CHAPTER - III

METHODOLOGY

This chapter deals with the methods and techniques adopted for the present study. Research methodology is a way to explain systematically how research was carried out. It includes not only the research methods but also consider the logic behind the methods used. Details of the procedures adopted in this chapter are given under following heads.

3.1 Research design

3.2 Study duration

3.3 Study area

3.4 Sample size

3.5 Selection of schools

3.6 Selection of subjects

3.7 Selection criteria

3.8 Data collection

3.9 Pilot study

3.10 Actual framework of study

3.11 Coding and tabulation of data

3.12 Statistical analysis

3.13 Operational definitions
Figure-3.1 Framework of the study

- Objectives of thesis
- Hypothesis
- Research design
- Pilot study
- Population
- Sample
- Data Collection
- Tabulation and coding
- Data Analysis
- Results and discussion
- Hypothesis testing
- Conclusion & recommendation
3.1 Research Design

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Descriptive research which includes survey and fact finding enquiries of different kinds was selected for present research. A interventional, case-control, and experimental study design was used to determine prevalence and risk factors of overweight and obesity in school children of Aurangabad city (M.S.). The main purpose of the study was to identify prevalence and risk factors of overweight and obesity in school children of Aurangabad city (M.S.). However, since it was an experimental study, gaining in-depth information concerning other aspects was essential to extend or enhance the scope of the research. Therefore, the mixed method approach was used in the current study. The design included a principally quantitative research with a complementary qualitative follow up study. Recently a perspective has been offered that considers quantitative and qualitative research to be complementary (Medlinger and Cwikel, 2008). Researchers have realized the benefits of using more than one theoretical perspective to study a problem or question. Creswell and his colleagues defined the mixed method approach as research that involves the collection and analysis of both quantitative and qualitative data in a single study (Creswell et al., 2003).
Figure-3.2 Research design

Population (School children from Aurangabad city)

Sample (Total 6000 children by cluster sampling)

Research tools (Anthropometric measurement, schedule, interview, observations)

Data analysis (Descriptive statistic, chi-square test, t-test, regression analysis)

Outcome (Prevalence and risk factors of overweight and obesity)
3.2. Study Duration

The present investigation was carried out in Aurangabad city, Maharashtra during July 2012 to December 2014.

3.3 Study Area

For present investigation, Aurangabad city in Marathwada region of Maharashtra, India was selected. As overweight and obesity in school children is more common in urban areas, due to rapid transition in lifestyle of population, it was decided to select students from different schools in Aurangabad city (M.S.). Aurangabad city is capital of Marathwada region of Maharashtra, India. It is also gaining importance as it is becoming education hub.

3.4 Sample Size

This refers to the number of items to be selected from the universe to constitute a sample. With the help of practical manual for sample size determination by Lwanga and Lemeshow (1960), sample size was determined. As previous studies, recorded 7% prevalence, anticipated prevalence was also considered same.

\[
n = \frac{4pq}{l^2}
\]

Anticipated Prevalence (p) = 7%
q = 1-p
Absolute precision – 5%

\[
n = \frac{4 \times 7 \times 93}{(0.70)^2}
\]
\[
= \frac{2604}{0.49}
\]
\[
= 5314.29
\]
Finally, it was decided 6000 school children as the present study sample.

3.5 Selection of Schools

List of all middle and high schools from Aurangabad city was obtained from the education office. The city was divided into 4 zones such as North, East, West and South. The schools from these zones of the city were selected for the survey. From each zone 3 government and 3 private schools were selected using simple random sampling by lottery method. Total 24 schools, including 12 governments and 12 private from four zones of city were finalized with school authorities consent. The school authorities were given letters to seek their permission by education officer. List of selected schools is given in Appendix-I.

