PAST EXAMINATION shows that hypertension is high in urban areas and less in rural areas. In India, most of the people hypertensive were not aware of their diagnosis. The control and prevention of hypertension has not received continuous or constant attention by India. Therefore, this study was directed with the target of discovering prevalence of hypertension and its risk factors in rural population of India. Hence, this study was directed with the target of discovering prevalence of hypertension and its risk factors in rural villages in south India.

Methods: Data were collected through a door-to-door survey among the residents of the village. Data collected was related to demographics and anthropometric measures. Blood pressure was measured with the help of the medical supervisor. Data were analyzed using Chi-square test for comparison between attributes. The potential hazard factor of hypertension was found by performing binary logistic regression model.

Result: Out of 299 participants considered for the study, 50 were hypertensive contributing to the overall prevalence of 16.72% with 95% confidence interval of 0.1292–0.2137, in which females have the prevalence rate of 17.8% and males with the prevalence rate of 15.5%. The study outcome identified education level, occupation, and family history of hypertension is the predicted risk factors.

Conclusion: The high blood pressure prevalence is low and comparable with the studies conducted in other rural regions of India. More studies are, however, required to decide the apropriation and determinants of hypertension in different parts of this region.

Keywords: Prevalence, Hypertension, Risk Factors, Cross-sectional Study, Rural India, Karnataka, India.
their blood pressure, and the treatment rate was poor followed by control of hypertension [13]. Similar study conducted by Vinod et al. in Amravati, district of Maharashtra, India, shows that the prevalence of hypertension was 13.4% [3]. Older age and body mass index (BMI) was significantly higher among the hypertensive compared with the normotensives. Tobacco and alcohol were significantly associated with hypertension [3]. The related examination conducted in Maharashtra to identify the prevalence of hypertension in rural India also shows that the prevalence rate was 7.24%. The study also identifies that the prevalence of hypertension increases with increase in age, BMI, salt intake, alcohol consumption, and diabetes mellitus [15].

MATERIALS AND METHODS

Materials
Considering the related investigation performed in rural India, it is to be comprehended that high blood pressure prevalence is a fluctuating variable in various part of rural India. Results have demonstrated that the prevalence factor is high in some rural India and extensively low in other rural parts of India. Existing studies also showed that the high blood pressure hazard factors change in different studies and are not same. The current study is necessary for following reasons:

- To identify the extent of hypertension in the study locale.
- To study the high blood pressure prevalence in the examination area.
- To identify the potential risk factor associated with hypertension in study population.

Methods

Sample selection
Korangrapady is a small town situated in Udupi region in Karnataka state with the number of inhabitants of 4944 as per the 2011 statistics. A cross-sectional examination was directed in this region in April 2017. The study included 300 permanent residents belonging to the region aged 20 years and above. All members belonging to one particular family are taken into consideration. All the participants considered in the study are considered to be rural population of India. Ethical clearance was obtained from the institution before the start of examination.

Data regarding significant correlates of hypertension were collected through a door-to-door survey in this study area. A questionnaire uniquely arranged for this examination was utilized for data collection. The questionnaire was structured into three legitimate areas (sociodemographic attributes, behavioral and medical-related inquiries, and anthropometric measurements). The WHO STEPS strategy was adopted to plan on choose of behavioral and lifestyle characteristics and estimates of weight and height. This is the first study that has been conducted in this area to identify the determinants of hypertension. The questionnaire was produced in English language and was managed to administer in Kannada (the neighborhood language) to the participants. Data were collected with the help of a team of two people (1 researcher and 1 medical supervisor). The team was prepared and trained in the methodology of the survey. The survey recorded fundamental demographic data such as age, sex, and education for every individual from the family. Age was cross-checked with individual’s birth certificate and the individuals with no birth declaration certificate age were computed using birth year and affirmed utilizing memory prompts. For those aged 20 years and more, data on tobacco utilize and alcohol admission and a history of hypertension were recorded. Diabetes was recorded as a categorical factor by examining participant’s self-knowledge about the diabetic disease.

