Chapter - III

METHODOLOGY USED IN THE STUDY

This chapter details out the research methodology for the present study. It explains the suitable research methodology which is used to achieve the research objectives. Therefore this chapter deals with the hypothesis, area of the study, sample size, sample selection procedure, tools of data collection, data collection procedure, intervention strategy and plan of data analysis.

Hypothesis of the study:
Hypothesis formulated in the present research are as follows:

$H_01$. There is no significant difference in nutritional status of pre school children of rural areas among different socio economic groups.

$H_02$. There is no significant association between severity of malnutrition and family background of children.

$H_03$. There is no significant impact of educational module and nutritional advice given to the mothers of malnourished children in order to bring improvement in their nutritional status.

3.1. Research Method and Approach

In order to conduct investigations researchers may use a variety of approaches. These fall into two categories- Quantitative and Qualitative. A mixed research approach was used; with a combination of quantitative and qualitative research methods. The qualitative research methods permit the researcher to explore social and cultural phenomena and allow detail understanding of individual’s views, attitudes and behavior. Quantitative research method is concerned with collection and analysis of data in numeric form (Lorainw et al., 1996).

Present study is an interventional study. In interventional studies the respondents undergo some kind of intervention in order to evaluate its impact. An education intervention is give to change in views and lifestyle of people.
Methodology used in the Study

A self-structured questionnaire-cum-interview schedule including closed ended questions, was developed by the researcher which provide different options to choose in and are extremely efficient at providing information in a relatively brief time period at low cost to the researcher.

3.2. Design of the Study:

A. Research design

B. Sampling design

A. Research design

The research design is overall strategy that we choose to integrate the different components of the study in a coherent and logical manner. Ensuring this we can effectively address the research problem.

Research design of the present study includes: Pre- intervention, Intervention and Post- intervention.

Pre- intervention: In pre- intervention nutritional status of children was assessed and data were collected from their mothers in order to find out the root causes of malnutrition in that area. Three hundred three (303) pre school children whose age was 24-42 months and their mothers were included for pre- test of the study.

Intervention: Interventions that include multiple strategies are the most effective in producing desired and lasting change. It is a combination of programs designed to produce behavior changes or improve health status among individuals or an entire population. It may include educational programs, new or stronger policies, improvements in the environment, or a health promotion campaign.

In this part of the present study mothers of malnourished children were given education related to various factors which were responsible for malnutrition in their children.

Post- intervention: This part of the study include post data collection after exposure of intervention programme. After imparting education effectiveness of educational module was re- assessed after 6 months to check the improvement in the nutritional status of malnourished children.
**Methodology used in the Study**

**Fig. 3.1: Research Design**

### B. Sampling design (Population, Sample and Sampling procedure)

A sample design is made up of two elements sampling method and the estimator. **Sampling method** refers to the rules and procedures by which some elements of the population are included in the sample. The estimation process for calculating sample statistics is called the **estimator**.

#### 1. Population or Universe (Area of study)

Defining the population is the first step in sampling process. Population is an entire aggregation of items from which samples can be drawn. For present study all pre school children of Pahari Block (rural area of Mirzapur district) were constituted as population.

**Mirzapur** district occupies an area of 4521 km² and is one of the 75 districts of Uttar Pradesh state in northern India. The district is bounded on the east by Chandauli district, on the northwest by Allahabad district, on the north by Sant Ravidas Nagar and Varanasi districts and on the south by Sonbhadra district. Mirzapur town is the district headquarters. This district is known for the Vindhyavasini temple in Vindhyachal. It consist of several Ghats where historical sculptures are still present. During the Ganges festival these Ghats are decorated with lights and diyas. The district consists four Tehsils. These are Mirzapur (sadar), Lalganj, Marihan and Chunar. These four tehsils are further divided into twelve blocks.
Methodology used in the Study

Fig. 3.2: Map of Mirzapur District


2. Sample

Selection of sample: There are total 12 blocks in Mirzapur district. Out of 12 blocks 1 block named “Pahari” was selected randomly. Pahari block is further divided into 45 Panchayats. Among 45 panchayats 4 panchayats named “Saraiyan, Sindhora, Pasaiya and Newadhiya” were selected randomly.

Furthermore, Saraiyan Panchayat consists of 3 villages; Sindhora and Pasaiya each panchayat consists of 1 village and Newadhiya Panchayat consists of 2 villages.

