Chapter III

MATERIALS AND METHODS

An appropriate selection and application of scientific methodology adds to clarity of research design. This chapter therefore elucidates in details the methodological steps used for present investigation distinctively described under the following headings:

3.1 Domain of the study
3.2 Sampling procedure
3.3 Development / construction of questionnaires
   3.3.1 Questionnaire/ interview schedule
   3.3.2 Awareness / knowledge testing schedule
3.4 Collection of data
   3.4.1 General and socio economic profile
   3.4.2 Information regarding Hypertension
   3.4.3 Anthropometry
   3.4.4 Dietary assessment
   3.4.5 Physical activation
   3.4.6 Nutrition education /counselling
3.5 Data analysis
   3.5.1 Tabulation of the data
   3.5.2 Statistical analysis

3.1 Domain of the study

The present study was undertaken in the Department of Food Science and Nutrition, College of Home Science, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur.

3.2 Sampling procedure

The present study was conducted on a total of one hundred thirty hypertensive subjects of age 30 years and above, selected randomly from Palampur region of Kangra District (H.P.). The information regarding hypertensive subjects was collected from different medical institutes near the CSK HPKV, University vicinity like University Health Centre, Civil Hospital and other private nursing homes. Most of the hypertensive subjects were employees of CSK HPKV Palampur and the subjects were also identified from residential areas of university as well as from nearby areas through personal contacts.
3.3 Development / construction of questionnaires

Firstly a preliminary survey of few subjects was conducted to investigate their dietary habits and other baseline information for further investigation.

3.3.1 Questionnaire/ interview schedule

A well structured and exhaustive questionnaire was formulated after consulting literature to collect the relevant information specifically keeping in mind the objectives of the study. For the pre-testing of questionnaire, 10 questionnaires were got filled up by hypertensive patients other than the selected subjects and then evaluated for responses of the subjects. On the basis of collected information and difficulties faced, necessary improvements / modifications were incorporated to make it more functional and the finalized questionnaire (Appendix-1) was used for final data collection.

3.3.2 Awareness / knowledge testing schedule

A separate questionnaire was drafted to test the awareness / knowledge of the hypertensive subjects regarding general nutrition awareness, knowledge regarding Hypertension and nutrition and Hypertension concepts (Appendix-II). The questionnaire was got filled up by the subjects to adjudge their basic knowledge (pre-testing). The same schedule was filled up by the same subjects after imparting nutrition education to see any change in the knowledge of subjects (post-testing).

3.4 Collection of data

Data was collected through personal interview method. An effort was made to develop a rapport with the subjects to extract correct information as far as possible. Cross checking and indirect queries were also raised to help ascertain the authenticity of data. In order to meet the objectives of the study, the data was collected through a well structured questionnaire cum interview schedule which was divided in various sections viz:

3.4.1 General and socio economic profile
3.4.2 Information regarding Hypertension
3.4.3 Anthropometry
3.4.4 Dietary assessment
   3.4.4.1 Food consumption pattern
   3.4.4.2 Food preferences
   3.4.4.3 Nutrient intake
3.4.5 Physical activity
3.4.6 Nutrition education/ counselling
3.4.1 General and socio economic profile

This segment included the general information, regarding name, sex, age, marital status, educational qualification, occupation as well as the socio-economic particulars such as region, caste, family type, family composition, type of housing, land holding, animal holding, total monthly family income and expenditure pattern of the hypertensive subjects.

3.4.2 Information regarding Hypertension

The information regarding the disease condition included duration of diagnosis, the symptoms, family history of the disease, etiological risk factors and information regarding other complications/disorders besides Hypertension. The data was also collected about the type of measures used to control the disease like information about medications in use as well as dietary modifications if made any.

Blood pressure measurement

Systolic and diastolic blood pressures (BP) of the subjects were determined during the course of the study using a mercury sphygmomanometer and the stethoscope. Blood pressure was reported as systolic / diastolic mm of Hg. A set of two blood pressure readings were recorded each time with a random zero sphygmomanometer reading to reduce the indeterminate type of errors. Mean of all the readings was taken as the final blood pressure of the subjects. Furthermore, the degree of Hypertension was assessed as per WHO, 2003 and JNC-7, 2003 classification.

