CHAPTER II
MATERIALS AND METHODS
Chhattisgarh region is one of the most prosperous region of Madhya Pradesh which is situated between the latitudes 17°46' North and 24°06' North and between the longitudes 80°15' East and 84°51' East.

The area covered by the seven eastern most districts of Madhya Pradesh namely Raipur, Bilaspur, Durg, Rajnandgaon, Bastar, Surguja and Raigarh are situated in the central part of India. It occupies 1,35,133 sq.km. i.e. 30.52 percent area of Madhya Pradesh and 4.14 percent of the area of India.

The climate of this region is rather hot, where the temperature varies from 19.8° centigrade in the coldest period of January to 47.3° centigrade in May which is the hottest month.

The region is predominantly an agricultural area and 80 percent of the working population is engaged in agriculture. Productive land (43.3 percent) and forest (44.3 percent) constitute the two largest landmasses in the region.
MAP OF CHHATTISGARH AREA SHOWING THE SELECTED BLOCKS OF STUDY

FIG. 1.
Chhattisgarh also possesses the largest tribal population of the country. Tribals comprise communities who live in the forest and hilly areas in a scattered way, which is far away from the civilized area. The tribal population of Chhattisgarh region is 57,17,105 i.e. 32.46 percent of the total population of Chhattisgarh region.

This study was undertaken in three districts of Chhattisgarh namely - Raipur, Bastar and Surguja.

RAIPUR DISTRICT: The district is situated between the latitudes 20°33' in North and 21°14' North and between the longitude 82°6' East & 81°38' East. Raipur is the headquarter town of this district. The area of this district is 21,258 sq.km. Average rainfall 138.4 cm per year. The tribal population is 7,14,027 i.e. 18.27 percent of total population of the district.

SURGUJA DISTRICT: The Surguja district was formed with Ambikapur as its head quarter town by merging the three feudatory estates, viz Surguja, Chand Bhakar andHora. The tribal population of this district is 11,17,577 i.e. 53.66 percent of the total population of this district. Average rainfall 133.7 cm per year.
BASTAR DISTRICT: The district is situated between the latitudes 17°46' - 20°34' in North and between longitudes 80°15' - 83°15' East. Jagdalpur is the headquarter town of this district. Average rainfall is 135.8 cm per year. The tribal population of this district is 15,29,888 i.e. 67.36 percent of the total population of this district.

The details of material collected and methods utilized are provided below:

This study provides, some aspects of the knowledge, attitudes and practices of infant feeding, socio-economic status and nutritional status of infants in the urban slums and tribals of Chhattisgarh region. A comparative study was also carried out on the same aspects on urban elite infants. The groups of infants studied were from 1 to 12 months of age.

SELECTION OF SAMPLES

Chhattisgarh area comprises of seven districts. Three districts were selected for the collection of data for this study. The selection of Surguja and Bastar was based on the fact that the tribal population of these districts is more than 50
percent of the district population. Raipur was taken as the third district because a small Dravidian Tribe (Kamar) is exclusively found here.

The data was collected from two blocks of each district for the sake of convenience. Blocks were Baikunthpur and Sonhat from Surguja; Narayanpur and Orchha from Bastar and Mainpur and Chhura from Raipur. 10 percent villages from each block having a high concentration of tribals was the final area of data collection.

For the sake of convenience, Raipur slums were taken as representative ones and out of the 135 slums of Raipur, 27 slums (20 percent) were selected at random and convenience for the study.

Houses having infants were enumerated and mothers were taken into confidence before the collection of data was started. They were acquainted with the purpose of this investigations and methods to be followed. In case of language problem, interpreter's help was taken.
615 infants (both sex) of Raipur slums of Chhattisgarh region and 553 infants (both sex) of tribals of Chhattisgarh region and 304 urban elite were selected for the present study.

Details of subject studied are provided in the table - 1.

A predesigned and pretested proforma used for the study is given in the Appendix - I,II & III.

**SOCIO-ECONOMIC SURVEY:**

For the general information, the details of families of infants are given below:

**Family Size :**

A family was considered as a unit for the collection of data, where an infant of 1-12 months age available. The total family size was assessed and the details regarding the age, sex of the infants, education of parents of the infant, number of family members was collected. Age was assessed from home records, horoscope or based on the local calendar of festivals and events.
Family Income:

Family income was estimated by assessing the income of all the earning members in the family, also considering the income through sources like agriculture, dairy keeping, poultry, home industries etc. The total family income per month was divided by the number of family members to get the per capita income of the family.

