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RESEARCH ARTICLE

DIET AND NUTRITIONAL STATUS OF ESSENTIAL SYSTEMIC HYPERTENSIVE ADULTS IN  
JABALPUR CITY OF MADHYA PRADESH, INDIA

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ABSTRACT

**Background:** Hypertension remains a global asymptomatic non-communicable disease and a preventable risk factor but often leads to health complications, if untreated. Many factors seem to be responsible for influencing hypertension; however, the role of dietary factors and nutrients still remains unclear and needs to be explored.

**Objectives:** The objective of the present study was to assess the nutritional status of systemic hypertensive adults and to find the correlation of nutrients with age of the hypertensive adults.

**Materials and Methods:** A cross sectional study with purposive random sampling was conducted wherein a government Medical college of Jabalpur city and some leading physicians were requested to send 200 newly diagnosed hypertensive cases in the age group of above 20-59 years for voluntary participation in the study. The subjects were enrolled in the study after taking their informed written consent. The subjects were interviewed through pilot tested questionnaire consisting of general information, clinical history, socio-demographic information, dietary patterns along with their anthropometric measurements.

**Results:** The prevalence of hypertension was maximum in the age group of 39-49 years affecting both males and females of similar age group. Out of 200 hypertensive cases, 78 (39%) subjects were had family history of hypertension. The nutritional status of the study subjects was assessed wherein 52% hypertensive subjects were found to be over-weight and obese. Meal intake by study subjects was majorly thrice a day (52%). Signs of nutritional deficiencies were found in 44.5% of study subjects. Further Univariate analysis predicted positive association of consumption of different nutrients statistically significant for calories, fibre, and potassium and zinc intake in different age groups.

**Conclusion:** An integrated approach of community based intervention with support from healthcare providers on prevention of hypertension is suggested for early detection and management of hypertension.

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INTRODUCTION

Hypertension remains (Nkosi *et al.*, 2010) a global, non-communicable chronic disease being asymptomatic and often known as the silent killer with signs and symptoms occurring when a target organ is damaged. Hypertension is a condition associated with increased risk for stroke, cardiac failure, renal failure and peripheral vascular disease. The prevalence of hypertension has remained stable or has decreased in economically developed countries during the past decade. However it has dramatically increased in developing countries like India, where marked changes have occurred in food consumption patterns changing from 'traditional' to 'western' due to rapid nutritional transition (Kearney *et al.*, 2004). Excessive intake of saturated fatty acids and trans fatty acids, along with higher consumption of salt and sugar, are risk

factors for hypertension. In addition, tobacco, alcohol intake and obesity increase blood pressure but adjustment for these factors does not entirely explain observed differences among populations, suggesting that other aspects of diet may also influence blood pressure (Alberto Ascherio *et al.*, 1992). Dietary and nutritional factors are thought to contribute to the development of hypertension in susceptible human. A simple correlation found between one nutrient and blood pressure is unlikely. Nevertheless, it is necessary to define the possible contribution of individual nutrients to blood pressure regulation. The evidence currently suggests that the development of high blood pressure depends upon the interaction of several dietary influences, nutritional factors, genetic influences and other influences. Epidemiological, clinical, experimental and randomised controlled trials (Alberto Ascherio *et al.*, 1992) suggest that diets habitually high in salt intake play an important role in increasing blood pressure.

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A recent article also suggests that health intervention, including government policy and action to regulate reduction in the salt content of processed foods, are cost effective ways to limit cardiovascular diseases and could avert over 21 million disability-adjusted life years per year worldwide. Public health approaches (e.g. reducing calories, saturated fat and salt in processed and prepared foods and increasing community/school opportunities for physical activity) can achieve a downward shift in the distribution of a population's blood pressure, thus potentially reducing morbidity, mortality and the lifetime risk of an individual's becoming hypertensive.

Furthermore, community based interventions focussing on public awareness on hypertension is extremely important as most of the population remains unaware of the symptoms of hypertension and is generally diagnosed in case of any illness. These public health approaches can provide an opportunity to intervene early interventions to prevent the costly affair of hypertension management and its complications with lifestyle modifications.