Researcher has selected 2 villages from Saraiyan Panchayat, 1 village from Newadhiya Panchayat by using simple random sampling. Whereas, both villages (Sindhora and Pasaiya) were selected. Therefore, total number of villages selected was 5 from 4 Panchayats.

Sample size: Total children of all selected villages were included for the study. There were 44 children in Bairi village, 68 children in Saraiya village, 105 children in Sindhora Village and 96 and 60 children were in Pasaiyan and Newadhiya villages respectively. Number of total children were 373 but at the time of survey 303 children were available. Therefore, sample size selected for the study was 303.
Methodology used in the Study

Fig. 3.3: Selection of Sample Size

Total No. of children: 373
Available children at the time of survey: 303;  (sample size = 303)
**Period of the study:** The total period of the data collection was from June 2015 to October 2016. The mentioned period includes pre-data collection (June 2015 to December 2015), Intervention (March-August 2016) and post data collection (September to October 2016).

**Inclusion criteria:** Household with a mother of children aged 24 to 42 months that agreed to participate were included in the study.

**Exclusion criteria:** Children whose age was less than 24 months and more than 42 months were excluded from pre data collection so that they couldn’t cross 60 months/5 years of age after intervention and post study. Also the mothers and children who were not willing to participate were also excluded. Furthermore the children who were physically challenged and unfit were also not included in the study.

**Pilot study:** The pilot study formed the base of the research. To collect information from the respondents a questionnaire-cum-interview schedule was developed by the researcher which was based on the objectives of the study. In pilot study assessment of nutritional status was done on 30 children and background information was collected by their mothers. These 30 samples of the pilot study were not included in original study.

The purpose of the pilot study was to test the clarity, applicability and feasibility of questions. Also pilot study determine whether the participants understand the questions correctly.

### 3.3. Tool of the Study

**Questionnaire – cum- interview schedule:** A pre designed and pre tested questionnaire-cum-interview schedule was developed by the researcher in consultation with references and subject experts. It was constructed with three main sections which are as follows:

- **Anthropometric measurement and clinical sign and symptoms:** In this section, weight (kg), height (cm), mid upper arm circumference (cm), head and chest circumference (cm) of child were taken as anthropometric
measurements. Also clinical signs and symptoms (Hairs, Face, Eyes, Mouth and Skin) which are associated with child malnutrition was also a part of this section.

- **General information:** This section dealt with socio-economic and demographic characteristics of child and their mothers (i.e., age of mother and child, sex of child, religion, caste, family size, family type, food habit, educational status of child’s parents, occupation of parents, family monthly per capita income etc.)

- **Specific information:** Information related to various factors which are responsible for child’s malnutrition were included in this section e.g. information relate to food security, antenatal care, diet history of child, hygiene and sanitation, hand washing practices, care during disease, immunization etc.

### 3.4. Data Collection Procedure

All ICDS centers of selected villages were visited first and personal rapport was built with Aaganwadi workers. Then, researcher has listed all the registered children of 24-42 months and detailed information (i.e. children’s name, age, their parent’s name and address) were noted by her.

After getting information about child house to house visit were performed for survey work. Total 303 children were included in this study and anthropometric measurement of every children were taken. The background information of children was collected with the help of pre designed questionnaire cum interview schedule method which was obtained from child’s mother.

**Assessment of children’s nutritional status**

The condition of health of a person that is influenced by the intake and utilization of nutrients is called nutritional status.

Nutritional status of children was assessed by anthropometric measurements and dietary assessment.
3.4.1. Anthropometric measurement

Anthropometric measurement is a sensitive indicator of health, growth and development in infants and children. For assessing nutritional status of under fives children various Anthropometric indicators are being used. For present study measurement weight, heath, mid upper arm circumference, head and chest were being used as Anthropometric indicators.

- **Body weight:** body weight is the most widely used sensitive and simplest reproducible indicator for the evaluation of nutritional status. It reflects the more recent nutrition than does height. Subjects were weighed in standing position with minimal clothing and without shoes with the help of electronic weighing machine. Weight was recorded in kilogram (kg) and grams (gm).

- **Height:** the height of an individual is influenced by both genetic and environmental factors and also is affected by long term nutritional deprivation. The height was measured nearest to 0.1 cm by using measuring scale. The subjects were made to stand erect with support to the wall against the vertical tape after removing their shoes.