Measurements

Blood pressure
Blood pressure was measured in a sitting position with the help of the standard measuring instrument. Twice blood pressure has been measured with the interval of 5 min, the mean of both the measurements is taken into consideration for the study. Hypertension was characterized as BP ≥140 mmHg systolic and ≥90 mmHg diastolic.

This is as per the joint national committee V criteria [4]. Participants having systolic and diastolic blood pressure less than the standard reading is considered to be normotensive, and participants with higher reading are considered to be hypertensive.

Anthropometric measurements
Weight was measured utilizing a standard measuring scale in kilograms and was recorded to the closest of 0.5 kg. Height was measured in a standing position shoes ousted by utilizing measuring tape. Waist estimations were taken utilizing a standard measuring tape. BMI was computed utilizing weight in kg divided by height in meter squared. BMI >25 kg/m² is characterized overweight. Abdominal obesity was characterized to be present when waist circumference ≥90 cm in males and waist circumference ≥80 cm in females.

Sociodemographic factors
The study incorporated the estimation of sociodemographic and behavioral factors such as smoking, alcohol consumption, and fruit intake, daily exercise routine, family history of hypertension, prior health examination of hypertension, education, and occupation. These covariates attributes of hypertension were collected through questionnaire. Categorical variables are communicated as absolute number, and continuous variable are communicated as mean and standard deviation (SD).

Statistical methods

Statistical analysis was done using bivariate methods. Data were tabulated and cross-tabulated and analyzed statistically. Chi-square test is used when confronting groups. The prevalence of hypertension was calculated as a number of participants considered as hypertensive by total number of participants. The overall prevalence of the study was calculated.

Statistical methods

Statistical analysis was done using bivariate methods. Data were tabulated and cross-tabulated and analyzed statistically. Chi-square test is used when confronting groups. The prevalence of hypertension was calculated as a number of participants considered as hypertensive by total number of participants. The overall prevalence of the study was calculated. The prevalence of hypertension was calculated with respect to each of the covariates to understand the contribution of each factor to hypertension. The association of hypertension with sociodemographic factors was surveyed by contrasting the commonness of hypertension and individuals with and without these hazard factors. Binary logistic regression model analysis was used to distinguish the potential hazard factor of hypertension.

\[ \log (P) = \log \left[ \frac{P}{1-P} \right] \]

The potential hazard factor with p<0.05 is held in the examination. Odds ratio (OR) with 95% confidence interval (CI) is reported. All the measurable analysis was done using Statistical Package for the Social Sciences.

RESULTS

Of 4944 residents of the village, a total of 299 were included in the study. The participants considered in the study were all above 20 years of age. Among the respondents of the study, 142 (47.5) were females and 157 (52.5) were males. Most of the participants were within the age group of 40–59 years. The mean age of the participants was 43 years. There were a total of 24 (8.02%) respondents who were known hypertensive and were under medication and were 26 (8.6%) respondents who were newly diagnosed and did not know that they had hypertension.

Only 47% of the participants have obtained secondary education and more. Most of the participants 92 (30.8%) had private job. Of all respondents, 23 (7.7%) were reported as everyday alcohol users and 89 (29.8%) participants are reported as smokers. Among all the participants, 173 (59.6%) had a BMI above 25 or higher. Diabetes and family history of hypertension were collected through self-reporting of the participants.
Table 1: Sociodemographic attributes, medical-related inquiries, measurements, and behavioral information characteristics of adults 20 years and above

