CHAPTER – III

METHODOLOGY

3.1 Research Design

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CHAPTER III

METHODOLOGY

In any research the appropriateness of the methodology to be followed is utmost important. The correct methodology plays a vital role in completing the research work scientifically. The researcher has to take numerous decisions about the selection of the research design, tools and techniques and type of statistical analysis. But proper methodology synchronizes all there steps. Keeping in view the above requirement, the methodology followed for the present study is described in the following paragraphs.

3: 1 Research Design:-

An action research study was made in planning and formulating the research work. A research design is the plan, structure and strategy of investigation conceived so as to obtain answer to research question and to control variance.

All the independent variables involved in the present study are “attribute” variables being beyond the investigator’s control. They cannot be manipulated by investigator. Hence present investigation is called “ex-post facto” in character.
In the present study, a 2x2x2 factorial design was thought to be best suited as the independent variables. Viz., socioeconomic status, eating habits and physical activity were to be varied at two levels to study their main and interaction effects on the dependent variable, viz., and obesity. Therefore, a (2)^3 factorial design was employed to verify the relationship between obesity and three aforesaid independent variables or factors. Further keeping in view of the comparative tone and nature of the first four problems and three hypotheses, the extreme groups (dichotomous groups) comparison oriented “research design” has been thought to be the best suited one. Thus, it is to be registered here that in this piece of research only two, namely, “comparative” and a 2x2x2 factorial design have been employed. The method of difference as the design of proof has been applied to ex-post facto scientific inquiry.

3: 2 LOCATION OF STUDY AREA:-

Study was carried out on age group (13 – 17 years) of children studying in schools of Bhilai steel plant and private organization localized in Bhilai township of Chhattisgarh state.
(figure 3.1) while selecting the schools for the study following criteria is emphasized :-

a) Sample comprised to different categories of schools based on socioeconomic status, religion and communities with different food habits.

b) Study was done during day time (under bright sunlight).

c) No such study has been undertaken earlier in this area.

3:2:1 BACKGROUND INFORMATION:-

Bhilai or Bhilai Nagar is a city in Durg district of Chhattisgarh state. It is situated in 21.22° north latitudes and 81.43° east longitudes. The city is located 25 kilometer (16 mi) west of the capital Raipur on the main Howrah-Mumbai rail line, and national highway 6. Bhilai is famous for Bhilai steel plant which is largest of its kind in India. As per 2001 censes Bhilai Nagar had a population of 753,837. Male constitute 52% of the population and females 48%.

Bhilai Nagar has an average literacy rate of 90%, higher than the national average of 59.5%; with male literacy of 90% and female literacy of 89%, 13% of the population is under 6 years
of age. The city is called Bhilai Nagar which is a planned township, divided into 11 sectors.

Table 3.1 PROFILE OF DURG-BHILAI NAGAR:-

<table>
<thead>
<tr>
<th>State</th>
<th>Total Population</th>
<th>20833803</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban Population</td>
<td>4185747</td>
</tr>
<tr>
<td>District</td>
<td>Total Population</td>
<td>2810436</td>
</tr>
<tr>
<td></td>
<td>Urban Population</td>
<td>1072309</td>
</tr>
<tr>
<td>Bhilai Nagar</td>
<td>Total Population</td>
<td>753,837</td>
</tr>
<tr>
<td></td>
<td>Male population</td>
<td>391995</td>
</tr>
<tr>
<td></td>
<td>Female population</td>
<td>361841</td>
</tr>
<tr>
<td>Bhilai Nagar Administration</td>
<td>Total number of school</td>
<td>156</td>
</tr>
<tr>
<td></td>
<td>Total number of BSP School</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Total number of public School</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Total number of government school</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Total number of students</td>
<td>31,575</td>
</tr>
</tbody>
</table>

Fig: 3.1 MAP OF BHILAI SHOWING LOCATION OF STUDY AREA
3: 3 UNIVERSITY AND SAMPLE:-

Universe means all the number of any well defined class of people, events or objects. Thus, the whole group from
the sample has been drawn, is termed as universe or population. Because of its large size, it is either impossible or impractical for investigators to produce statistics based on all members of the universe. Therefore, it seems necessary to select a representative sample for estimating population characteristic, so that, generalization of inferences can be scientifically made.