3.6 Selection of Study Sample

Aurangabad city was divided according to cluster sampling in four zones. From each zone 3 government and 3 private schools were selected. The selection of children between ages 10 to 15 years from selected 24 schools was done. From each selected school, randomly near about fifty percent children from different standards (5\textsuperscript{th} to 10\textsuperscript{th}) were enrolled for present investigation. Total 6000 children, 2616 children from government and 3384 from private schools were finally included to assess the prevalence of overweight and obesity.
### Table- 3.1 Selection of school children

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>City Zones</th>
<th>Govt. School</th>
<th>Private School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of Schools</td>
<td>Number of Children</td>
</tr>
<tr>
<td>1</td>
<td>North</td>
<td>1</td>
<td>231</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>303</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>117</td>
</tr>
<tr>
<td>2</td>
<td>East</td>
<td>1</td>
<td>441</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>215</td>
</tr>
<tr>
<td>3</td>
<td>West</td>
<td>1</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>91</td>
</tr>
<tr>
<td>4</td>
<td>South</td>
<td>1</td>
<td>271</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td><strong>12</strong></td>
<td><strong>2616</strong></td>
</tr>
</tbody>
</table>

### 3.7 Selection Criteria

**Inclusion Criteria**

- Children aged 10 to 15 years studying in Aurangabad city (M.S).
- School children willing to participate in study and present on the day of survey.

**Exclusion Criteria**

- School children below age 10 and above age 15 years.
- Children with chronic illness, endocrinial problems, physical and mental defects.
3.8 Data Collection

Data is an unprocessed or raw information. Data collection is an important step while conducting any research. The primary data are those which are collected afresh and for the first time, and thus happens to be original in character. The secondary data, on the other hand, are those which have already been collected by someone else and which have already been passed through the statistical process. Various data collection procedures adopted during study are presented in Figure-3.3. To collect primary data a schedule was designed. With help of observations and interview data regarding anthropometric measurements, socio-demographic aspects, food behaviour, activity pattern and psycho-social background was collected. For secondary data collection research institutes, government offices, electronic media and references from books, journals, periodicals, and newspapers were given preference.

3.8.1 Research Tools

The height and weight measurements were taken with the help of instruments such as weighing machine and a non stretchable fibre tape to know BMI of each student. A schedule was developed to collect necessary data.

3.8.2 Development of Schedule

Two schedules were prepared for collecting necessary information. One was prepared for school children and another for their parents. Schedules were prepared in English and Marathi. Improvement in schedules was done to get correct response and minimum bias from respondents after pilot study. Schedule prepared for children to collect data (Appendix-II, A and B) was divided into four sections.
A) **Personal details**-to collect information such as age, gender, birth order, standard, religion, family type, school type, school name, family member count, medium of education, height and weight.

B) **Food behaviour**- to collect information about food habits, meal pattern, habit of skipping breakfast, habit of watching television while eating, eating outside home, food preferences and frequencies, along with main reasons for eating outside home.

C) **Activity pattern**-to collect information about regular participation in sports, outdoor activities, time for computer use, television viewing, sleeping and conveyance to school.

D) **Psycho-social background**- to collect information about weight perception and common psycho-social problems faced by children.

A schedule for parents was prepared to collect information about socio-demographic aspect, weight perception, remedial measures adapted and level of satisfaction from adopted measures. The details of the designed schedules for parents are given in (Appendix- III, A and B). The schedules were checked by expert team members. The names of team members are given in Appendix-IV. Reliability and validity of designed schedules were tested before survey.

**3.9 Pilot Study**

The pilot study is a small scale version or trail done in preparation for the main study. The pilot study enables researchers to find the feasibility of the tool and thereafter to make the necessary amendments and modifications in the tool.