| S. No. | Characteristics                  | n=299 (%) |
|--------|----------------------------------|-----------|
| 1      | Age                              |           |
| 20–39  | 127 (42.5)                       |           |
| 40–59  | 141 (47.2)                       |           |
| 60+    | 31 (10.4)                        |           |
| 2      | Gender                           |           |
| Male   | 157 (52.2)                       |           |
| Female | 142 (47.4)                       |           |
| 3      | Education                        |           |
| No education | 25 (8.3)                   |           |
| Primary | 131 (43.8)                      |           |
| Secondary| 94 (31.4)                        |           |
| Higher  | 49 (16.4)                        |           |
| 4      | Occupation                       |           |
| Unemployed | 65 (21.7)                    |           |
| Student | 23 (7.7)                         |           |
| Government employee | 78 (26.1)   |           |
| Private employee | 92 (30.8) |           |
| Own business | 41 (13.7)              |           |
| 5      | Health examination               |           |
| Yes    | 65 (21.7)                        |           |
| No     | 234 (78.3)                       |           |
| 6      | Family history of diabetes      |           |
| No     | 139 (46.5)                       |           |
| Parents | 53 (17.7)                       |           |
| Brother and sister | 50 (16.7)  |           |
| Grandparents | 16 (5.4)              |           |
| Other  | 41 (13.7)                        |           |
| 7      | Daily exercise (30 min)          |           |
| Yes    | 160 (53.5)                       |           |
| No     | 139 (46.5)                       |           |
| 8      | Vegetable and fruit intake       |           |
| Everyday | 169 (56.5)                     |           |
| Weekly | 50 (16.7)                        |           |
| Twice a week | 80 (26.8)    |           |
| 9      | Smoke                            |           |
| Yes    | 89 (29.8)                        |           |
| No     | 210 (70.2)                       |           |
| 10     | Alcohol                          |           |
| No     | 206 (68.9)                       |           |
| Daily  | 23 (7.7)                         |           |
| Weekly | 49 (16.7)                        |           |
| Monthly| 21 (7.0)                         |           |
| 11     | BMI                              |           |
| <25 (normal) | 126 (40.4)                  |           |
| >25 (obesity) | 173 (59.6)                  |           |

*Systolic blood pressure>140 and diastolic blood pressure>90, BMI: Body mass index (Kg/m²), n: No of respondents

Prevalence of hypertension

The sociodemographic and behavioral information characteristics of the study population are shown in Table 1. Of all participants, 50 were considered to be hypertensive giving a prevalence of 16.72 with 95% CI of 0.12–0.21. The average systolic blood pressure of hypertensive participants was 145.52 (SD 5.03) and the average diastolic blood pressure of hypertensive participants was 106.62 (15.12). Whereas in normal hypertensive respondents, the average systolic blood pressure was 128.59 (SD 8.74) and average diastolic blood pressure was 87.75 (SD 12.98).

According to Table 2 the prevalence of hypertension is slightly higher in females 17.8% than in males 15.5%. The study also showed that the prevalence of hypertension was higher among the participants aged 20–39 years 18.1%. Participants with hypertension were significantly older with the average age of 42.6 (SD 12.65). Prior health examination of hypertension had no difference in the prevalence of hypertension. Participants with hypertension also had an average greater BMI of 25.19 compared to the participants without hypertension 23.16. The prevalence of hypertension is slightly higher in females 17.8% than in males 15.5%. The study also showed that the prevalence of hypertension was higher among the participants aged 20–39 years 18.1%. Participants with hypertension were significantly older with the average age of 42.6 (SD 12.65). Prior health examination of hypertension had no difference in the prevalence of hypertension. Participants with hypertension also had an average greater BMI of 25.19 compared to the participants without hypertension 23.16.

Prevalence of hypertension is defined as individuals who had *systolic blood pressure>140 and diastolic blood pressure>90, CI: Confidence interval, n: No of respondents

Factors associated with hypertension

Of all the covariates considered for the study, the factors found to be significantly associated with hypertension include educational level, family history of diabetes, BMI, smoking habits, and alcohol consumption. The prevalence of hypertension was higher among the participants who had a habit of less consumption of vegetables and fruits 28.7%. Participants with diabetes had higher prevalence of hypertension 19% than with participants recorded with negative diabetes. The prevalence of hypertension was high among the members who had a propensity for day-by-day alcohol consumption. The prevalence of hypertension was greater among the participants with smoking habits 21.3% and also among the participants with everyday alcohol consumption 17.4%. Hypertension prevalence was more among participants who had a habit of less consumption of vegetables and fruits 28.7%. Participants with diabetes had higher prevalence of hypertension 19% than with participants recorded with negative diabetes. The prevalence of hypertension was high among the members who had a propensity for day-by-day alcohol consumption.