In order to get proper estimate of obesity level it is necessary to select sample of at least moderate size. To obtain a true representative sample, the sample should be selected at random. In the present study probability sampling design was used, in which stratified random sampling was done in order to select an unbiased representative sample from the universe. The purpose of stratification is to increase a heterogeneous universe into more and more homogenous one within each stratum. 250 children of 13-17 years of age from BSP Schools and 250 children of same age from public schools of Bhilai city were selected randomly. Total 500 were assessed. Distribution of sample size on different school types is listed in table 3-1. About 2 schools of public sector and 4 schools of BSP were
selected, in order to cover the required number of children from low and high income category.

**Table 3.2 DISTRIBUTION OF SAMPLE SIZE ON DIFFERENT SCHOOL TYPE**

<table>
<thead>
<tr>
<th>Name of school</th>
<th>Type of school</th>
<th>Number of students</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.M.M.S Sect-5</td>
<td>BSP middle school</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>S.S.S. Sect-4</td>
<td>BSP secondary school</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>S.S.S. Sect-10</td>
<td>BSP secondary school</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Bhilai vidyalaya Sect-2</td>
<td>BSP middle and secondary school</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>D.P.S Risali</td>
<td>Private</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>K.P.S Nehru Nagar</td>
<td>Private</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>500</td>
</tr>
</tbody>
</table>

In the present study, the children of different schools are split into a number of categories on the basis of some specific characteristics.
Socioeconomic status – high vs. low income group

Eating habits - excess vs. less food consumption

Physical activity – physically inactive vs. physically active

Thus, in this study we have 2x2x2 or 8 strata were formed. Each factor is to be varied at two levels. In a 2x2x2 factorial design total number of 500 subjects was randomly drawn following the stratified technique. The particulars of the finally selected sample is shown in table No. 3.2

Table 3.3 PARTICULARS OF THE SAMPLE

<table>
<thead>
<tr>
<th>Groups</th>
<th>Excesses food consumption</th>
<th>Less food consumption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physical inactive</td>
<td>Physical active</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSES 82(S₁)</td>
<td>73(S₂)</td>
<td>74(S₃)</td>
</tr>
<tr>
<td></td>
<td>49(S₄)</td>
<td></td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>LSES 49(S₅)</td>
<td>52(S₆)</td>
<td>62(S₇)</td>
</tr>
<tr>
<td></td>
<td>59(S₈)</td>
<td></td>
<td>222</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td>125</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>108</td>
<td></td>
<td>500</td>
</tr>
</tbody>
</table>

3:4 Technique Adopted for Motivation:-

Collection of data is most important step in any research work. To get the required information of the subjects, survey was conducted during school time with the help of instrument and pre-tested structured questionnaire.
3:4:1 **Pilot survey:-**

In the first stage a pilot survey was conducted on 80 subjects to know the characteristic of child population taken under study. The question which was found ambiguous was eliminated and necessary modification was made. In this pilot survey basic anthropometric measurement (height, weight, waist, hip, MUAC) of the children were measured as well as pre-tested questionnaire are used. This pretesting system of the question helped in the physical layout for the final questionnaire.

3:4:2 **Final Surveys:-**

Finalized through the pilot survey plan consisted of the following features:-

(a) Anthropometric measurement; such as height (cm), weight (kg), mid upper arm circumference (cm), waist hip circumference (cm), triceps measurement (mm) each of the students were measured. According to percentile method the children were classified as overweight and obese.
(b) Another questionnaire was administered to all the students for collecting their socioeconomic status such as community, type of house, type of residence, possession of household articles and information on the type of fuel used for cooking purposes, mode of transport etc.

(c) Using non quantitative food frequency questionnaire for dietary survey. The frequency of consumption of various foods for the past one month was collected on the entire overweight and obese subjects as well as non obese/overweight subjects.

(d) To assess the life style pattern and physical activity another pre-tested questionnaire was used. Information on physical activity such as participation in outdoor and indoor games (hours/week); exercises (hours/day) like jogging, cycling etc, time spent on watching television was collected.

3.5 Tools and Techniques for data collection:-

Tools play very important role in any research. A research cannot be conducted scientifically without proper tools. Tools in research refer to the scales or measures or questionnaires,
used to conduct the research. Through these tools the researcher can assess’ scores and can arrive at conclusions.

In the present study different types of tools are used these are:-

1. Anthropometric measurements;
2. Non quantitative food frequency questionnaire;
3. Socioeconomic status scale;
4. Pre-test questionnaire for physical activity and lifestyle pattern.