The data from 100 students was collected for pilot study during July to Aug. 2012. The analysis was done after pilot study, the tool was found to be feasible, practicable and acceptable.
Figure-3.3 Data collection

DATA

Primary
- Physical examination
 (Anthropometric measurements)
- Schedules
- Interviews
- Observations

Secondary

Updated Information From
- Reference books
- Text books
- Journals
- Periodicals
- News papers
- Encyclopaedia

Research Institutes
- Dr V.N.M.K.V Parbhani

Offices
- Dist. Stat. Office Aurangabad

Electronic Media
- Internet
- E-Journals
- E-Papers
- E-Thesis

Institutes
- Dr B.A.M.U.
- MGM Health Uni. Aurangabad
- Zillah Parishad
- Municipal corporation

Internet
- E-Journals
- E-Papers
- E-Thesis

Text books
- Dr B.A.M.U. Aurangabad

Education office
- Zillah Parishad

Online sources
- Internet
- E-Journals
- E-Papers
- E-Thesis

Internet
- E-Journals
- E-Papers
- E-Thesis

Encyclopedia
- Dr V.N.M.K.V Parbhani

Dist. Stat. Office
- Aurangabad

Electronic Media
- Internet
- E-Journals
- E-Papers
- E-Thesis

Dist. Stat. Office
- Aurangabad
3.10 Actual framework of study

**Figure-3.4  Actual framework of study**

**STEP I**

To know prevalence of overweight and obesity  
(Sample size 6000 children)

**STEP II**

To know risk factors of overweight and obesity  
(518 children expt. group + 518 children cont. group)

**STEP III**

To know psychological aspects related to overweight and obesity  
(518-child parent pairs)

**STEP IV**

Nutritional and behavioural counselling of selected respondents  
(100 child parent pairs)
After receiving permission from school authorities, school staff was given detailed information about the purpose of the study and procedure to be carried out for collection of data. The efforts were taken to collect information during parent-teacher meetings and either arts or physical education class was identified as most of the schools do not want to interrupt their schedule. Consent forms were distributed to parents willing to participate in study before data collection (Appendix-V).

The researcher was introduced to the students by the schools staff to give brief explanations of the project. Students were allowed to take help of teachers or researchers to clarify the questions wherever necessary. The participants were reassured about confidentiality of data in any case.

The study is conducted in four steps;

3.10.1 Step-I - To know the prevalence of overweight and obesity

Total 6000 school children of Aurangabad city were selected in step-I. To know the prevalence of overweight and obesity in children, anthropometric measurements were taken as it is widely accepted. For present study as it is common practice, age and gender specific BMI charts published by Centre for Disease Control (CDC-2000) were used to determine nutritional status of children.
3.10.1.1 Anthropometric Measurements

Anthropometry reflects both health and nutritional status and predicts performance, health and survival. Major anthropometric measurements taken for investigation by adopting standard procedures were age, height, weight and BMI. Three readings of height and weight were recorded and the mean of the three was taken as the final reading of these parameters of the individual and used for analysis.

3.10.1.2 Measurement of Age

The date of birth of each child was taken from school record. Only the children of age 10 to 15 years were selected for the study. For present investigation, 10-12year age group was considered as early adolescence and 13-15 years of children were grouped as late adolescence.

3.10.1.3 Measurement of Height

The height was recorded to the nearest of 0.1 cm. by using non-stretchable fibre measuring tape. Each subject was asked to stand upright with bare feet, the position of the eyes and ear lobes was horizontal, feet was together, knees straight and heels, buttocks and shoulders blades was in contact with vertical surface of wall. Arms were hanging loosely at the sides with palm facing the thighs. The head was not necessarily in contact with the vertical surface; it may be necessary; to hold the heels to ensure that they did not leave the ground. Subjects were asked to take a breath and stand erect to aid the straightening of the spine, keeping shoulders relaxed.
3.10.1.4 Measurement of Weight

A portable weighing balance was used to measure weight of the students. The weight was noted on TANITA, HA-622 model to the nearest of 0.1 kg. while child was standing upright on the balance with minimum clothing and bare feet. The students were in school uniforms and all contents were removed from their pockets.

3.10.1.5 Measurement of Body Mass Index (BMI)

Assessing the BMI of children is more complicated than adults because a child’s BMI changes as they mature. These patterns of growth are different for boys and girls. Therefore to work out whether a child’s BMI is too high or too low, both the age and sex of the child need to be taken into account.

