CHAPTER 2

MATERIALS AND METHOD
This chapter covers the systematic plan of the present study. Government and Government aided Primary school children specially between the age group of 6 to 11 years were selected as sample to meet this end. This group was chosen, since it is a period of relatively static physical growth.

Applied plan under the different heads is indicated below :-

1. Study Area
   1) selection of area
   2) selection of schools
   3) selection of subjects
   4) environmental characteristic

2. Nutritional status :
   A) General clinical examination.
      1) weight
      2) height
      3) arm circumference

   B) Anthropometry
      1) I. Q. test

   C) Haemoglobin Estimation

   D) Diet Survey

3. Mental Test
   1) Combined mean & standard deviation
   2) 't' test
   3) correlation

4. Statistical Analysis

1. Study Area
   1) Selection of Area :

   Samples were drawn from the schools situated in Raipur city. The schools situated in Raipur city were
mainly classified into 2 parts—Raipur rural and Raipur urban. Samples for the present study have been drawn from the schools situated in Raipur urban area. The schools and students therein provided sufficiently large mix of diversified samples being sufficient to reflect proper results.

This study is confined to schools situated in Raipur urban area, which is further divided in five zones by education department. These five zones are east, west, north, south and fifth zone for girls only. Two schools from each zone were selected for the proposed study. This selection was made by random sampling method. The map of Raipur city is enclosed herewith in which location of selected schools is shown.

2) **Selection of sample**

There are 110 Government and Government aided Primary schools in 5 zones. Approximately 30,000 students are studying here. 74 schools of boys had the strength of 20,000 whereas 36 schools had only 10,000 girls enrolled. The basic ratio between boys and girls being 2:1. Figure below shows the selection of schools in the city.

Out of 74 boys schools 10% (8) and out of 36 girls schools 10% (4) schools were selected for the study. Approximately 300 students were studying in each.
school. So out of 2400 boys studying in 8 schools 15% (360) were included in this study while out of 1200 girls studying in 4 schools 15% (180) were selected for this study. All the selections were done by stratified random sampling method (Table No -1).

3. Selection of subject:

The number of students from each school were as follows. A rough idea of the total number of students from class I to class V was first obtained. Then 9 students from each standard from different schools were selected. Thus a total of 540 school going children between the age of 6-11 were the subjects of this study. These children were further classified in age groups 4-6, 7-8 and 10-11 years respectively for nutritional analysis. This classification is based on R.D.A.83.

The chronological age given in the school register was taken. This information was verified during home visits. At the same time during first school visit, residential addresses were also taken for socio-economic survey. The selection of subjects is shown in table No.2
**TABLE NO. 2**

<table>
<thead>
<tr>
<th>Age</th>
<th>Class</th>
<th>No. of Boys</th>
<th>No. of Girls</th>
<th>Total number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-7</td>
<td>I</td>
<td>72</td>
<td>36</td>
<td>108</td>
</tr>
<tr>
<td>7-8</td>
<td>II</td>
<td>72</td>
<td>36</td>
<td>108</td>
</tr>
<tr>
<td>8-9</td>
<td>III</td>
<td>72</td>
<td>36</td>
<td>108</td>
</tr>
<tr>
<td>9-10</td>
<td>IV</td>
<td>72</td>
<td>36</td>
<td>108</td>
</tr>
<tr>
<td>10-11</td>
<td>V</td>
<td>72</td>
<td>36</td>
<td>108</td>
</tr>
</tbody>
</table>

TOTAL: I to V 360 180 540

4. Environmental Inventory:

A detailed home environmental inventory was prepared for each child to assess its environmental characteristics. This includes type of family, family size, parents education, income and occupation of parents. This information was collected using Kulshreshtha's°4 socio-economic status scale (Proforma No.-5). Another pretested questionnaire was used for physical environment, which includes type of house, space availability, doors, windows, roofs, floors, lighting, toilet facility and water sources. This was carried out using modified pretested schedule as described by Rajlaxmi°5.
II. Medical Examination:

Every child was subjected to clinical examination, to identify significant illness. This was carried out by using pretested proforma which is listed by W.H.O. The presence or absence of deficiency symptoms on face, eyes, hair, nails, glands, skin, gums, teeth, tongue and lips were recorded. Common health ailments were checked during home and school visits (Proforma No.-2).

