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## MATERIAL AND METHODS

The methodology adopted for the present study “**Dual Nutrition Burden in Urban Women from Low Middle Income Families**” is presented under the following headings

### **A. Identification of Lactating and Non Pregnant and Non lactating Women (NPNL) for the Study**

- a. Selection of study area and population
- b. Selection of subjects for enrollment
- c. Formulation of tools for data collection
- d. Ethical consideration and confidentiality

### **B. Assessment of Nutritional Status of the Enrolled Women**

- a. Measurements of Body weight
- b. Measurement of Height
- c. Computation of BMI
- d. Preparation of Vernier tape
- e. Measurement of Mid Upper Arm Circumference
- f. Measurement of Waist Circumference
- g. Measurement of Hip Circumference
- h. Computation of Waist Hip Ratio

### **C. Imparting Nutrition Education to Women**

### **D. Statistical analysis and Interpretation**

- Data Collection and Cleaning
- Data Analysis

**A. Identification of Lactating and Non Pregnant and Non lactating Women (NPNL) for the study**

**a. Selection of Study Area and Population**

Currently India is experiencing the highest underweight burdens in the world, coupled with signs of raising obesity and the prevalence of both under and over nutrition is reported to be higher in women as compared to men population (Zargaret *al.*,2000). A mixed longitudinal study was undertaken to assess the nutritional status and to find out the prevalence of dual nutrition burden among the urban women from low middle income families. Between January 2015 and December 2017, Four thousand one hundred fifty five non pregnant and non lactating women and two thousand two hundred forty lactating Women were enrolled for this observational study. The areas selected for data collection were in the ICDS Blocks of South Delhi Viz Neb Sarai, LadoSarai and Andheria Mod. In these selected area of Delhi, Nutrition Foundation of India, New Delhi has been working for several decades and has a good rapport with the people of these selected area and also has good support and co operation from the Anganwadi workers and beneficiaries. A total of 30 Anganwadies were selected from the selected study areas – 12 in Neb Sarai, 6 in LadoSarai and 12 in Andheria Mod, the present study was carried out. Prior to the actual conduct of the study, objectives, purposes and benefits of the study were clearly explained and confidentiality of the collected data was ensured to the Authorities , ICDS officials and beneficiaries and the enrolled subjects. The enrolled subjects were also motivated to extend their full co – operation for the successful conduct of the study.