<table>
<thead>
<tr>
<th>Degree of Hypertension</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Hypertension</td>
<td>120-139</td>
<td>or</td>
</tr>
<tr>
<td>Stage I Hypertension</td>
<td>140-159</td>
<td>or</td>
</tr>
<tr>
<td>Stage II Hypertension</td>
<td>&gt;/= 160</td>
<td>or</td>
</tr>
</tbody>
</table>

3.4.3 Anthropometry

Anthropometric measurements are considered as a tool for assessing nutritional status. Body measurements though are simple and easy to measure, at the same time giving maximum information on nutritional status of the subjects. The correlation of anthropometric measurements with blood pressure was also calculated. The details of various anthropometric measurements taken and standard methods followed are given below:

3.4.3.1 Height

Height was measured according to the method described by Jelliffe (1966) with the help of anthropometer rod. The barefooted respondents were made to stand erect with heels, buttocks,
shoulders and back of the head touching the upright anthropometer rod at the back. The head was held comfortably erect and the arms hanging on the sides in a natural manner. The head piece was gently lowered crushing the hair and making contact with the top of the head. Height was measured and the readings were recorded to the nearest of 0.5cm. The same procedure was repeated thrice to avoid any error and then mean was taken.

3.4.3.2 Weight

The weights of the respondents were taken using the weighing balance calibrated in kilograms and grams (Jelliffe, 1966). The balance was initially standardized with known weight before use and kept on a flat surface adjusted to zero. The subjects with light clothing and were shoes removed were made to stand erect on the centre of the platform without any support. The weight was recorded in kilograms and determined to the nearest of 0.5 Kg to avoid errors. The mean of three readings was taken as the weight of the subject.

3.4.3.3 Mid upper arm circumference (MUAC)

Mid upper arm circumference indicates both calorie and protein reserves and is a good indicator of nutritional status as well as over nutrition. The measurements were taken firmly around mid way marked the lateral part of the left upper arm with the subjects forearm held in horizontal position. The measurement was taken with a non stretchable fibre glass tape calibrated in inches, centimeters and millimeters to the nearest 1millimeter at the marked mid point. The mean of two readings was taken as final value.

3.4.3.4 Waist and hip circumferences

Waist circumference is a measurement at the naval point when the patient breaths quietly, whereas, the hip circumference was measured at the intertchantric level (Despres, et al., 1991) with the help of non stretchable tape.

3.4.3.5 Indices derived from growth measurements

The indices are an essential part of the interpretation of anthropometry (WHO,1986). Indices constructed from two or more raw measurements included BMI, WHR and WHtR.

3.4.3.5.1 Body mass index (BMI)

BMI, a measure of body weight adjusted for height is used as an indicator of nutritional status and size of the body energy store in adult population and includes both fat and lean tissues.
BMI was calculated by the equation given by Garrow and Webster (1985).

\[
\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height}^2 (m)} = \text{Kg / m}^2
\]

**Classification of BMI (WHO, 1998)**

<table>
<thead>
<tr>
<th>BMI (Kg / m(^2))</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 18.50</td>
<td>underweight</td>
</tr>
<tr>
<td>18.50 – 24.99</td>
<td>normal range</td>
</tr>
<tr>
<td>25.00 – 29.99</td>
<td>overweight</td>
</tr>
<tr>
<td>30.00 – 34.99</td>
<td>obese – Grade I</td>
</tr>
<tr>
<td>35.00 – 39.99</td>
<td>obese – Grade II</td>
</tr>
<tr>
<td>≥40.00</td>
<td>obese – Grade III</td>
</tr>
</tbody>
</table>

3.4.3.5.2 Waist-to-hip ratio (WHR)

WHR is a measurement of visceral obesity and is a strong indicator of risk of Hypertension, cardiovascular diseases and some other disease like cancer etc. (Rockville, 1993).

\[
\text{WHR} = \frac{\text{Waist Circumference (cm)}}{\text{Hip Circumference (cm)}}
\]

**Classification used:**

- 0.7 – 0.8
- 0.8 – 0.9 Where, WHR ≥0.80 for women
- 0.9 – 1.0 WHR ≥ 0.95 for men
- ≥1.0 were considered indicative of abdominal obesity (Florencio, et al., 2004)

3.4.3.5.3 Waist to height ratio (WHtR)

The normal body mass index (BMI) range, as defined by the World Health Organization (WHO) is quite wide and some people within this range may have an excessive central fat accumulation and elevated metabolic risks. Waist circumference is improved by relating it to height to categorized fat distribution and WHtR is a simple and practical anthropometric index to identify higher metabolic risks in normal and overweight people (Hsieh, et al., 2003).

**Classification used:**

- 0.45 – 0.50
- 0.50 – 0.55 Where, WHtR < 0.50 considered normal
- 0.55 – 0.60
- ≥0.60 WHtR ≥ 0.50 considered boundary value for CVD risks (Hsieh, et al., 2003)
3.4.4 Dietary assessment

3.4.4.1 Food consumption pattern

The subjects were interviewed to collect information regarding the detailed dietary history with added information about his / her food likes / dislikes, eating habits, general meal pattern and dietary intake. Added information about dietary modifications (if any) in relation to the Hypertension condition such as foods specially taken, avoided, consumption of salt, heavy salted and other processed foods etc was also collected.

