | 0.0                  |
| Chronic heart disease   |                                | 6          | 6.6                    | 29                   | 20.7                               | 23                        | 32.9                   | 7                     | 17.5                 |
| Stroke                  |                                | 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 |
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).

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/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                      | 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% | Count | Row n% |
| Education level of participant  |       |        |       |        |       |        |       |        |
| Illiterate                      | 75    | 82.4   | 8     | 8.8    | 8     | 8.8    | 8     | 8.8    |
| Completed primary school        | 107   | 76.4   | 20    | 14.3   | 13    | 9.3    | 13    | 18.6   |
| Completed high school           | 37    | 52.9   | 20    | 28.6   | 13    | 18.6   | 8     | 20.0   |
| Completed graduation/postgraduation | 18   | 45.0   | 14    | 35.0   | 8     | 20.0   | 5     | 8.5    |
| Occupation of participant       |       |        |       |        |       |        |       |        |
| Unemployed                      | 46    | 78.0   | 8     | 13.6   | 5     | 8.5    | 12    | 7.3    |
| Homemaker                       | 124   | 75.2   | 29    | 17.6   | 12    | 7.3    | 7     | 20.0   |
| Laborer                         | 22    | 62.9   | 6     | 17.1   | 11    | 19.0   | 4     | 7.0    |
| Self-employed                   | 40    | 69.0   | 7     | 12.1   | 11    | 19.0   | 5     | 8.5    |
| Service/Professional            | 5     | 20.8   | 12    | 50.0   | 7     | 29.2   | 4     | 12.0   |

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          |
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 (91.7%) 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 |
|-----------------------------------------|------------------|-----------------|------------------|-------------------|
| Helps control hypertension              |                  |                 |                  |                   |
| Count                                   | 23               | 54              | 52               | 45                |
| Column %                                | 62.2%            | 62.1%           | 46.8%            | 42.5%             |
| Does not help control hypertension      |                  |                 |                  |                   |
| Count                                   | 2                | 5               | 5                | 5                 |
| Column %                                | 5.4%             | 5.7%            | 4.5%             | 4.7%              |
| Uncertain                               |                  |                 |                  |                   |
| Count                                   | 12               | 28              | 54               | 56                |
| Column %                                | 32.4%            | 32.2%           | 48.6%            | 52.8%             |

### Table 9: Patient’s feelings on diagnosis and associated factors

| Associated variables                      | Worried because of hypertension | Not worried by hypertension | Uncertain |
|------------------------------------------|---------------------------------|-----------------------------|-----------|
| Education level of participant           | Count                           | Row n %                     | Count     | Row n % |
| 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 |
|-----------------------------------------|-------------------------------|---------------------------|
| Gender of participant                   | Count                         | Column %                  | Count     | Column % |
| 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 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 treat you with respect | 261 76.5% | 79 23.2%      | 1 0.3%    |

Table 12: Distance to travel to health-care center

| Kilometers range | Frequency | Percentage |
|------------------|-----------|------------|
| 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].

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    |         |
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 1261 participants 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 daily. 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 Tibue 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 Tibue 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 Tibue 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 less 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 %) counted-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 Tibue 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 Tibue 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 Alsaikrati 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.

ACKNOWLEDGMENT
Nil.

AUTHOR CONTRIBUTION
Our sincere thanks to karthik rao in correcting the draft and also to everyone instrumental in collection of results and analysis.

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].
CONFLICT OF INTEREST
Nil.

FUNDING
Nil.

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