(1) **Anthropometric Measurements** :-

The anthropometric measurements taken for each subject include height in centimeters (cm), weight in kilograms (kg), three circumferences in centimeters (cm) [mid-upper arm, minimum waist and maximum hip] and one skin fold measurements in millimeters (triceps). In the present study two directly measured variables (MUAC and triceps skin fold thickness) and two derived variables (body mass index and waist-hip ratio) were included.

1. A: **BMI**: -
It is to assess how much an individual body weight departs from what is normal or desirable for a person of his or her height.

BMI (Quetelet’s index) = Weight (kg)/ Height (m²). The WHO classification of BMI are valid when applied to adults, and do not predict health (*Aykroyd and J.Mayer, 1968*).

BMI values for adults are age and sex independent. However in children BMI changes physiologically with age and sex. At birth the median BMI is as low as 13 kg/m², increasing to 17 kg/m² at age 1, decreasing to 15.5 kg/m² at age 6, then increasing to 21 kg/m² at age 20. The American obesity uses the 85\textsuperscript{th} percentile of BMI for the age and sex as a reference point for overweight and the 95\textsuperscript{th} percentile for obesity in children (CDC growth charts, 2000).

1. B: **Waist-Hip ratio**:-

   Nutritional Foundation of India (NFI), New Delhi, 2004 has classified central obesity for male and female based on waist-hip ratio (WHR).

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHR I</td>
<td>&lt; 0.93</td>
<td>&lt; 0.81</td>
</tr>
<tr>
<td>WHR II</td>
<td>0.93 – 1.0</td>
<td>0.81 – 0.89</td>
</tr>
</tbody>
</table>
Waist circumference alone provides crude index of absolute amount of abdominal tissue where as waist-hip ratio (WHR) provides index of relative accumulation of abdominal fat since a simultaneous increase in waist and hip measurements in the same individual would mean the WHR remaining stable over time despite considerable accumulation of abdominal fat which can be thus assessed by the increased waist circumference.

(2) Non quantitative food frequency questionnaire (FFQ):

It is self made non quantitative FFQs used to find out the dietary habits of the particular subject. The questionnaire is in English language. FFQs was used to derive food habits based on the information collected on 31 food items. Consumption of different food items was differentiated into more than once/day; once/day; 2-3 time/week; seldom and never. In this questionnaire all the food groups are included
(Milk and milk product; cereals and pulses; fruits and vegetables; non vegetarian foods; fats and oils including fast food, beverages, sweets).

(3) Socioeconomic status scale:-

Socio-economic status scale was developed by Agashe and Helode which was modified by us according to research area. The scale is in Hindi language. This socioeconomic status scale contain 10 items With particulars such as family education, family occupation, composite family income, type of house, type of residence, possession of house hold articles, information on type of fuel used for cooking purposes, mode of transport and family expenditure.

(4) Self made Questionnaire for physical activity:-

It is self made questionnaires were used, to collect the information on physical activity level including lifestyle pattern. Under this questionnaire 6 items asked for physical activity of the children and 5 items taken for life style pattern of the children. Physical activity such as participation in physical education, like and dislike of outdoor and indoor games; exercises (hours/week) like cycling, walking, yoga,
dancing, time spent on watching television, video and computer games, mode of transport. Information taken on lifestyle pattern include consumption of vegetables/animal foods, extent of use of fatty/junk food (day/week), eating food in front of TV (day/week), eat meals or snacks in school lunch time.

3:6 PROCEDURES AND SCORING:-

To verify the hypothesis and to conduct the research in a scientific way, proper procedures must be followed. Procedure refers to the way or the steps to be followed to conduct the research. It has three major steps; first of all is the preparation and the research design part, second one is instruction and the data collection using various tools and the last one is conduction, scoring, measurement and analysis. The systematic procedure is very important in any research.

Proper permission was taken from the principals of different schools of Bhilai township of Chhattisgarh and
requested to extend their co-operation in this respect. This was facilitated by arranging meetings to explain the objectives of the present study to the responds, as well as mode of the study programme was also explained.

Both interview and questionnaire were used. Firstly interview the students to explain how to deal with the questionnaire. The questionnaire has two sections; in the first section their personal information: age, grade, date of birth, frequency of eating fast food, information about the sedentary/activity of individual. The second section was concerned about socioeconomic status of the family; information about parent occupation etc. children filled both the sections of the questionnaire in the classroom. After that, an Anthropometric measurement was taken (height, weight, waist-hip circumference, mid upper arm circumference and triceps skin fold thickness) for each student in the class.