As BMI of children changes considerably between birth and adulthood, fixed thresholds such as those used for adults should not be applied to children as they would provide misleading findings.

Age and gender specific cut points were used to classify participants as underweight, normal weight, overweight and obese by using CDC growth chart (2000).
Anthropometric measurements of children
BMI of subject is best and most widely used measures of adiposity among indices derived from height and weight measurements.

BMI is the ratio of weight (kg) to height (m²) of a subject

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

With help of measured height and weight, BMI of each student was calculated. After calculating the BMI values, the student’s age and sex were considered and on CDC growth charts, points were plotted. With help of the graphs their percentile rank was determined and finally they were grouped as underweight, normal weight, overweight and obese.

**Table 3.2  BMI categories**

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>BMI categories</th>
<th>Percentile rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Underweight</td>
<td>&lt; 5ᵗʰ percentile</td>
</tr>
<tr>
<td>2</td>
<td>Normal weight</td>
<td>5ᵗʰ to 85ᵗʰ percentile</td>
</tr>
<tr>
<td>3</td>
<td>Overweight</td>
<td>85ᵗʰ – 95ᵗʰ percentile</td>
</tr>
<tr>
<td>4</td>
<td>Obese</td>
<td>&gt; 95ᵗʰ percentile</td>
</tr>
</tbody>
</table>

As prevalence rate is 10%, total 600 students were selected as overweight and obese (420 overweight and 180 obese). For further study, these two groups were merged and considered as experimental group. Out of selected 600 students only 518 were considered for final study as consent was received from their parents.
3.10.2 step-II - To know risk factors of overweight and obesity

There were total 518 school children selected from step-I. These 518 school children were considered as experimental group and 518 normal weight children with age and gender match to them were again enrolled for investigation as control group. A comparative study between experimental and control group children was conducted to know the factors influencing overweight and obesity. A pre-designed, pre-tested schedule was provided to each student and their parents to get information. Mostly mothers of children were selected as parents. Regarding parental BMI, self reported height and weights were considered due to practical difficulties. Educational level and family monthly income was used as a proxy of socio-economic status. Socio-demographic factors, food behaviour and activity pattern of experimental and control group children were recorded.

3.10.3 Step-III - To know psycho social aspects related to overweight and obesity.

Total 518 child parent pairs were assessed for different psycho-social aspects related to overweight and obesity. Experimental group children (overweight and obese) were asked regarding different psycho social problems faced and weight perception. Out of 518 selected pairs, 231 parents gave correct weight perception. These parents were interviewed to know remedial measures adopted and level of satisfaction after adopting these measures.

3.10.4 step-IV – Nutritional and behavioural counselling of selected respondents

100 child-parent pairs with their consent were purposefully selected for nutritional and behavioural counselling. The counselling schedule was decided for 8 months and conducted with the help of
different methods and materials. A tool i.e. a booklet was developed (Appendix- VI and distributed to each participant. At school level, lectures were delivered with the help of charts and posters. At family level personal visits, diet planning and demonstrations were conducted. Constant follow-up with help of phone, e-mails, whatsapp and personal visits was done. After 8 months, BMI values were recorded and compared with previous values in each case.

3.11 Coding and Tabulation of Data

The collected data was coded and tabulated for further processing. Before entering data, variables in the schedule were abbreviated and each response was assigned a numerical code. A summary of coding of all variable is given in Appendix -VII.

3.12 Statistical Analysis

The data was recorded on a pre-designed performa and managed on MS Excel sheet. All the entries were double checked for any possible keyboard error. The data was analysed using SPSS version 20\textsuperscript{th} software (Statistical Packages for Social Sciences).