III. Nutritional status:

A) Anthropometry: The anthropometric measurements like height, weight and arm circumference were recorded using standard techniques. All measurements were recorded thrice and then averaged (Proforma No. 1).

1) Weight: Platform beam was used for the weight measurement. The subject was asked to stand on the centre of the platform without taking any support. Weight was taken with minimum clothes and without shoes or socks. The subject was asked to empty bladder before weighing. The balance was checked against standard balance from time to time. Same balance was used for all the subjects throughout the study. Weights were recorded to the nearest 1/2 kg.
2) **Height**: Height was measured by using an anthropometer. The subject was asked to stand without shoes and asked to look straight without raising heels from the ground. Head bar was lowered down just touching the crown. Care was taken that the bar does not press the crown. The height was measured to the nearest 1 centimeter. The back was flattened against the wall. Child was encouraged to take a deep breath and stretch upward maximum. Height is genetically determined and socio-economic deprivation during the growth period may be a cause of failure to reach genetic potential.

3) **Arm Circumference**: Arm circumference is a valuable measurement which is used as an indicator of protein-calorie malnutrition. Left upper arm was measured with the flexible non-stretchable tape. The tape was in complete contact with skin. The midpoint of upper arm was recorded between acromianal process of scapula and olecranon process of ulna. The tape was placed gently but firmly. Arm circumference was recorded to the nearest 1 centimeter.

**Classification into nutritional grades**:

All the above anthropometric measurements were classified into nutritional grades, several other indices were calculated using the above measurements.
**Weight for age**: Children were placed in different grades of nutrition, using NCHS standard\(^8^7\) and weight for age cut-of points of Gomez's\(^8^8\) classification. Children who had over 90 percent of expected weight were considered as normal, those with weights between 75-89% were considered as suffering from grade I malnutrition, those with weights between 60-74% were considered as suffering from grade II malnutrition and those whose weights were lower than 60% were considered as suffering from grade III malnutrition.

**Height for age**: Children whose heights were 95% of expected height for age were considered as normal. Those with height between 90-95% were considered as grade I stunting. Those with heights between 85-90% were considered as grade II stunting and those whose heights were below 85% were considered as grade III stunting. This classification has been suggested by Waterlow\(^8^9\).

**Weight for Height**: All children who were classified on the basis of weights, were subdivided according to their heights. This category included several children with normal weights for their stunted heights.

**Arm circumference for Age**: Children were classified on the basis of nutritional grades as prescribed by Gomez\(^8^8\). All children were graded as normal or below standard.
**Relative body Weight**: This index was used to identify children as normal, lean, over weight or obese. Weight/height index was developed by Durant and linder for children. Weight for height was calculated by the following formula:

\[
\text{Relative body weight} = \frac{A}{B} \times 100
\]

Where 

- \( A \) = Actual weight (Kg)
- \( B \) = 50th percentile of expected weight
- \( \text{Actual height} (\text{cm}) \)
- \( \text{50th percentile of expected height} \)

* NCHS standard.

**Body mass index**: Body mass index has been used in assessing chronic energy deficiency and over weight in children over one year of age. It is calculated with the following formula:

\[
\text{B.M.I.} = \frac{\text{Weight (Kg.)}}{\text{height}^2 (\text{cm})} \times 100
\]

**B. Biochemical Examination**: Biochemical examination included haemoglobin estimation. This was done by simple prick method by which samples were examined easily as prescribed by Whitehead's (Proforma No 3).
Collection of blood: Peripheral blood (capillary blood) was used for investigation, left arm ring finger was selected for pricking. The finger was cleansed with spirit and dried. It was then punctured quickly with sterile steel lancet. First few drops were wiped away and the sample collected when the blood was flowing spontaneously, usually in 30 seconds.

Estimation of haemoglobin: Haemoglobin was estimated by cyanamethaemoglobin method. This method is based on Drabkin's cyanide ferricyanide solution. It contains potassium cyanide (.05 gm.) and potassium ferricyanide (.20 gm.), sodium bicarbonate (1 gm.) and distilled water (1 Ltr.). This solution was kept in brown bottle under cold storage. Haemoglobin cyanide and ferricyanide were converted to cyanmethemoglobin. The absorbance of solution was measured in photoelectric colorimeter at a wavelength of 540 m.$\mu$.