Figure 14: Area Map of Neb Sarai

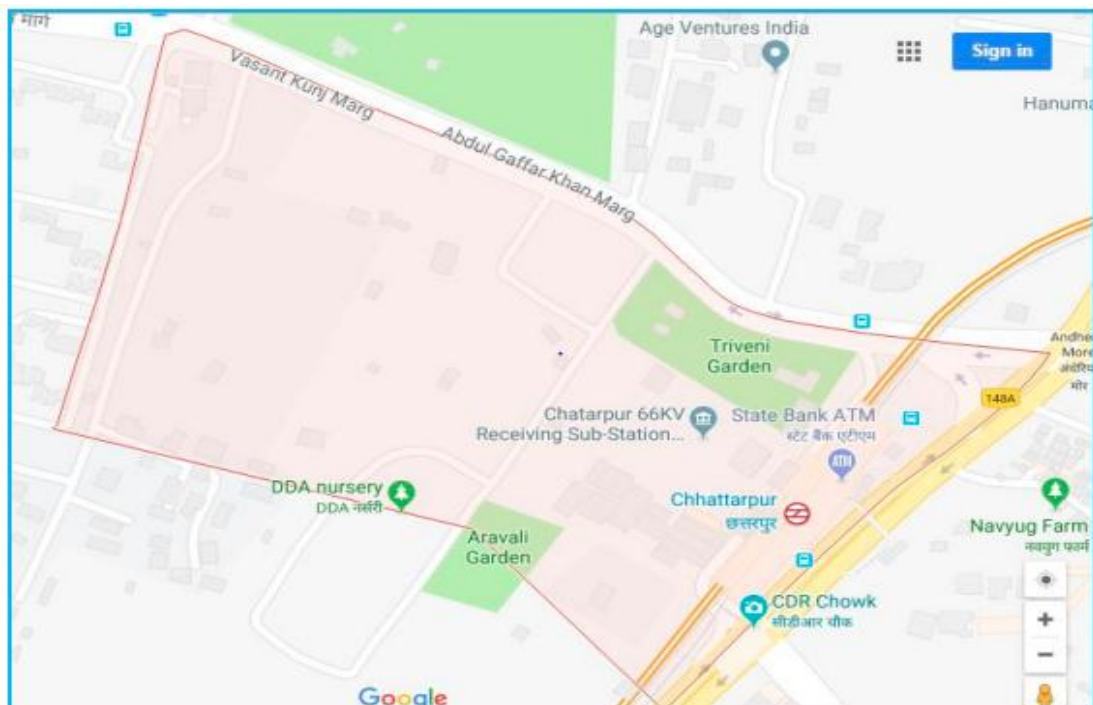


Figure 15 Area Map of Lado Sarai



**Figure 16: Area Map of Andheria Mod**

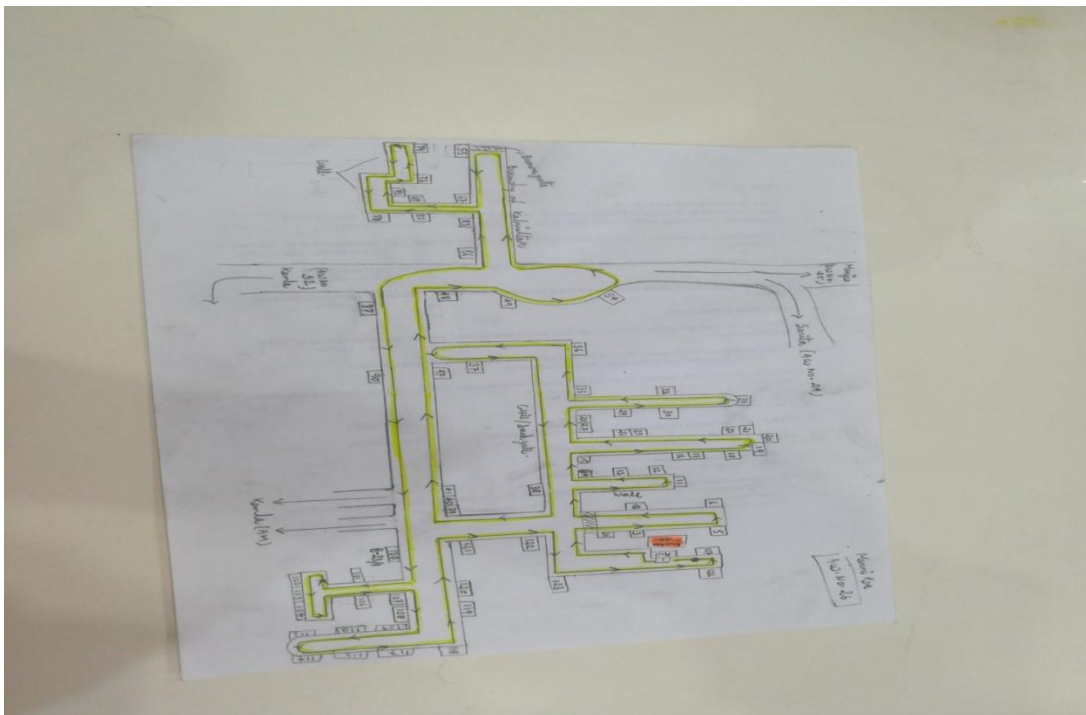
#### Census and Preparation of Area Maps

In the first step of census and preparation of area maps, a complete door-to-door census was carried out in the 'locale'. During the census, all houses and households included in an Anganwadi were numbered whether they came into inclusion Criteria or not. Numbering was done using small stickers that were affixed outside the house came under that particular Anganwadi. The sticker comprised of a two digit 'Anganwadi number' and a three digit 'House number'. A household was identified through another unique three digit numerical code which was noted on the householder's wall.