Type of Family:

Details of family, whether joint or nuclear was also assessed for all the infants.

Occupation:

The occupations of all the earning members of the family were noted. As suggested by Thimmayamma, occupation were broadly classified as major occupation, subsidiary occupation and other source of income i.e. agriculture, cattle wealth, poultry and house rent.

Educational Status of Parents:

Literacy status of both father and mother of infants was assessed in terms of illiteracy, primary, middle, higher secondary, graduate and post graduate level.
House Accommodation:

Information regarding house accommodation like own house, rented house, type of house, number of living rooms, kitchen facilities, ventilation, electricity etc. was collected.

Sanitary Condition:

Information like source of drinking water, lavotary facilities, drainage facilities and surroundings etc was collected.

The details of the above socio-economic information were recorded in the proforma (Appendix-1).

KNOWLEDGE, ATTITUDES AND PRACTICES OF INFANT FEEDING

For collection of data for knowledge, attitudes and practices of infant feeding, following definition were used.

(i) Infant: An infant is a child from birth to the completion of 12 months as per Jelliffe.

(ii) Breast Feeding Status:

(a) Solely Breast Fed (S.B.F.): An infant was called as solely breast fed, if he or she was still taking entirely breast milk at the time of examination.

(b) Partially Breast Fed (P.B.F): An infant was called partially breast fed, if he or she was taking either milk, semi solid or solids in addition to the breast milk.
(c) Not Breast fed (N.B.F.): Those infants who were not on breast feed but on substitute liquids, semi solid or solid foods at the time of interview.

Apart from above, the information regarding feeding practices i.e. breast feeding, introduction of top milk and age of introduction of semi solid and solid foods and influence of various practices, beliefs and customs among mothers and also attitude of mothers towards feeding practices was collected(Appendix-II).

Before collection of the data, mothers were taken into confidence and were appraised of the purpose of the study, so that the correct information could be obtained.

Prior to the interview, the purpose of study was thoroughly explained to them. Those who were not co-operative and those who were conservative or suspicious in their statements were excluded from the study. In case of tribal mothers whose language was not understandable, the help of an interpreter was sought.
NUTRITIONAL STATUS

There are various methods of assessing nutritional status. Anthropometry is one of them and this was the method used for the present study.

Among various possible body measurements those which were simple and easy to adopt and at the same time gave maximum information on nutritional status (growth and degree of malnutrition) of infants were chosen for the present study.

The anthropometric measurements were recorded in metric system in the proforma (Appendix-III). All the measurements were taken thrice and the mean data finally recorded.

The measurements taken were:

i) Weight;

ii) Length;

iii) Head circumference;

iv) Chest circumference;

v) Arm circumference.

(i) Weight:

Body weight is the most commonly used anthropometric measurement as it gives a good idea of
nutrition and growth.

Infants were weighed nude with pan type beam balance which had accuracy of 5 g. Every day, before starting the work, the balance was checked for any error, using standard weights. The same balance was used throughout the study.

(ii) Length:

Crown to heel length of the infant was measured in infantometer having an accuracy of 1 mm. The infant was laid on the board which was placed on a flat surface. The head was positioned firmly against the fixed head-board. The knees were extended by firm pressure applied by an assistant and the feet were flexed at right angles to the legs. The upright sliding foot-piece was moved to obtain firm contact with the heels and the measurements noted were nearest to 0.1 cm.

(iii) Head Circumference:

In nutritional anthropometry, the ratio of chest/head circumference is of value in early childhood. Head circumference was measured with a flexible, non-stretchable fibre glass tape. The head circumference was measured by placing the tape firmly
round the frontal bones just above the supra-orbital ridges, passing it around the head at the same level on each side and laying it over the maximum occipital prominence at the back. It was recorded to the nearest 0.1 cm.

(iv) Chest Circumference:

With a fibre glass tape, the measurement was taken at the nipple line in mid-inspirations. The measurements were noted to the nearest 0.1 cm.