Procedure: .02 ml of blood was transferred with the help of pipette, into a test tube containing 5 ml of Drabkin's solution. The contents of the tubes were mixed and reading was taken in a photoelectric colorimeter (Klett summerson) using 540 filter. The haemoglobin was recorded in gm/dl.
C. Diet Surveys:

Diet surveys were carried out for 3 days by oral questionnaire method. Consumption of food of the family was recorded by pretested proforma prepared by Rajlaxmi\(^{34}\) (Proforma No.4). Food consumption of individual was recorded by 24 hour recall method, using standard cups for consumed food.

Calculation of nutritive value:

Collected data on food consumption were converted into uniform terms of weight and then their nutritive value was calculated using food composition tables. Food consumption of the subjects was then compared with Recommended daily allowances (RDA)\(^{35}\).

4. Mental Ability:

Mental ability was assessed in term of I.Q. This was performed by using "Draw - A - Man" test which has been developed by Mishra\(^{36}\) (Proforma No.6).

Method: 5-6 children were tested at a time. One blank white paper was distributed to each child. They were asked to draw a human figure. Children were encouraged while drawing. The subject was not permitted to use erasers. There was no time limit. After completing the figure all papers were collected. Scoring was done by using pretested score schemes. Tested scores were
converted into I.Q. and mental age. Results were
compared with other variables.

5. Statistical Analysis:

Statistical analysis of data for mean and
standard deviation was carried out with the help of
scientific calculator. Combined mean and combined
standard deviation was calculated for average values.

**Combined mean**: This analysis was made by mean values
and standard deviation of individual groups. All the
subjects were classified in 5 age groups. Combined mean
was calculated with the following formula:

\[
\text{Comb} \ M = \frac{M_1 N_1 + M_2 N_2 + M_3 N_3 + M_4 N_4 + M_5 N_5}{N_1 + N_2 + N_3 + N_4 + N_5}
\]

Where \( N_1, N_2, N_3, N_4 \) and \( N_5 \) were number of students in each
group and \( M_1, M_2, M_3, M_4 \) and \( M_5 \) were mean values of each age group.

Combined standard deviation was calculated with the
following formula:

\[
\text{Comb} \ \sigma = \sqrt{\frac{N_1 (d_1^2 + \zeta_1^2) + N_2 (d_2^2 + \zeta_2^2) + N_3 (d_3^2 + \zeta_3^2) + N_4 (d_4^2 + \zeta_4^2) + N_5 (d_5^2 + \zeta_5^2)}{N_1 + N_2 + N_3 + N_4 + N_5}}
\]

d_1 = M_1 - \text{Comb.} \ M

d_2 = M_2 - \text{Comb.} \ M

d_3 = M_3 - \text{Comb.} \ M

d_4 = M_4 - \text{Comb.} \ M

d_5 = M_5 - \text{Comb.} \ M

\( N_1, N_2, N_3, N_4 \) and \( N_5 \) were for number of students in each
group.
Correlation Coefficient:

The association or magnitude of relationship between two variables can be measured by means of correlation coefficient, calculated using the following formula:

\[
\text{Correlation Coefficient} = r = \frac{\sum dx dy}{n \times \sigma_x \times \sigma_y}
\]

Where

- \(x\) - Denotes the values taken by one variable;
- \(y\) - Denotes the values taken by another variable.
- \(n\) - Is the sample size.
- \(\sigma_x\) - Standard deviation of sample of 'x' variable.
- \(\sigma_y\) - Standard deviation of sample of 'y' variable.

The coefficient of correlation varies between -1 to +1. In testing the significance of correlation values may be compared with the theoretical values at various degree of freedom. If \(r\) is greater than .05 or \(r\) .01 at \(n-2\), it can be taken as significant at respective level of significance.

*****
### TABLE NO. -1

#### SELECTION OF SAMPLE

<table>
<thead>
<tr>
<th>No. of Schools (110)</th>
<th>Sample</th>
<th>2 : 1</th>
</tr>
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<tbody>
<tr>
<td>74 boys</td>
<td>Sample</td>
<td></td>
</tr>
<tr>
<td>(20000) approximately</td>
<td></td>
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</tr>
<tr>
<td>36 Girls</td>
<td>Sample</td>
<td></td>
</tr>
<tr>
<td>(10000) approximately</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School</th>
<th>Student</th>
<th>School</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>360</td>
<td>4</td>
<td>180</td>
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