The corresponding Anganwadi was assigned a 'house number' and 'household number' of 001 (a three digit number) and then the numbering increased consecutively for the houses/households to the left side of Anganwadi. The numbering started from Anganwadi and ended at Anganwadi. The population size of an Anganwadi was about 1,000.

With the help of the Anganwadi staffs all the houses with women aged 18 and above were identified. Every enrolment was given a house number and a unique

household number. If one particular family changed their house and a new family came into that house, then, the house number remained same; a new household number was assigned. The new household number was an addition of one to the last recorded household number. For recalling the household numbers that had been given an Anganwadi wise notebook was maintained which kept records of house number and household numbers assigned. In case there was a new construction in a particular Anganwadi than we gave it the house number of the adjacent house while assigning an alphabet next to it. For example house constructed next to house 5 would have been given house no 5a. As this was a mixed longitudinal study, such numbering was necessary to ensure easy follow-ups. The Anganwadi were vast and a fortnightly visit could not have been done without the help of adequate staff. Therefore, requisite staff members were recruited by the Nutrition Foundation of India. These staff members usually comprised of students who worked on a shorter tenure. Therefore, a mapping was necessitated in order to enable the NFI staff to identify the households easily. The mapping allowed every new person to take up the measurements in any Anganwadi.



**Figure 17: Anganwadi Mapping of the Study Area**

**b. Selection of subjects for enrollment**

Adulthood is a period of stability when compared to childhood and adolescence. Individual's physical growth is complete at this stage and all organs and body systems are fully developed. Functional capacity of organs is also reached at its peak been the ages of 20 years and 40 years. During adulthood, it is important to practice good nutrition. Healthy eating habits promote metabolic functions, assist repair and regeneration of cells and prevent the development of chronic adulthood disease conditions. Under the unfavorable conditions, malnutrition is predominant among all segments of the population; poor nutrition among women starts with infancy and continues throughout their lifetime. Women are vulnerable for early marriage, early conceptions, and domestic inequality and so on, which has an impact on their nutritional status. With these backdrops, adult women were selected from urban low middle income families for the present study.

A total of 4155 adult women who were non pregnant and non lactating, in the age group of 18 and above years and 2240 Lactating Women were selected for the study.



**Plate I: The Study Areas**

## Criteria for Inclusion and Exclusion

### Inclusion criteria for subjects:

- Subjects who were women of the age 18 or above
- Belonged to Low middle income group families residing in the selected locale
- Subjects who were likely to reside in the area for a period of minimum two years
- Subjects who had no physical and mental illness
- Belonged to Non Pregnant and Non Lactating women and Lactating women
- Co-operative and willing to give consent to take part in the study.
- Attended and benefitted ICDS programme systematically and
- Regularly attended the personalized nutrition counseling campaign.

Subjects were excluded from the study if they met any of the following exclusion criteria:

- Age group less than 18 years.
- Non co-operative and not willing to give consent and participate in the study
- Having health issues and under medical care
- Not willing to attend the personalized nutrition counseling campaign regularly.
- Subjects who were likely to migrate to some other areas before the next two years.

For this study, a mixed longitudinal analysis was opted because it provided the opportunity for enrolling new subjects any time and also allowed anybody to leave at will. It was also found to be helpful in analysing the data cross sectional as well as longitudinal wise.

Population in the areas covered was migrating in nature; they lived on rent and kept moving from one house to another either within the same area or even outside depending upon their work and the financial status. We could not exclude this section of the population because it comprised majority. Therefore it was impossible to perform pure longitudinal analysis in these localities and a mixed study was preferred.

In the research design of this study, a mixed longitudinal analysis was opted because it provided the opportunity for enrolling new subjects any time and also allowed anybody to leave at the time of their needs. It was also found to be helpful in analyzing the data cross sectional as well as longitudinal wise. A mixed longitudinal study is one

wherein a group of women were observed over the period of study in such way that “some women leave the study and others, if desired, join it” as the new entrants.