- **Mid upper arm circumference (MUAC):** MUAC has been shown to be a simplest, sensitive and cost effective measurement for community assessment of early childhood malnutrition. it was measured to the nearest 0.1 cm by measuring scale at mid upper arm (mid point between acromion and olecranon).

- **Head circumference:** Head circumference was measured by placing one end of the tape on the glabella and placing it around the head over the opisthocranium point and again meeting at glabella.

- **Chest circumference:** It was measured by measuring tape at the level of nipple.

Classification of malnutrition

Malnutrition is a spectrum of conditions ranging from growth failure to overt marasmus or kwashiorkor, hence classification has to be based on arbitrary cut-off points. In present study following classifications have been used-

**Gomez classification (Weight for Age/ Underweight):** This classification is based on weight retardation. It is most sensitive indicator when used carefully. A decrease in
weight gain or loss in weight can be seen within one month. It compares child’s weight with a normal child of the same age.

\[ \text{Weight for age} \% = \frac{\text{weight of the child} \times 100}{\text{weight of a normal child of same age}} \]

- Between 90 and 110\% = normal nutritional status
- Between 75 and 89\% = 1\textsuperscript{st} degree, mild malnutrition
- Between 60 and 74\% = 2\textsuperscript{nd} degree, moderate malnutrition
- Under 60\% = 3\textsuperscript{rd} degree, severe malnutrition

**Waterlow’s classification:** This classification defines two group of malnutrition

**Height for age (Stunting):** Height for age compares the child’s height with the expected height for the same age.

\[ \text{Height/ Age} \% = \frac{\text{height of the child} \times 100}{\text{height of a normal child at same age}} \]

- Normal = > 95
- Mildly impaired = 87.5 – 95
- Moderately impaired = 80 – 87.5
- Severely impaired = < 80

**Weight for height (wasting):** This compares the child’s weight with the expected weight of the same height.

\[ \text{Weight/ height} \% = \frac{\text{weight of the child} \times 100}{\text{weight of a normal child at same height}} \]

- Normal = > 90
- Mildly impaired = 80 - 90
- Moderately impaired = 70 - 80
- Severely impaired = < 70

**Mid upper arm circumference:** It yields a relatively reliable estimation of body’s muscle mass, the reduction of which is one of the most striking mechanism by which the body adjusts to inadequate energy intakes. Arm circumference cannot be used before the age of one year. Between the age of one and five it hardly varies.

- Normal = > 13.5 cm
- Mild and moderate = 12.5 – 13.5 cm
- Severe = < 12.5
Methodology used in the Study

**Kanawati and McLaren index (MUAC/HC):** It is a ratio between mid upper arm circumference and head circumference (MUAC/HC) measured in children between 3 months to 5 year old.

- **Normal** = $> 0.31$
- **Mild** = $0.31 – 0.28$
- **Moderate** = $0.27 – 0.25$
- **Severe** = $< 0.25$

**Jellife’s ratio (HC/CC):** It is a ratio between head and chest circumference (HC/CC). In a child within one year head circumference is more than chest circumference. Gradually it decreases after one year onwards because thereafter chest grows more rapidly compared to brain.

- **Normal** = $< 1$
- **Malnourished** = $> 1$

Note: In present study nutritional status of children has been determined in reference with underweight, stunting, wasting, MUAC, MUAC/HC and HC/CC but as underweight is an indicator of both acute and chronic malnutrition only underweight (Weight for age) has been taken for fulfillment of 3rd and 5th objectives (i.e. To examine the association between severity of malnutrition and family background of children as well as various factors associated with malnutrition and To assess the influence of nutritional advice given to mothers in order to bring improvement in the nutritional status of their malnourished children respectively).

### 3.4.2. Dietary assessment

To assess the nutritional status, recording all the food items consumed in last 24 hours is very important. Household measures are used for recording the food intake.

Information regarding the intake of food was collected from respondents using 24 hour recall method for three consecutive days. Cooked food consumed was converted into their raw equivalents. Nutrients namely energy, carbohydrate, protein, fat, calcium, iron and zinc were calculated using food composition tables of nutritive
Methodology used in the Study

value of Indian foods (Gopalan, C. et al., 2009) and compared with recommended dietary allowances (appendix- ) laid down by (ICMR, 2010).