## MATERIALS AND METHODS

The present study was conducted in the Department of Medicine and Biochemistry, Government Medical College, Jabalpur, Madhya Pradesh with the primary objective of delineating dietary habits and nutritional status of hypertensive adults. This cross sectional study was conducted after Institutional Ethics Committee's approval. Both males and females aged more than 20- >59 years were included while pregnant women or unhealthy subjects with serious health issues were excluded. A purposive sampling of 200 newly diagnosed cases of essential systemic hypertension from the hospital were registered for the participation in the study after obtaining their informed written consent. Apart from this, some leading physicians were also requested to send newly diagnosed cases of systemic hypertensive adults.

All the cases included in the study were subjected to ancillary investigations suggested for ruling out the identifiable cause of systemic hypertension. Participants were subjected to a pre-tested questionnaire including general information, personal, clinical and laboratory investigations. Measurement of Blood Pressure (BP) was carried out on each participant by using the standard technique (Canadian Hypertension Education Program, 2009). It was measured in left arm in the sitting position on the upper arm with the arm supported, with the palm facing upward. Mercury column Sphygmomanometer was used to measure the BP. The average value of three consecutive BP readings was taken in to account for this study purpose. A subject was considered hypertensive if one had an average systolic blood pressure (SBP) of 140 mmHg or Diastolic Blood Pressure (DBP) of 90 mmHg, or if he or she was using antihypertensive medication with normal or high BP. The grading of systemic hypertension was done according to the WHO Technical report (Series No.628). The systemic hypertension in adults was characterised by the systolic blood pressure equal to or greater than 95 mmHg. Essential hypertension is defined as systemic hypertension without any evident organic cause. In the present study, the evident organic cause was ruled out by subjecting the hypertensive patient to

clinical, electrocardiographic, radiographic and related laboratory investigations. Body mass index (BMI) was calculated using the formula: weight (Kg)/height (m<sup>2</sup>). Generalized obesity was defined using the new WHO Asia Pacific guidelines i.e. BMI  $\geq 25$  kg/m<sup>2</sup> and abdominal obesity as waist circumference  $\geq 90$  cm for men and  $\geq 80$  cm for women (World Health Organization, 2000). The subjects were enquired about their dietary habits using a food frequency questionnaire (De Lezenne Kromhout and Coulander, 1984). The data was entered, filtered and analyzed by using SPSS 18<sup>th</sup> version.

## RESULTS

The information, concerning each individual case, was carefully recorded and analysed using standardised questionnaire-cum-personal interview method. Among 200 systemic hypertensive adults, 116 (58%) were males and 84 (42%) were females. The subjects were in the age range of above 20 ->59 years. Among the study subjects, majority of the hypertensive cases in respect to both males and females were found to be in the age group of 39-49 years seen in Table 1.

**Table 1. Categorisation of Hypertensive Adults in Groups and as per Sex**

| Group       | Age (yrs) | Male |       | Female |       | Total |        |
|-------------|-----------|------|-------|--------|-------|-------|--------|
|             |           | No.  | %     | No.    | %     | No.   | %      |
| I           | >20-29    | 7    | 3.50  | 3      | 1.50  | 10    | 5.00   |
| II          | >29-39    | 25   | 12.50 | 12     | 6.00  | 37    | 18.50  |
| III         | >39-49    | 46   | 23.00 | 32     | 16.00 | 78    | 39.00  |
| IV          | >49-59    | 17   | 8.50  | 29     | 14.50 | 46    | 23.00  |
| V           | >59       | 21   | 10.50 | 8      | 4.00  | 29    | 14.50  |
| Grand Total |           | 116  | 58.00 | 84     | 42.00 | 200   | 100.00 |

Based on the WHO classification of hypertension, the study subjects were categorised into three categories as per the severity of hypertension viz. mild, moderate and severe as presented in Table 2.