In the selected study areas, people had a tendency to migrate easily since they lived in the rented houses and kept moving from one house to another either within the same study area or even outside depending upon their work and financial status. Hence, it was not possible to exclude this selection of population because it comprised majority of the study population. Therefore, it was impossible analysis in these study areas and decided to have the mixed longitudinal study for the present study. In this study, study subjects consisted of two groups, in the first group, 4155 non pregnant and non lactating women, 2240 of lactating mothers were enrolled in the second group. Totally 6395 women were enrolled in the present study during the study period of January 2015 – December 2017.

### **c. Formulation of Tools for Data Collection**

An interview schedule is basically a list containing a set of structured questions that have been prepared, to serve as a guide for interviewers, researchers and investigators in collecting information or data about a specific topic or issue.

Study Information Sheet and consent form was prepared in Hindi and English and provided to Aganwadi workers, Helpers and participants. (Annexure I and II) This pretested, precoded - structured questionnaire was used to collect the data through self administered method. The consent form first prepared in English and was then translated into the local language Hindi. (Annexure III and IV). Pre-structured and Pre-tested proformas were used for data collection.

- **Socio demographic proforma**

Socio demographic profile data was collected at the time of enrolment. Enrolment was done either at the time of census or post census during field visits. Enrolees were informed about the benefits of participating in this study and a consent form was obtained from them. Information on various socio economic and demographic parameters was collected from the primary caregivers.

The socio demographic profile consisted of details like name, age, gender, age at the time of marriage, education and income profile of household, education profile of all

the members of the household, name of the anganwadi, native place, family type, family size, dietary habits, monthly income, number of rooms in the house, drinking water facility, toilet facility, means of transport, cooking fuel used and usage of public distribution system. (Annexure V)

- **Anthropometric Proforma**

This was a well-structured; pre tested and per coded proforma in which the anthropometry information was noted. On the top of the proforma there was space for general information like area code, Anganwadi code, house no, household no, name of women, husband name, age and date of first visit.

In this Proforma, Anthropometric measurements like weight, height, MUAC, waist and Hip Circumference of all women were collected using the standard techniques(WHO, 1995). The date of visit and the physiological status of the woman were also noted. The physiological status for women was noted as ‘L’ for lactating and ‘NPNL’ for non pregnantnon lactating. All information was noted in the women card. Instruments were calibrated and quality control measures were taken before each visit to eliminatethe measurement errors. (Annexure VI)

**d. Ethical consideration and confidentiality**

Ethical clearance was obtained from the Research Review Committee of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamilnadu, and Nutrition Foundation of India, New Delhi. Permission letter from Union Ministry of Women and Child Development, State Women and Child Development and Integrated Child Development Scheme (ICDS) was received for effective conduct of the study. Informed written consent was received from the enrolled each of the study subjects of ICDS centre. Confidentiality of the information was also maintained. Ethical Committee approval number of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore is AUW/IHEC-17-18/XPD/49 and Nutrition Foundation of India, New Delhi also issued the Ethical clearance certificate. Both the certificates were given in Annexure VII and VIII.

## **B. Assessment of Nutritional Status of the enrolled subjects**

The dual burden of malnutrition is often assessed by reporting the prevalence of a measure of under nutrition and the prevalence of a measure of over nutrition within households, specific communities, regions, or at the country level. Under and over nutrition are non specific terms used to describe the opposite ends of the spectrum of nutritional status (WHO, 2016). Nutritional status of the enrolled women was assessed using anthropometric measurement.

The investigator and the team were trained at Nutrition Foundation of India on measuring various anthropometric measurements of weight, height, mid upper arm circumference, waist circumference, hip circumference. The investigator and team were also taught to minimize the intra individual variation in nutritional anthropometry and in using calibration of electronic weighing scale, and fibre glass tape with vernier attachment. The training was imparted at regular intervals to minimize the Inter and intra individual variation in the measurements.