3.6.1 Anthropometric measurements:

**Height(cm):**- Height was measured using “Anthropometer”. The subject was asked to stand without shoes and asked to look straight without rising heals from the ground. It is the erect body length from the soles of the feet to the vertex.
Vertex is the most superior or the highest point on the head. When the head is in Frankfort horizontal plane, the height was measured to the nearest 1 cm.


Weight (kg):- Platform beam balance was used for weight measurement. The subjects asked to stand on the center of the platform without any support. Students were weighted while wearing school uniform, without shoes. Reading was recorded to the nearest half kg. Weight was taken thrice and mean was taken as a score.
**Mid arm circumference (mm):** Left upper arm was measured with the flexible non stretchable tape. The tape was in complete contact with skin. The midpoint of the upper arm was recorded between acromial process of scapula and olecranon process of ulna. The tape was placed gently but firmly round the midpoint, avoiding compressing of the soft tissues. Circumference was recorded to the nearest 0.1 cm.

![Measurement of Mid Arm Circumference](image)

**Triceps skin fold (mm):** The subject stand erect, arms normally hanging down by the side. The skin fold is picked up over the triceps muscle of the right arm midway between the olecranon processes. To fold should be parallel to the long axis of the arm.
Source: * National health and nutrition examination survey-2007
Anthropometry Procedures manual.
**Waist and hip circumference:** Waist circumference and hip circumference for each children’s was measured with the children standing with empty pockets, using a fiber-glass tape to an accuracy of 0.1 cm. The waist circumference was measured at level of midway between the lower rib margin and the iliac crest, at the umbilicus, with the subject breathing out gently. The hip circumference was measured at the maximum width over the buttocks at the level of the greater trochanters. From the waist and hip circumferences, the waist to hip ratio (WHR) was calculated.

*Source:* National health and nutrition examination survey-2007
Anthropometry Procedures manual.
**Socio-economic status scale (SES):-**

Socio-demographic profile of each child was recorded on a semi structured proforma of Agashe and Helode with necessary modification while interviewing the children. The proforma included community, type of cooking fuel used, occupation of the father and mother and possession of household (HH) articles. To calculate composite socioeconomic index; all the socioeconomic variables were given a logical score (1-5). The total score was added up to a grand score. Using the composite socioeconomic score, the children were categorized into two socioeconomic group via i) low socioeconomic status (LSES) (Score < 56) and, ii) high socioeconomic status (HSES) (Score >=56)

**Assessment of dietary habits:-**

Semi non quantitative food frequency questions were asked in simple language to facilitate better results. Total 31 items were recorded as daily/more than once, once/day, 2-3 times /week, seldom and never; scoring was done accordingly as per the responses. Scores were allotted from (0-4), and then totaling was done. Using the composite score, the children were
categorized into two levels via (i) Excess food consumption and (ii) less food consumption.

**Physical activity:-**

Third tool was used to collect the information on physical activity level including lifestyle pattern, habit of watching TV, exercises, mode of transport, eating food in front of TV etc. Proforma was filled by children. Scoring was done later to classify the subjects on the basis of obtained score. On the basis of median of score subjects were divided into two groups (i) Physically active and (ii) Physically inactive.

**STATISTICAL MEASURES USED:-**

Various non parametric and parametric statistical methods were used in this study based on the nature of data and the type of information required.

**Percentage**- Simple comparisons were made on the basis of percentage calculations.

**Frequency**- The number of observation in each group is called frequency. It shows at a glance how many individual observations are there in a group and where does the main
concentration lie. It also shows the range and the shape of distribution.

**ANOVA (Analysis of variance)** - This test is applicable whenever the numbers of subjects are more and there is cross query. It is also called fisher F test. This statistics was used where dependent data was metric (parametric) or interval or in ratio scale. Effect of socioeconomic status, physical activity and food habits on child health was analyzed by this test.

**Multiple Regression Analysis** - This is a method of analyzing the contribution of two or more independent variables to one dependent variable of the multivariate method, with the possible exception of factor analysis it is perhaps the most useful and flexible. Therefore in the present study to analyze the effect of different independent variables i.e. socioeconomic status, physical activity and food habits on dependent variable were done by this method. For all the statistical analysis computer software was used.