Factors associated with hypertension

Of all the covariates considered for the study, the factors found to be significantly associated with hypertension include educational level, family history of diabetes, BMI, smoking habits, and alcohol consumption.
Hypertension is one of the main sources of death globally. It builds the danger of heart sickness, stroke, kidney failure, and many other diseases according to global status report on non-communicable disease 2010 [6]. The study conducted by Anchala et al. shows the overall prevalence of hypertension in India was 29.8%, and there was a significant difference in hypertension prevalence in rural India and urban India [7]. The prevalence rate of hypertension in India is lesser compared to the study conducted in China by Wei et al. [41%] [8]. The prevalence of hypertension in rural India is slightly less compared to the prevalence of hypertension in urban India.

This study was conducted in Koranagapady a small rural area in Udupi district, coastal Karnataka, India. The overall prevalence of hypertension of the study was 16.72% which is less compared to the study conducted by Parthaje et al., 29.6% in an urban South India [9]. The study was comparable with the study conducted by Saxena et al., 18% in rural coastal Karnataka [5]. The several studies conducted in rural India show the average prevalence of hypertension has 18.6% [10-13]. Moreover, certain studies conducted also show lower prevalence of hypertension compared to our study with an average prevalence rate of 13.7% and 7.24% [14,15]. The prevalence of hypertension is slightly higher in females (17.8%) than in males (15.55). This shows that there is no much difference between the prevalence rate of male and female in the study. All other study conducted shows the prevalence of hypertension in male is higher than the prevalence of hypertension in females. The prevalence of hypertension was found to be less compared to that of Kerala, which is similar to coastal area with respect to dietary habits, occupation, and higher literacy rate [16,17]. In cross-sectional study, the prevalence of hypertension varies with respect to selection criteria of the study subjects, number of samples considered for the study and the region considered for the study.

The potential risk factors of the study include education level, occupation, BMI, vegetable and fruits intake, and family history of hypertension. BMI was one of the significantly associated risk factors of the current study, which is similar to the study conducted in rural area of Maharashtra by Vinod et al. [18]. Family history of hypertension is also shown as the potential risk factor. This predictor also acts as a strong predictor of hypertension in this region because the study conducted by Rao et al. also shows family history of hypertension is a potential risk factor in coastal region of Karnataka [19]. The study also shows that occupation which is indirectly associated with income and stress level is also a predictor of hypertension in this region. As many studies agreed that there is an association between age and hypertension [20-22] as age increases the risk of having hypertension.

### DISCUSSION

Hypertension is significantly associated with hypertension with p=0.036. Family history of hypertension was significantly associated with hypertension with p=0.023. Table 3 summarizes the illustration of following risk factors associated with hypertension.