Orientation training was conducted in addition to the periodic training whenever there was a need for the purposes of data collection.

To assess the nutritional status accurately, it was necessary that all the equipment's used in field provided precise readings. Therefore, these equipment's were tested daily to have quality assurance. It is equally important and crucial to take the measurements accurately. Hence the investigator and team were trained in taking the anthropometric measurements with great accuracy and sensitivity. Anthropometric and Circumferential measurements such as height, weight and mid upper arm circumference, waist and hip circumference of the enrolled women were measured and recorded using standard equipment's and procedures suggested by WHO (1995) protocol and BMI and WHR were computed from the recorded data of anthropometric measurements.

Anthropometry deals with physical measurement that provides an indirect assessment of body composition, growth and development. It is also indicated that changes in the individual's health status. This is considered to be the most sensitive parameter for assessing the nutritional status of the study population. The date of visit and number of visits for collection of data and record using their anthropometric measurements and physiological status of the women were also recorded as 'L' for Lactating women and NPNL for Non Pregnant and Non Lactating Women.

- For NPNL women all the anthropometric and Circumferential Measurements were done once in a three month.
- Lactating Women was divided in to two groups as per their duration of lactation.
- Lactating women with less than 12 months of duration of lactation were measured once in a month for all anthropometric and circumferential measurements.
- Lactating women with 12 month to 35.9 month of duration of lactation were measured once in a three month for all measurements.

**a. Measurement of Body Weight**

Body weight is the most important measurement of an individual. Generally weighed with minimum clothing and in the morning using with suitable accurate digital weighing balance produce a valid data for assessing the nutritional status of an individual. The body weights of the 4155 enrolled NPNL women and 2240 lactating women were systematically recorded by the periodical visits of the investigator and her team members. The measurements of weight of the enrolled women were recorded accurately following the strict procedures suggested by WHO protocols.

For measuring the body weight, a digital weighing balance with the below specification was used. i) Lithium battery operated, ii) Weight of the machine 1.2-2.5 kg, iii) Capacity 5 - 150 kg and iv) Accuracy  $\pm 100g$

Accuracy of balances is an vital requirement for measuring accurate weight there is a procedure for checking the accuracy of balances

- Weighing standard weights certified by the Department of Weights and Measures and noting the weight recorded by the balance.
- Weighing a member of the NFI staff five times on the test balance and comparing the consecutive readings. This was carried on minimum of two NFI staff members and maximum five staff with different weight to ensure accuracy.



**Plate II: Accuracy Testing of Weighing Balances Using standard Weights**

### **Sensitivity Test**

Sensitivity Test was carried out to test the accuracy of the balancing balance. Therefore, it was vital to do sensitivity test of weighing balance by carrying standard weights and recording the total weight of an adult. A comparison was then drawn with the previous isolated readings.



**Plate III Sensitivity Test of Weighing Balance**

**As shown in Plate IV testing sensitivity of balances (adult + standard weight)**

This girl was carrying weight 8 (5+2+1) kg and 8.5., 8.7 and 8.8 kg

➤ **Precautions taken while using digital weighing balance:**

- Digital weighing machines were used to minimize errors in weighing; but they needed to be checked for accuracy every day before use.
- Weighing balances were never loaded one on the top of the other.
- While not in use, battery was removed and safely put in a dry zip lock bag.
- If any balance had low battery or did not turn on - the battery was checked.
- Whenever there was any doubt about the battery, the same was immediately replaced and a test for accuracy was conducted.

➤ **Procedure Followed in using the Digital Weighing Balance:**

- The balance was kept on a level ground.
- Then, to switch on the battery, an NFI member stepped on it.
- The member was advised that he/she should stand on the digital balance in straight posture and must be bare foot with a minimal clothing

**b. Measurement of Height**

Height is one of the most extensively used indicators for assessment of nutritional status and provides an index of linear skeletal growth. Until a few decades ago, many of the surveys were carried out in places without level ground or without a vertical wall. Under these circumstances height was measured using either a stadiometer or anthropometry rod. Stadiometer is a bulky heavy instrument occupies space. Anthropometry rod is relatively compact but intensive training was required to keep the rod perpendicular and accurately measured the height (WHO, 2010).