**Nutrient Adequacy Ratio (NAR):** Nutrient Adequacy Ratio (NAR) of children has been used in present study. To estimate the nutrient adequacy in diet NAR was calculated for 7 nutrients (Energy, Carbohydrate, Protein, Fat, Iron, Calcium, and Zinc). For each nutrient NAR was calculated as the ratio of daily individual intakes to standard recommended amounts. Mean NAR was calculated by using following formula

\[
\text{Nutrient Adequacy Ratio (NAR)} = \frac{\text{Observed Nutrient Intake}}{\text{Recommended Dietary Allowances}} \times 100
\]

The NAR measures whether the children are consuming more or less than, or equivalent to RDA. The value of 100 specifies that intake of nutrients are equal to the RDA and the value below 100 species lower than the recommended intake.

In present study,
- < 80 NAR depicts less than 80% from RDA
- 90- 100 NAR depicts less than 90- 99.9% from RDA
- > 100 NAR depicts equivalent to RDA.

**3.5. Method of Intervention**

At baseline, mothers were divided into different groups including 10-15 mothers in a group based on the villages they were living. After dividing into groups researcher has developed personal rapport with them and took them in her confidence.

Further each group was educated regarding various aspects of intervention through focused group discussion and also with the help of self developed poster. The intervention continued for 6 months including 2 follow- ups during which nutrition education was given to intervention group only. First follow up was done after three months in which children’s weight was assessed to know whether mothers are implementing the education in their daily practice. Second follow up was done after six month.
Implementation of Intervention

A prospective randomized trial was conducted with one intervention group (100) and one controlled group (100) for comparison with the intervention group.

The main aim of the intervention was to improve the dietary behavior, health seeking behavior, hygienic practices of children as well as their mothers, caring practices of mothers and disease control.

Based on the findings of situation analysis which was gathered by questionnaire cum interview schedule a range of nutrition and health intervention was designed. These were included the following education:

- Mothers were advised to be relaxed with the child during meal time.
- Mothers were suggested that if child is not eating green leafy vegetables, they can add spinach or other green leafy vegetables to the flour while making dough and can make roti or paratha in order to bring taste so that child can consume leafy vegetables.
- Intake of milk, curd and seasonal fruits intake was encouraged.
- Mothers were also encouraged intake of easily available, low cost protein, iron and calcium rich foods.
- Mothers were advised to avoid tea intake in children regularly.
- Mothers were advised to avoid use of food items with low nutrient density such as chips, sweets etc (specially from market)
- Education was given to mothers to use money to buy locally available fruits and nuts rather than chips and sweets.
- Mothers were encouraged and educated regarding importance of hand washing practices with soap (specially after toilet and before cooking and taking meal).
- Mothers were educated about proper disposal of waste material and child’s excreta.
- It was educated to mothers regarding use of sanitary toilets for themselves and their children.
- Researcher has promoted and advised mothers for using slippers when going outside and proper leg washing with soap after coming.
• Mothers were also suggested that after sneezing or cleaning running nose while cooking food or feeding their child they should wash their hands with soap.
• Education was given to mothers they should use separate hand towel or cloth for kitchen purpose and also cleaning of that towel or cloth (atleast 2-3 times in a week)
• Researcher has convinced mothers about importance of cleaning their surrounding.
• Mothers were recommended regarding use of chlorine, Alum or boiling method for safe drinking water.
• Mothers were educated regarding care during diseases.
• Education was given to mothers about home based care during diarrhoea and pneumonia.

Post data collection

After completion of intervention programme post data was collected with the help of interview schedule and anthropometric measurement of weight was assessed from both the groups i.e. the intervention and controlled groups.

3.6. Analysis of Data (Statistical techniques)

The data after collection, has to be processed and analyzed in accordance with the outline laid down for the purpose at the time of developing the research plan. This is essential for a scientific study and for ensuring that we have all relevant data for making contemplated comparisons and analysis. The term analysis refers to the computation of certain measures along with searching for patterns of relationship that exist among data group.