### Table 3: Risk factor analysis of hypertension

| S. No. | Characteristics          | Total | Hypertension | OR  | CI (95%)    | p     |
|-------|--------------------------|-------|--------------|-----|-------------|-------|
| 1     | Age                      |       |              |     |             |       |
| 20-39 | 127                      | 23 (18.1) | -          | -  | -           | 0.481 |
| 40-59 | 141                      | 23 (16.3) | 0.498      | 0.091–1.279 | 0.422 |
| 60+   | 31                       | 4 (12.9)  | 0.397      | 0.086–1.828 | 0.236 |
| 2     | Gender                   |       |              |     |             |       |
| Male  | 157                      | 22 (15.5) | 0.853      | 0.341–2.132 | 0.733 |
| Female| 142                      | 28 (17.8) | -          | -  | -           | -     |
| 3     | Education                |       |              |     |             |       |
| Primary| 131                      | 32 (24.4) | 0.315      | 0.025–3.952 | 0.371 |
| Secondary| 94                       | 9 (9.6)   | 1.21      | 0.357–4.110 | 0.758 |
| Higher | 49                       | 7 (14.3)   | 0.310      | 0.087–1.106 | 0.041*|
| 4     | Occupation               |       |              |     |             |       |
| Student| 23                       | 5 (21.7)   | 0.319      | 0.089–1.148 | 0.080 |
| Private employee| 92           | 14 (17.9)  | 0.326      | 0.055–1.935 | 0.217 |
| Government employee| 78         | 13 (14.1)  | 0.436      | 0.124–1.535 | 0.196 |
| 5     | Self employed            | 41     | 11 (26.8)   | 0.271 | 0.080–0.921 | 0.036*|
| 6     | BMI                      | 299    | 50 (16.72)  | 0.807 | 0.710–0.917 | 0.001**|
| 7     | Vegetable and fruit intake|       |              |     |             |       |
| Everyday| 169                      | 22 (13.0) | -          | -  | -           | 0.037*|
| Weekly | 50                       | 5 (10.0)   | 0.356      | 0.142–1.895 | 0.028*|
| Twice a month | 80               | 23 (28.7)  | 0.216      | 0.071–0.957 | 0.043*|
| 8     | Family history of hypertension | | | | | |
| Parent| 53                       | 19 (35.8)  | 0.410      | 0.100–1.684 | 0.216 |
| Brother/sister| 50          | 10 (20.0)  | 4.553      | 1.109–18.69 | 0.035*|
| Grandparent| 16            | 3 (18.8)   | 1.375      | 0.306–6.222 | 0.676 |
| Other  | 41                       | 4 (9.8)    | 0.522      | 0.074–4.108 | 0.562 |
| 9     | Smoke                    |       |              |     |             |       |
| Yes   | 89                       | 19 (21.3)  | 0.501      | 0.191–1.314 | 0.160 |
| No    | 210                      | 31 (14.8)  | -          | -  | -           | -     |
| 10    | Alcohol                  |       |              |     |             |       |
| No    | 206                      | 37 (18.0)  | -          | -  | -           | 0.349 |
| Daily | 23                       | 4 (17.4)   | 1.958      | 0.399–9.613 | 0.408 |
| Weekly | 49                       | 6 (12.2)   | 0.809      | 0.095–6.327 | 0.918 |
| Twice a week | 21              | 3 (14.3)   | 0.731      | 0.119–4.506 | 0.736 |

*p<0.05 is considered as statistically significant, **systolic blood pressure>140 and diastolic blood pressure>90, CI: Confidence interval, BMI: Body Mass Index (Kg/m²). OR: Odds ratio
is high. The current study shows that the prevalence of hypertension is high among the participants aged 20–39 years than among with higher age. This indicates that hypertension is rapidly growing in younger generation in this area. The study also showed the association between education level and hypertension. The prevalence of hypertension was high among the participants with primary level of education (32%). This may be due to lack of knowledge about hypertension and no proper medication taken. Utilization of vegetable and organic product is likewise a critical factor associated with hypertension. The prevalence of hypertension was high with members having twice every week utilization of vegetable and organic products. This indicates that hypertension was high among the people who less utilizes vegetable and organic products than with the members who consume every day and weekly. This examination has potential constraints. Initially, being a cross-sectional one, it has inborn limitation; hypertension may have preceded some of the logical factors. Second, this examination is restricted to behavioral and physical estimations and did exclude biochemical estimations. Third, it just covered a part of the study population concerned with the study region.

**CONCLUSION**

There was a prevalence of 16.72% in rural coastal population of Udupi district, Karnataka, India. A significant proportion of 8.6% of participants were unaware of having the hypertension condition. Education level, occupation, family history of hypertension, and vegetable and organic food consumption are identified risk factor of hypertension in the study region. Our study is the only community-based examination directed in this rural population concerned with the study region. The prevalence and correlates of prehypertension among adults in urban south India. Asia Pac J Public Health 2016;28:935-101S. Galav A, Bhataanagar R, Meghalwak SC, Jain M. Prevalence of hypertension among rural and urban population in Southern Rajasthan. Natl J Community Med 2016;6:174-8.

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