**Table 2. Categorisation of Adults as per the severity of Hypertension**

| Group       | Severity of Hypertension | No. | %   |
|-------------|--------------------------|-----|-----|
| I           | Mild                     | 156 | 78  |
| II          | Moderate                 | 28  | 14  |
| III         | Severe                   | 16  | 8   |
| Grand Total |                          | 200 | 100 |

Further, the socio-demographic data revealed that majority of cases were Hindus (89%). The data on physical activity revealed that most of the subjects (76%) had sedentary lifestyle while 23% cases had moderate physical activity (Durnin and Womersley, 1974). Out of 200 hypertensive cases, 78 (39%) subjects were having family history of hypertension while 122 (61%) didn't had any family history. The nutritional status of the study subjects was assessed wherein 52% hypertensive subjects were found to be over-weight and obese. The data on dietary habits revealed that 126 (63%) of study subjects were vegetarian while 74 (37%) were non-vegetarian respectively. Meal intake by study subjects was majorly thrice a day (52%) or twice a day (83%) while only (6%) very few of subjects took meals four times a day. Signs of nutritional deficiencies were

found in 44.5% of study subjects. The common signs were pallor, pigmentation, koilonchiya and spongy bleeding gums whose incidence was respectively 12%, 10.5% and 6% amongst study subjects. There is meagre literature available relating sign of nutritional deficiencies in hypertension. Univariate analysis was carried out to find association of nutrient intake with age of the hypertensive subjects as presented in Table 3.

obese, this clearly highlights the role of obesity as risk factor to hypertension while most of the subject were leading sedentary lifestyle which could be also an underlying risk factor responsible for hypertension. A significant relationship was found between nutritional status and blood pressure in this study. The pattern is similar to what is observed for the Latin American countries and a few other developed countries of Europe.

**Table 3. Univariate Analysis of Nutrient intake of Hypertensive Subjects as per their Age**

| Nutrients         | Group I                    | Group II         | Group III        | Group IV       | Group V            | F    | P         | Significance |
|-------------------|----------------------------|------------------|------------------|----------------|--------------------|------|-----------|--------------|
|                   | Age (yrs) 20-<29<br>N (10) | 29-<39<br>N (39) | 39-<49<br>N (78) | 49-<59<br>(46) | 59 & above<br>(29) |      |           |              |
| Calories (kcal)   | 2619.64±167.60             | 2359.26±87.13    | 2424.95±60.01    | 2254.36±78.14  | 1956±98.42         | 5.20 | P=0.01*** | S            |
| % Cal Pro.        | 11.27±0.42                 | 11.17±0.22       | 11.13±0.15       | 10.57±0.20     | 11.34±0.25         | 1.95 | P>0.05    | NS           |
| % Cal Fat         | 30.02±2.59                 | 27.45±1.34       | 27.77±0.92       | 30.01±1.20     | 26.61±1.52         | 1.09 | P>0.05    | NS           |
| % Cal CHO         | 58.70±2.48                 | 61.36±1.29       | 61.08±0.88       | 59.40±1.15     | 62.04±1.45         | 0.80 | P>0.05    | NS           |
| Total Fibre (gms) | 44.59±4.58                 | 39.68±2.38       | 38.97±1.63       | 34.76±2.13     | 30.09±2.68         | 2.91 | P<0.05    | S            |
| Crude Fibre (gms) | 8.47±0.75                  | 7.94±0.39        | 8.16±0.26        | 7.54±0.35      | 6.46±0.44          | 3.12 | P<0.05    | S            |
| Sodium (mg)       | 3070.33±253.75             | 2627±131.40      | 2706±90.50       | 2733.99±117.84 | 2856.42±148.42     | 0.80 | P>0.05    | NS           |
| Potassium (mg)    | 2189.79±157.06             | 2078.57±81.65    | 1988.89±56.23    | 1844.12±73.23  | 1745.32±92.23      | 3.07 | P<0.05    | S            |
| Magnesium (mg)    | 572.92±46.90               | 520.96±24.38     | 534.65±16.79     | 473.76±21.87   | 477.79±27.54       | 2.06 | P<0.05    | NS           |
| Zinc (mg)         | 1218.30±109.40             | 903.62±56.92     | 909.74±39.20     | 921.93±51.05   | 844.17±64.29       | 4.39 | P<0.01    | S            |

On analysing combative data of the consumption of different nutrients statistically in different age groups of hypertensive subjects, significant difference was found for calories, fibre, potassium and zinc intake in different age groups. The data clearly indicates a decreasing trend in consumption of total calories with advancing age among hypertensive adults i.e. higher the age, lower the calories intake except in group III. Adults in the age group of 39-<49 years consumed higher calories and are more vulnerable of developing high blood pressure. The difference was statistically significant.

