MATERIAL AND METHODS
The aim of the study was to find out the effect of dietary habits on nutritional status of urban slum and rural population in Amravati district.

Ramchandran (48) has suggested that the assessment of nutritional status can be done using the following information:-

a) Direct parameters, e.g. dietary intakes, anthropometric, biochemical and biophysical parameters.

b) Indirect parameters, e.g. morbidity and mortality experience in the community especially age specific mortality rates.

c) Ecological parameter, e.g. socio-economic status, housing and environmental hygiene.

For the study different steps taken are discussed under following heads.

1) Selection of the sample.
2) Collection of data.
   a) Questionnaire and interview method.
   b) Weighment method.
   c) Anthropometric measurement.
   d) Clinical examination for ascertaining nutrition deficiencies.
3) Analysis of data.
4) Statistical analysis.
5) Supplementary feeding experiment.

1. SELECTION OF THE SAMPLE:

Sampling is the principle, accepted in the research project of urban slum and rural area of Amravati district in Vidarbha that deals with diet and nutrition of the urban slum population and rural population. 5 families from each urban slum and 5 families from each village of rural area were selected randomly. Thus survey was conducted on 50 urban slums (given in map No. 1) i.e. on 250 families and on 50 villages (given in map No. 2) i.e. on 250 families from Amravati district. The purpose of selecting samples from urban slum population and rural population was to compare these two group. The urban slum group was in contact with civilised people of Amravati city but the later group was not.

2. COLLECTION OF DATA:

a) Questionnaires and Interview Method:

Food and Agriculture Organization and World Health Organization questionnaires of diet survey and Indian
Urban Slums surveyed in connection with the study of Dietary Habits and Nutritional status of Urban Slum population of Amravati city.

MAP NO. 1.
Villages surveyed in connection with the study of Food Habits and Nutritional status of Rural Population of Amravati District.

MAP NO. 2.
Council of Medical Research nutrition assessment schedule (given in appendices) were filled personally by the investigator by interview method. General information regarding income, occupation type of family, size of family, existing customs and information regarding food habits, food intake, anthropometric measurement, nutritional deficiency diseases were collected. The interview schedule was pre-tested on forty urban slum and forty rural families of Amravati district, which were not included in this study. The inconsistencies and ambiguities which were revealed through the pre-testing were removed and the schedule was finalised.

The urban slum and rural population were interviewed at their homes particularly in the early morning and in the evening, when they could spare some time for the investigator. Interview schedule was filled by investigator by collecting information.

Thus the interview method was selected for its flexibility, validity, observability and possibility of checking the responses. It is also a very successful technique of field work as it lends an informational atmosphere.
b) Weighment Method:

Weighment method for assessing the family dietary intake involves actual weighment of raw foods (edible portions) before cooking. This has been considered to be accurate for assessing food consumption but, it is laborious and time consuming and is much dependent on the availability of foods at home.

Taskar (49) suggested weighment method of diet survey for one day was followed to assess the family intake. Rao (50) studied that a diet survey for three days is an efficient as a seven days. Raw food of the families included for the survey were weighed before cooking for three days and noted personally. The total raw amount of food, used during these three days by the family for morning, afternoon and evening were weighed. The total members, ages and physical activity of member who shared the meal on that day was noted.

c) Anthropometric Measurement:

Anthropometric measurement is an important tool for the assessment of nutritional status. The pattern of
growth and physical state of the body, through genetically determined, are profoundly influenced, by diet and nutrition. Hence anthropometric measurements are useful criteria for assessing nutritional status.

Anthropometric measurement i.e. age, height, weight, arm circumference of all age and groups and chest circumference and head circumference up to five years were taken whose dietary history was known.

i) Age:

Anthropometric indices like height and weight are frequently used in the evaluation of nutritional status and growth performance of infants and children. For proper interpretation of these data correct assessment of the age of the children is a pre-requisite. It was observed that assessment of correct ages of children in urban slum and rural population is beset with difficulties since documentary evidence of data of birth is rarely kept. Also due to ignorance and negligence, method in urban slum and rural population are unable to recall the dates of birth of their children. However, they are often able to provide information regarding the birth of child in relation to some local events or festival. An attempt was therefore made to
assess the ages of urban slum population and rural population by local calendar by knowing local events and festivals or by asking the mother to relate the birth of their children to some local events of festivals. The validity of these methods has been demonstrated by Thimmayamma and Naidu (51).

ii) Weight:

Weight is the simplest measurement of growth and nutritional status. Weight was measured using personal weighing scale. Weight was recorded without foot wears with minimum clothing. The measurement was taken to the nearest 0.25 kilogram. Children were weighed with very light clothing with and without mother or guardian. Some of the children to toddler age was weighed alone. It was noticed that both the methods yielded the same results.

iii) Height:

Height is a linear measurement made up to the sum of four components: legs, pelvis, spine and skull. The measurement of body length for young children and height
for older children and adult is well recognised is nutritional assessment. Heights were measured using measuring tape.