(v) Mid-arm Circumference:

Measurements of the mid-upper arm circumference appear to be most useful in practice. The arm circumference was measured to the nearest 0.1 cm with a fibre glass tape, which was placed gently, but firmly around the limb to avoid compression of the soft tissues. Always the left upper arm was measured. The measurement was made with the arm hanging relaxed at the side. The mid point was carefully selected, half way down the arm, between the tip of the acromion process of the scapula and olecranon process of the ulna.
GROWTH STATUS

All the anthropometric measurements were expressed as percentage of standard. Because of non-availability of local standard for various anthropometric measurements, international standard were utilized.

The details of source of international standards for various anthropometric measurements, are provided below:

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Source of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Weight</td>
<td>National Centre for Health Statistics (NCHS)¹²,¹³.</td>
</tr>
<tr>
<td>(b) Length (Height)</td>
<td>- do -</td>
</tr>
<tr>
<td>(c) Weight/Length (Height)</td>
<td>- do -</td>
</tr>
<tr>
<td>(d) Head circumference</td>
<td>- do -</td>
</tr>
<tr>
<td>(e) Chest Circumference</td>
<td>Nutrition foundation of India.¹⁴ (Growth standard for Indian children)</td>
</tr>
<tr>
<td>(f) Arm Circumference</td>
<td>Wolansky¹⁵.</td>
</tr>
</tbody>
</table>

Weight for Age

Weight has been found to be a sensitive anthropometric measurement for assessing the nutritional status of a community. The classifications
of malnutrition prominently utilized were those suggested by Gomez et al.\textsuperscript{16,17} and modified classification of Visweswara Rao et al\textsuperscript{18}. They are as follows:

(a) Gomez classification

<table>
<thead>
<tr>
<th>Grades of Malnutrition</th>
<th>Body weight as percent of standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>90 and above</td>
</tr>
<tr>
<td>Grade I</td>
<td>75-89</td>
</tr>
<tr>
<td>Grade II</td>
<td>61-74</td>
</tr>
<tr>
<td>Grade III</td>
<td>&lt; 60</td>
</tr>
</tbody>
</table>

(b) Visweswara Rao's classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Body weight as percent of standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>≥ 75</td>
</tr>
<tr>
<td>Mild</td>
<td>65-75</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt; 65</td>
</tr>
</tbody>
</table>

Height for age:

It has been noted that weight alone does not distinguish different forms of malnutrition (Water low\textsuperscript{19}, Visweshwara Rao and Singh\textsuperscript{20} and Visweswara Rao et al\textsuperscript{21}). Therefore, height as percentage of standard were calculated and infants were classified into two groups on the basis of height percentage.
> 90 percent : Normal  
< 90 percent : Long term malnutrition (chronic)

**Weight/height² :**

This was calculated by dividing absolute weight in grammes with absolute height (centimeters) squared. This is also an index for assessing the current forms of protein-calorie malnutrition. Children can be classified into various forms of malnutrition based on the critical limits of index observed through a prospective study of infants and toddlers.

The limits were:

(i) Good growth status (Normal) - F (weight/height² > 1.5)
(ii) Mild to moderate forms of - F (Weight/height² < 1.5) malnutrition
(iii) Malnourished - F (Weight/height² < 1.35)

(F = Anthropometric indices)

The limits for classification of various forms of malnutrition were taken as above based on co-efficient of variation (Visweswara Rao, Visweswara Rao et al.)

**Weight for height (%)**

It is considered as a good index of current
nutritional status. Length may differ widely among healthy children of the same age and consequently weight is related to length. Most often accurate assessment of age may not be possible. Weight for height is also believed to be age independent.

Visweswara Rao et al. suggested the classification of nutritional status of early childhood.