Currently, in all urban areas and in most of the rural areas, residences have an evenly flat floor and vertical walls. Under such conditions the small readily portable wall mounted stature meter is used for measurement of height. During the study a portable wall mounted stature meter with the below specifications was used - Tape length of 2 meters and Instrument accuracy is 0.1 cm. Accuracy of the tape is assessed by comparing with the standard steel tapes certified by the Department of Weights and Measures. Accuracy of stature meter in measuring height of the individuals is tested against a standard stature meter.

Standard steel tapes certified by the Department of Weights and Measures were used to check the accuracy of the tape in the stature meter. To check the accuracy of the stature meter, the tape was fully wound to the zero mark of the stature meter and till it was against the red line in the reading window when pressed against the wall. If the readings in the tape crosses or does not coincide with the red line in the stature meter, the stature meter is rejected. Next the tape is fully unwound; now the reading 200 should be against the red line in the reading window when the stature meter is pressed against the wall. Accuracy of the stature meter is tested by comparing the height of two individuals measured by the stature meter with the height of the same person measured using the standard stature meter.

- **Fixing of Stature Meter to the Wall**

Most Indian houses have skirting in all the walls. Skirting created a gap and there will be difference in the readings. To prevent this, error or difference, first measure the height of skirting using a tape. If the skirting was of 10 cm height pull out the tape in the stature meter and fixed it so that the reading in the red mark in the window is 10 cm. Keep the horizontal limb of the stature meter on the top of the skirting and pull the vertical limb up fully so that the reading is 190 cm. The vertical limb of the stature meter will be fixed to the wall using an adhesive tape for measuring the height of person of the household. While undertaking measurement of height especially for children it is essential that the tape of the stature meter winds down vertically because if the tape slants while being wound down, there will be error in the reading. In order to ensure that the tape was wound down vertically, a small weight of 200 or 500gram is placed on the limb of stature meter and the tape is allowed to wind down under gravity. Both the vertical sides of the tape are marked with pencil. This will ensure that the tape winds down vertically and any error due to slanting of the tape is eliminated

- **Precautions taken while Measuring Height**

- The person whose height is being measured should be standing barefoot and his/her hair should be flat
- The Feet should be aligned with heels, buttocks, shoulder each touching the wall

- Tragus of the ear and the lower orbital margin should be in the same horizontal plane. This is called Frankfurt Plane.
- The horizontal limb of the stature meter should be firmly placed on the top of the head but should not be pressed
- The eyes of the investigator should level with the window showing the reading. The height should be taken/noted to the nearest 0.1 cm.
- If the height of the subject is more than that of the investigator, then the investigator should use a stool. This should be done in order to ensure that the eye of investigator is on the same level as the window providing the accurate reading in the stature meter.
- If the height of the subject is less than that of investigator, then investigator should stoop to take the measurement