The measuring tape was fixed vertically on a smooth wall perpendicular to the ground, taking care to see that the floor area is even or not rough. The subject was asked to remove his shoes, stand with the centre of his back touching the scale, with his feet parallel and heels, buttocks, shoulders and back of head touching the wall. The head was held comfortably erect; arms were hung loosely by the side. A smooth, thin wooden scale was held horizontally on top of the head in the centre, crushing the hair at a right angle to the scale, and the height read off from the lower edge of the scale to the 0.1 cm. Each reading was taken twice to ensure correctness of the measurement.

In case of infants, length was measured taking the recumbent length (crown heel length) with measuring tape. The subject was placed on the plane surface. The head was positioned firmly with the eyes looking vertically. Firm pressure was applied on the knees, keeping the legs extended. The feet were flexed at right angles to the legs.
and length was measured from crown to heel.

iv) Arm Circumference:

Jelliffe (52) recommended inclusion of arm circumference in the four basic measurements, which should be made on all groups. Arm circumference runs next to weight in reflecting nutritional status of the children (53). Jelliffe (54) concluded that in the field survey arm circumference measurement can be used as a rapid economic method, of approximately equaling growth failure and protein-calorie inadequacy and differently well nourished children from group or communities with Protein Calories Malnutrition.

The arm circumference was measured to the nearest 0.1 centimeter with a flexible measuring tape, which was placed gently, but firmly around the left mid upper arm to avoid compression of soft tissues. The left upper arm circumference is measured while it is hanging freely, at its mid point. Each measurement was taken twice to ensure accuracy.
v) Head Circumference and
    Chest Circumference:

    In nutritional anthropometry chest/head circumference ratio is of value in early childhood. The main
    practical use of the measurement will be in the second and perhaps their year of life. This is because the
    circumference of head and the chest are about the same at one year of age. After this, the skull grows slowly and
    chest more rapidly.

    The head and chest measurement from birth to five years subjects was taken with flexible measuring tape.
    The head circumference was measured by placing the tape finely around the frontal bones ridge passing it around the
    head, at the same level on each side and laying it over the maximum occipital prominence at the basic. The chest
    measurement was taken at the nipple line. The average of the inspired and expired chest measurement was taken with
    flexible measuring tape. Measurements were taken to the nearest 0.1 centimeter.
d) Clinical examination for Ascertaining Nutritional Deficiencies:

Clinical examination has always been and remain, an important practical method for assessing the nutritional status of a community. The assessment based on the recognition of certain physical signs, has the advantage of relative inexpensiveness. Neither elaborate field equipment nor a costly laboratory is needed. Clinical examination is the most essential part of all nutritional surveys since the ultimate objective is to assess levels of health of individuals as influenced by the diet.

In all age subjects a careful clinical examination was conducted with special reference to nutritional deficiency signs by the investigator with the help of personal doctors. This clinical assessment was carried out on the lines suggested by Nutritional Advisory Committee of Indian Council of Medical Research using a rapid nutrition survey schedule (given in appendices No. 2). In this study signs related to nutritional deficiency are identified by assessing condition of teeth, gums, skin, hair, eyes, tongue and other external characteristics.
3. ANALYSIS OF DATA:

The data was collected on general information and was analysed the urban slum and rural families were classified according to size and type of the family and their percentage was calculated. The percentage of illiterate females and males was calculated. The urban slum and rural families were classified according to their occupation and income.

The urban slum and rural population was also classified according to their food habits and percentage of vegetarian and non-vegetarian was calculated, daily dietary intake of various food groups was expressed in per consumption unit.

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\text{Food intake per consumption unit per day} = \frac{\text{Total raw amount of each food stuff}}{\text{Total consumption units of the family who shared the meal}}
\]

Nutrient intake was calculated, using food composition tables \(^{(55)}\) and compared with standards of Indian Council of Medical Research \(^{(55)}\).
Gomez Classification:

For assessing the mild forms of malnutrition, Gomez classification (Gopaldas and Seshadri 1987) was used for the children under five years. The details of these classifications are as follows:

* $\leq 60\%$ weight of age Grade III Malnutrition.
* 67-75\% weight for age Grade II Malnutrition.
* 76-90\% weight for age Grade I Malnutrition.
* $> 90\%$ weight for age Normal.

4. STATISTICAL ANALYSIS:

Statistical analysis of collected data on anthropometric measurement was done. The mean values were calculated for each parameter under age groups. The standard deviation of anthropometric measurement calculated the 't' test was applied to test the significant difference between calculated measurements and standard measurement.