3.4.4.2 Food preferences

Information regarding food preferences of the subjects in terms of frequency of consumption was also collected about a detailed list of food stuffs selected with special reference to their sodium content and inducing risks of metabolic diseases.

3.4.4.3 Nutrient intake

A 24-hour recall method for three consecutive days was used to collect information regarding food intake. Standard measures including glasses, katoris, serving spoons were used to record the amount of food consumed by the subjects. Detailed information about the ingredients used and the method of cooking was also recorded. The amount of cooked food consumed was converted into raw ingredients and the nutrient intake was calculated by using the value per 100 g of edible portion using Food Consumption Table (Gopalan, *et al.*, 1995). Nutrient intake for three consecutive days was taken and the calculated mean values were used for further analysis. The mean nutrient intake by the subjects was compared with RDA (Gopalan, *et al.*, 1995; FNB, 1980) and furthermore, correlation of nutrient intake with the blood pressure was also calculated.

3.4.5 Physical activity

This component included the information to get an idea about the activity pattern such as sedentary, moderate or heavy working class and the information regarding individual’s exercise schedule if any.

Estimation of energy expenditure (24-hour record)

The information of energy expenditure on routine activities for three consecutive days was collected. The subjects were asked to fill time in minutes spent for each relevant activity. Thereafter, the energy calculations were made using standard method (Wilson, *et al.*, 1967) and the
mean energy expenditure was calculated. Energy value of each activity (cal/ Kg/ min) is given in Appendix – III.

**Formula:** Energy cost of an activity performed by the subject is the product of his BMR and time for which that activity was performed and the metabolic constant assigned to that particular activity. i.e. Total Energy Expenditure (24 hours): BMR + Energy Expenditure in Physical Activity

Where, BMR was calculated using ICMR prediction equation (ICMR, 1990).

For male:

\[
\begin{align*}
30 – 60 \text{ year} & = 10.9 \times B.W \text{ (Kg)} + 833 \\
>60 \text{ years} & = 12.8 \times B.W \text{ (Kg)} + 463
\end{align*}
\]

For females

\[
\begin{align*}
30 – 60 \text{ year} & = 8.3 \times B.W \text{ (Kg)} + 788 \\
>60 \text{ years} & = 10.0 \times B.W \text{ (Kg)} + 568
\end{align*}
\]

**3.4.6 Nutrition education /counselling**

**3.4.6.1 Pre and post testing of knowledge**

The selected proportion of hypertensive subjects (N=50) were firstly evaluated to test their basic Knowledge (pre testing) regarding various aspects of the disease using knowledge / awareness testing questionnaire divided in three parts i.e. general nutrition awareness test, knowledge regarding Hypertension and nutrition and Hypertension.

In nutrition education/ counselling programme, the subjects were educated regarding various aspects of Hypertension, its causes, symptoms and the complications associated with the disease. Subjects were also educated about the importance of various nutrients, balanced diet as well as the necessary dietary and lifestyle modifications required for healthy living. Nutrition education was given individually through printed matters like leaflets and pamphlets according to the field situation and respondent’s convenience. All queries were cleared and discussions were also made with the subjects. The medium of interaction was mostly Hindi and local dialect. Personal contacts with the respondents were maintained and moreover, all the selected subjects were counselled during the period of data collection.

After imparting nutrition education, any changes in the knowledge of the subjects were reassessed by asking them to fill up the same questionnaire (post testing). The responses were evaluated by awarding one score for each correct and zero score for each wrong answer (“Don’t Know” response was given a zero score).
3.4.6.2 Gain in knowledge

Knowledge is a body of understood information possessed by an individual about a particular thing, act or a process. In the present study, the effect of nutrition education was assessed in terms of gain in knowledge calculated by finding out the difference between post and pre exposure knowledge of the subjects, i.e.

\[ \text{Gain in knowledge} = \text{Score of post testing} - \text{Score of pre testing} \]

3.5 Data analysis

3.5.1 Tabulation of the data

After collection of field data, the information was coded on the master sheets and then tabulated into master tables. Depending upon the objectives, different modes of classification i.e. sex wise, age wise and according to degree of Hypertension (HTN) were made to get maximum information from the data.

3.5.2 Statistical analysis

The tables were quantified using frequency tables and also calculated the percentages, standard errors and means for studying variables. Statistical analysis was carried out on socio economic parameters, disease variables, anthropometric measurements and nutrient intake and energy expenditure by the subjects. The data was statistically analysed to find out various differences and associations among variables using \( \chi^2 \), correlation and t-tests (paired ‘t’ test for nutrition education) given by Snedecor and Cochran, 1967.