In present study data was analyzed by using trial version of SPSS (Statistical Package for Social Sciences) version 16. It is very user friendly database, through which statistical analysis can be done very easily, correctly and also very minutely. Following statistical techniques have been used in the study:

**Percentage:** Simple percentage is worked out to assess the consideration of desired observation and various variables. It is also used for the purpose of comparison.
**Arithmetic mean:** In statistics central tendency is a central value or a typical value for a probability distribution. It is occasionally called an average or just the centre of the distribution. Arithmetic mean (or simply mean) which is the sum of all measurements divided by the number of observation in the dataset is a common measures of central tendency and has been used in the study. It is formulated as

\[
X = \frac{\sum fx}{N}
\]

- \(f\) = frequency of respective class
- \(x\) = mid values of specified variables
- \(N\) = total number of observation

**Range:** In order to measure the scatter of a values of the items of variable in the series around the true value of average, statistical device called measures of dispersion are calculated. Important measures of dispersion are range, mean deviation and standard deviation.

The crudest measure of dispersion is the range of distribution. The range of any series is the difference between maximum and minimum value in the series.

**Range = Max. – Min.**

- \(\text{Max.}\) = Maximum value of the series
- \(\text{Min.}\) = Minimum value of the series

**Standard Deviation (\(\sigma\)):** The standard deviation is the most common measure of dispersion. A measure of dispersion is designed to demonstrate the extent to which the individual measures differ on an average from the mean. The standard deviation may be expressed in an “absolute form”. It is said to be in an absolute form when it states the actual amount by which the value of an item on an average deviates from mean.

\[
\text{Standard Deviation (\(\sigma\))} = \sqrt{\frac{\sum fx^2}{N}}
\]

- \(x^2\) = square of deviations from mean
- \(fx^2\) = product of each value by its frequency
- \(\sum fx^2\) = sum of all the products
- \(N\) = number of observations
- \(\sqrt{\cdot}\) = square root
Chi-Square Test ($\chi^2$): A statistical $\chi^2$ test is applied to observe the association between two groups or among more than two groups and specific statistical inference on the basis of acceptance or rejection of null hypothesis. The $\chi^2$ is formulated as

$$\chi^2 = \frac{\sum (O - E)^2}{N}$$

$O =$ observed frequency
$E =$ expected frequency
$\Sigma =$ sum

Degree of Freedom: The number of independent or freedom movement of observation or cells which specified by virtue of their nature.

1. In case of Chi-Square ($\chi^2$), df = (r-1)(c-1)
   - $c =$ number of columns
   - $r =$ number of rows
2. In case of unpaired t-test, df = ($N_1 + N_2 - 2$)
   - $N_1$ and $N_2$ are the number of observations of first and second sample.

Level of Significance (Probability level): The probability level is nothing but it is a measurement of change factor which is represented in terms of percentage or per unit. The level of significance is determined on the basis of the value of statistics and the value of degree of freedom. Probability levels are generally used i.e.

- P<0.05, Statistically significant and expressed as (*)
- P<0.01, Statistically highly significant and expressed as (**) 
- P<0.001, Highly and highly significant and expressed as (***)
- P>0.05, Statistically not significant and expressed as (NS)

- When the calculated value of statistical test is greater than the tabulated values then null hypothesis is rejected i.e. P<0.05, 0.01 and 0.001.
- When the calculated value of statistical test is less than the tabulated values then null hypothesis is accepted i.e. P>0.05.

Paired t-Test: “t-test” is considered as an appropriate test for judging the significance of a sample mean or for judging the significance of difference between the mean of two samples in case of small sample(s) when population variance is not known (in which case we use variance of the samples as an estimate of the population
variance). In case two samples are related we use **paired t-test** (or what is known as difference test) for judging the significance of the mean of difference between the two related samples.

**For paired t test,**

\[ t = \frac{m}{s/\sqrt{n}} \]

- Where, \( m \) and \( s \) are the mean and the standard deviation of the difference (\( d \)) respectively.
- \( n \) is the size of difference.

**Multiple Logistic Regression:** This analysis is adopted to understand the functional relationships between the dependent and independent variables. The objective of this analysis is to make a prediction about the dependent variable based on its covariance with all the concerned independent variables. One can predict the level of the dependent phenomenon through multiple regression analysis model, given the levels of independent variables. Given a dependent variable, the linear-multiple regression problem is to estimate constants \( B_1, B_2, \ldots, B_k \) and \( A \) such that the expression

\[ \hat{Y} = B_1 X_1 + B_2 X_2 + \ldots + B_k X_k + A \]

\( \hat{Y} \) = Expected value

\( A \) = Intercept

\( B_1 \) = Estimated slope of a regression and so on for \( B_2, B_3 \) etc..