## DISCUSSION

The present study highlighted the nutritional status of hypertensive adults and categorised adults based on the severity of disease. It was found that most (78%) of the adults had mild hypertension while 8% of the study subjects had severe hypertension. This could be possible due to the fact that subjects who recognised the symptoms and consulted the physician at right time were diagnosed early while still 8% of the subjects were remain unaware of the symptoms of hypertension and lately consulted the physician. This is in agreement to studies which states that a considerable proportion of the general population remain unaware of having hypertension or do not have their blood pressure well controlled (Panagiotakos *et al.*, 2003). Majority of the study subjects were Hindus, followed by Sikh and other religion. A number of researchers have found that religious commitment has a salutary effect on blood pressure levels (Fields *et al.*, 2004). Idemiologic studies of the effects of religion on blood pressure suggest that religious commitment is inversely associated with blood pressure and that several religious denominations or groups have relatively low rates of hypertension-related morbidity and mortality (Rudnick *et al.*, 1977).

The data on nutritional status of study subjects predicts that 52.2% of the study subjects were found to be overweight and

These study findings are consistent with those of other studies, although the criteria applied to define high blood pressure and establish nutritional status categories may not have been the same (Anthony Walsh Religion and Hypertension: Testing Alternative Explanations Among Immigrants Behavioral Medicine, 1998). The more common defining characteristics include "lack of physical conditioning" and "lack of physical exercises (Jeffrey *et al.*, 1989). This is in line with the study (Omura *et al.*, 2004) conducted in Japan. A definitive link between obesity and hypertension has been found using animal and clinical studies; from these it has been realized that many mechanisms are potential causes of obesity-induced hypertension. These mechanisms include the activation of the sympathetic nervous system as well as the activation of the renin-angiotensin-aldosterone system (Guerra *et al.*, 2001).

The difference in consumption of total fibre, crude fibre, potassium and zinc were found to be statistically significant in different age group of hypertensive, the consumption being lower for higher age. These trends were statistically significant for energy (P<0.05) as well. Evidence from observational studies and several clinical trials suggests that increased fiber intake may reduce BP. Studies suggest that increased potassium has beneficial effects on BP in the setting of a low intake (eg, 1.3 to 1.4 g/d, or 35 to 40 mmol/d) (Guedes *et al.*, 2010) or a much higher intake (eg, 3.3 g/d, or 84 mmol/d) (Rahmouni *et al.*, 2005). These nutrients may be important determinants of hypertension (Brancati *et al.*, 1996; Naismith Braschi, 2003). The prevalence of hypertension is increasing with rapid globalization, urbanization and stress affecting right from adolescents to adults of all age and irrespective of sex. There is an urgent need to carry out surveillance to find out the exact prevalence of hypertension amongst different age group of individuals and populations. Individual or community based interventions are essential in raising awareness on hypertension amongst adults such that they are aware of early signs and symptoms of high blood pressure. An awareness generation camps may be organised in communities, workplace, schools,

hospitals etc to maximize awareness against hypertension. Various behavioural communication change strategies may be adopted with relevant development of IEC materials along with guidelines on prevention and management of hypertension for maximising awareness generation. The Government of India may establish linkages with community body institutions and other health care providers for providing helpline or helpdesks for providing health information against hypertension and its management. Though, the Government of India has been tackling hypertension through National Non-communicable diseases Control program; however it needs to be strengthened through implementing effective clinical and public health strategies that lead to effective control of hypertension among individuals and populations.

**Conflict of Interest-** Not any

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