Normal  > 90%
Moderate  80-90%
Severe  < 80%

Chest / Head circumference :

chest/ head circumference ratio was calculated by dividing the chest circumference by head circumference. A chest / head circumference ratio less than one between the age of six months to 5 years is due to growth failure or due to wasting of muscle and fat of the chest wall. It has been used as indicator of protein-calorie malnutrition of early childhood. It's validity was also evaluated for the diagnosis of clinical form of protein-calorie malnutrition.\textsuperscript{11,18}
Normal > 1
under nourished < 1

Arm Circumference:

It has been suggested as a useful public health index of protein-calorie malnutrition for the assessment of nutritional status of a community (Jelliffe\textsuperscript{11}). Arm circumference was calculated as percentage of international standard (Wolanskey\textsuperscript{15}) and the limits for classification of various grades of malnutrition were taken as suggested by Jelliffe and Visweswara Rao et al.\textsuperscript{18}

Normal > 85.0 percent
Poor nutritional status < 85.0 percent

Forms of malnutrition and criteria:

There are broadly three forms of malnutrition. Water low,\textsuperscript{19}, Visweswara Rao et al.\textsuperscript{21}; they are

1) Long duration malnutrition
2) Current forms of malnutrition or short duration and
3) Combination of these two forms.

These forms of malnutrition have been well identified by the several approaches using composite nutritional anthropometry. For the present study to
identify the forms of malnutrition, the following approach was used. The details are here with.

Height for age and weight/height (Waterlow 19)

Details

<table>
<thead>
<tr>
<th>Height %</th>
<th>Weight for Height %</th>
<th>Forms of Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 90</td>
<td>≥ 80</td>
<td>Normal</td>
</tr>
<tr>
<td>&lt; 90</td>
<td>&lt; 80</td>
<td>Chronic &amp; current forms of Malnutrition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(or stunting and wasting)</td>
</tr>
<tr>
<td>≥ 90</td>
<td>&lt; 80</td>
<td>Short duration of Malnutrition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Wasting only)</td>
</tr>
<tr>
<td>&lt; 90</td>
<td>≥ 80</td>
<td>Nutritional Dwarf.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(or stunting only)</td>
</tr>
</tbody>
</table>

STATISTICAL ANALYSIS

Statistical analysis was carried out with a Wipro PC Computer of Indostat using SASS Programme at Hyderabad. The differences in mean values of groups of infants by age, sex-tribals, slums and urban elite areas were tested with the use of analysis of variance (ANOVA - TECHNIQUES) and least significance differences approach at 5% level. The factors that are different between nutritional status groups of tribals,
slums and urban elite communities, as well as between tribals were traced with the use of multiple discriminant function analysis. The evaluation of the discriminant function was carried out with the use of Mahalanobis $D^2$, Hotelling $T^2$ and multiple correlation and with percentage of subjects properly or improperly classified were found with these functions. The best set of factors (or indicators) that are different was traced using the step down discriminant function analysis. All the variables (or factors) which are found to have significant differentiation at 5% level of significance were taken as best set for discrimination. Mean values with standard deviation and standard error were found for each group and comparison were made.

Discriminant function analysis is useful for tracing the differences of various indicators between two or more populations. Thus, in two samples representing different populations such as undernourished and well nourished (or normal) we have measured one character for them and find that though their means for this character are not identical, their distributions overlap considerably. On the basis of this character one could not, with any degree of accuracy, identify an individual as belonging to one or
the other of the two populations. A second character might also differentiate them somewhat, but not absolutely. As many as 'P' variables together can be had for differentiation with this analysis. Discriminant function analysis computes a new variable 'Z', which is a linear function of 'P' variables. This function is constructed using the correlation matrix in such a way that as many as possible of the members of one population have high value for 'Z' and as many as possible of the members of the other have low values so that 'Z' serves as a much better discriminant of the two populations than does variable $X_1$ or $X_2$ taken singly. Significance of discriminant functions is assessed with calculations of Mahalanobis $D^2$, Hotelling $T^2$ values, $R^2$ values and $R^2$ adjusted values. Values of $D^2$, Hotelling $T^2$, $R^2$ or $R^2$ adjusted are all interrelated. Higher the values of these, better is the degree of differentiation between groups of populations. For significance of these Fisher's 'F' test utilized with analysis of variance.

$R^2$ : Coefficient of determination = (Multiple correlations)$^2 \times 100$ co-efficient.

$R^2$ adj : Coefficient of determination adjusted for comparison due to different degree of freedom.
Values of $D^2$ or $T^2$ as well as $R^2$ are tested by Fisher's 'F' test. Best set, out of 'P' variables is traced with the use of stepdown discriminant function analysis. In the use of stepdown procedure, the partial discrimination co-efficient of each variable in discriminant function is tested by Fisher's 'F' test at 0.05 level of significance and function which has all the discriminant coefficients significant is chosen as the best.