The descriptive statistics, such as percentage and mean were determined. Association of each of the categorical variable with overweight and obesity was assessed with Chi-square test and strength of their association was computed by odds ratio (OR) with 95\% CI (Confidence Interval). Variables showing statistically significant association with the outcome variables (p<0.05) were considered as potential risk factors for overweight and obesity. These variables were subjected to multiple regression model to determine the significant independent risk factor of overweight and obesity. ‘t’ test was applied to study statistical difference between BMI values before and after counselling. The appropriate graphs and tables were prepared for presentation of the results.
Counselling to parents
Counselling to Students
Figure- 3.5 Presentation of variables under study

Variables

Independent

Age
Education
Occupation
Family type
Family Income
Conveyance to School

Dependent

Height
Weight
BMI
Food behaviour
Activity pattern
**Figure-3.6 Statistical Analysis of variables**

<table>
<thead>
<tr>
<th>Type of variables</th>
<th>Tests used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-demographic aspects such as Age, gender, birth order, religion, Type of school, type of family, Medium of education, Parent’s education, Occupation, SES area of residence, Family Income</td>
<td>Frequency, Percentage and chi-square test, (p&lt;0.05) significant</td>
</tr>
<tr>
<td>Anthropometric measurements Height, weight, BMI</td>
<td>Mean, SD, t-test</td>
</tr>
<tr>
<td>Risk factors for overweight/obesity (Socio-demographic variables, variable related to food behaviour, activity pattern)</td>
<td>Odds ratio and Regression analysis</td>
</tr>
</tbody>
</table>
3.13 Operational Definitions

**Birth Order**- It is the chronological order of sibling birth in a family.

**Physical Activity**- It is generally defined as any bodily movement produced by skeletal muscles that results in energy expenditure above resting level.

**Childhood Obesity**- It is a condition where excess body fat negatively affects a child’s health or wellbeing.

**Calorie** – It is a unit of energy supplied from food.

**Breakfast**- This is the first meal of the day consumed.

**Schedule**- A schedule is a structure of set of questions on a given topic which are asked by the interviewer or investigator personally.

**Validity**- Refers to how well a test measures what it is purported to measure.

**Reliability**- It is the degree to which an assessment tool produces stable and consistent results.

**Anthropometric Measurements**- These are the measurements of a child’s body physical dimensions.

**Meal**- It is an instance of eating that takes place at a specific time and includes consumption of specific prepared foods by person.

**Private Schools** – An institute for educating children, which does not, receives its financial assistance from the government.

**Government Schools** - An institute for educating children, which receives its financial assistance from the government.

**Snacks** - Small meals usually eaten between meals.
**BMI-** Body Mass Index (BMI) or Qutelet Index is a value derived from the mass (weight) and height of an individual.

**Nuclear Family-** A nuclear family is a family group consisting of a pair of adults and their children.

**Joint Family-** Is an extended family arrangement prevalent throughout the Indian subcontinent, particularly India consisting of many generations living in the same home.

**Fast Foods-** It is the term given to food that is prepared and served very quickly.

**Chat Food Items-** It is a term describing savoury snacks, typically served at roadside tracks from stalls or food carts in India, Pakistan, Nepal and Bangladesh.

**Food Frequency-** Refers to usual frequency of consumption of each food from a list of foods for a specific period.

**Junk Foods-** Prepared or packaged food that has low nutritional value.

**Remedial Measures-** It means taking steps to alleviate something we do not desire to experience.

**Sedentary Lifestyle-** A sedentary lifestyle is a type of lifestyle with no or irregular physical activity.

**Balanced Diet-** A balanced diet is one that gives your body the nutrition it needs to function properly.

**Dietician-** Is an expert in dietetics; that is human nutrition and the regulation of diet.
**Prevalence**- Is the proportion of a population who have a specific characteristics in a given time period in medicine, typically an illness, a condition or a risk factor. It is usually expressed as percentage.

**Self Esteem**- It reflects a person’s overall subjective emotional evaluation of his or her own worth. It is a judgement of oneself as well as an attitude towards the self.

**Body Image**-Body image is the way you see yourself and imagine how you look.

**School Lunch**- A school lunch is a meal, typically in the middle of the school day, provided to students at school.

**Meal Pattern**- A meal pattern is a menu planning tool used to develop menus for a specific age group.