* $\leq$ means 'less than or equal to'
* $>$ means 'more than or equal to'.
Clinical analysis of urban slum and rural population was done. Percentage prevalence of nutritional deficiency signs was calculated.

5. SUPPLEMENTARY FEEDING EXPERIMENT:

In India, children between the age of one to five years constitute more than 15 per cent to total population and they are the most vulnerable to malnutrition. The mortality rate in children below five years is as high as 40 per cent. Malnutrition during critical phases of early growth can lead not only to the stunting of physical growth, but also to suboptimal intellectual development in children. Apart from Protein Energy Malnutrition, vitamin-A deficiency and iodine deficiency are major nutritional problem. To get control over malnutrition and other major deficiency diseases, Govt. of India had started many supplementary feeding projects such as Integrated Child Development Scheme in many states.

In present study also some preschool children were malnourished. Vitamin -A and B-Complex deficiency also found in some preschool children. The dietary intake of prechildren was less than recommended dietary allowance.
Nutrient intake of urban slum preschool children was lower than rural children. So the supplementary feeding experiment was done to find out the effect of supplementary feeding among the preschool children of studied urban slum population of Amravati district.

Selection of sample 120 preschool children (2 to 5 years old) were selected from studied urban slum population. Children were divided into two groups (1) control group and (2) supplemented group. Each group carried 60 preschool. Preschool children of supplemented group were supplemented for 90 days, but preschool children of control group were not supplemented.

Combination Of Feeding Formula:

For feeding to preschool children cereal and pulse product (wheat, pulse laddus) and banana were selected.
The combination of wheat pulse laddus was as follows:

**Ingredients:**

- Roasted Bengal gram flour - 60 gm
- Roasted wheat flour - 60 gm
- Jaggary powder - 30 gm

**Method:**

All these ingredients were mixed and made into small balls.

Wheat pulse laddus (prepared from above quantities of ingredients) and banana 100 gm were fed to selected preschool of supplemented group at one feed.

Each preschool child had received following nutrients from the above feeding formula:

- **Calories** - 668 Kcals
- **Protein** - 21.04 gms.
- **Thiamin** - 0.63 mg.
- **Riboflavin** - 0.32 mg.
- **Niacin** - 4.62 mg.
- **Iron** - 16.06 mg.
- **Calcium** - 106.00 mg.
Supplementary Feeding Schedule:

Supplementary experimental formula was fed to preschool children of supplemented group for 90 days (thrice a week). Control group was not fed.

Anthropometric Measurements:

Anthropometric measurements are useful criteria for assessing nutrition status. It should be remembered that the other factors such as frequent illness due to infection or infestation may also affect the growth and physical status of the body.

Anthropometric measurements (i.e. height, weight) of preschool of both the groups were taken. Measurements were taken before start of feeding schedule and after completion of feeding schedule.

Biochemical Test:

Blood is a liquid tissue, circulating virtually in closed system of blood vessels. Blood is constituted of the cells i.e. red blood cell, white blood cells, platelets,
present in liquid fraction, plasma. Haemoglobin is the main constituent of red blood cells and carries out the important function of transportation of oxygen from lungs to various parts of body.

Sahli's Method (Sood 1987) \(^{57}\) is used for haemoglobin estimation. This method is based on conversion of haemoglobin to acid haematin, which has brown colour. Haemoglobin tube was filled till 20 mark with N/10 HCl. To this sucked blood (capillary blood from finger prick was sucked into the haemoglobin pipette upto 20 micro liter) was added. This tube was left for 5-45 minutes. During this time stirring of mixture (acid blood) in the tube was continuous. Distilled water was added until a match is obtained with brown glass standard (comparator) provided. Then reading was taken on the lower level of fluid meniscus on gm% side of the tube. Reading was reported in gm/100 ml of blood.

With the help of Sahli's method, haemoglobin in gm/100 ml blood, was calculated of preschool children of both the groups before start feeding schedule and after completing feeding schedule.
Analysis of Data on Supplementary Feeding Experiment:

The data was collected on initial and final anthropometric measurement (height and weight of preschool children 2-5 years) of supplemented group and control group. The measurements of both the groups compared with each other. The measurement also compared with standards of Indian Council of Medical Research (64).

Initial and final haemoglobin level of preschool children of supplemented group and control group was calculated and compared with normal level of haemoglobin in blood recommended by WHO (58).

Statistical Analysis of Supplementary Feeding Experiment:

Statistical analysis of data collected on anthropometric measurements was done. Mean values were calculated for each age group. The standard deviation of height and weight calculated. The 'T' test was applied (a) between initial and final anthropometric measurement of preschool children of control group (b) between initial and final anthropometric measurements of preschool children of supplemented group to see the test of significance.