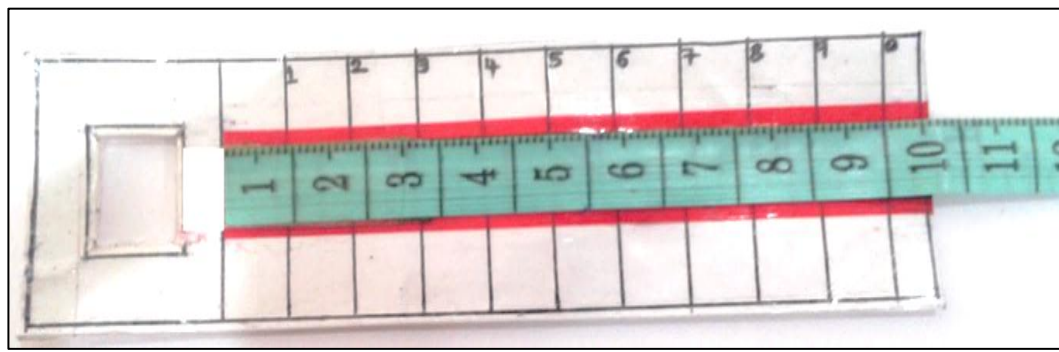
**Plate IV Measuring Standing Height**

**c. Body Mass Index (BMI)**

**BMI** or **Quetelet index** is a derivative of the mass(weight) and height of an individual. The BMI is defined as the body mass divided by the square of the body height, and is universally stated in units of  $\text{kg}/\text{m}^2$ ,

BMI highlights the nutritional status of the selected subjects in terms of undernourished, normally nourished and overnourished. It is a widely used tool for assessing the nutritional status of population above the age of 18. BMI is easy to obtain, as this is a measure of relative height and weight. The current WHO BMI cut-off points of  $<16 \text{ kg}/\text{m}^2$  (severe underweight),  $16.0\text{--}16.9 \text{ kg}/\text{m}^2$  (moderate underweight),  $17.0\text{--}18.49 \text{ kg}/\text{m}^2$  (mild underweight),  $18.5\text{--}24.9 \text{ kg}/\text{m}^2$  (normal range),  $25$  (overweight),  $25\text{--}29.9 \text{ kg}/\text{m}^2$  (pre-obese),  $30 \text{ kg}/\text{m}^2$  (obesity),  $30\text{--}39.9 \text{ kg}/\text{m}^2$  (obese class I),  $35\text{--}39.9 \text{ kg}/\text{m}^2$  (obese class II),  $40 \text{ kg}/\text{m}^2$  (obese class III) have been used for classification.

**d. Preparation of Vernier Tape:**



**Plate V: Preparation of Vernier Tape**

A thin glossy card (type used for printing invitation card) is taken; cut out 12 cm by 3 cm strips of the card. Leave 1.5 cm from the left side. Put a centimeter tape in the middle of the strip. Divide 9 cm in the tape into 10 divisions of 0.9 cm each on the card. Label the divisions as 0-10 on the card. Cut a window of 1 cm by 1.2 cm in the middle of the blank left-hand end of the card. Strengthen the card by pasting cello tape over the card. Lay the non-stretch centimeter tape in the middle of the card so that the zero of the tape coincides with the zero of the Vernier card. Fix a cm strip of cello tape to the zero end of the non-stretch tape. Pass the cello tape through the window to the back of the card. Fix

the cello tape to the back of the card so that the zero of the tape coincides with the zero of the Vernier cards. The non-stretch tape with Vernier attachment is ready for use

**e. Mid Upper Arm Circumference**

Mid-upper arm circumference (MUAC) measurement can be useful as an indicator of protein–energy malnutrition. As the arm covers both muscles and fat so as the MUAC will change it will reflect a change in muscle mass. Measurement of MUAC was taken to the nearest mm on the left arm using a fibre glass tape with vernier attachment. The vernier tape is effective in providing precise measurement. It is easy to use and thus helps in taking the measurement faster.

➤ **Methodology for Measuring Mid Upper Arm Circumference**

- MUAC measurement was taken on the left arm
- Non-stretch tape with a vernier scale provided a more accurate measurement of MUAC especially for children
- The person was advised stand erect with a relaxed and hanging left upper arm
- The tip of acromion was identified by passing the hand on the spine of the scapula
- The arm was bent at the elbow so that arm was at 90 degrees from upper arm.
- The tip of the olecranon process was identified
- The zero mark of the tape was kept on the acromion and the tape was drawn down until olecranon process was reached.
- The length between these two bony points was measured.
- The midpoint in length between tip of acromion and olecranon processes was marked on the skin using soft pen
- The Vernier tape was wound around the arm with the lower border of the tape lying on the marking on the arm.
- It was ensured that the tape lied snugly around the arm by passing the fingers along the tape
- There was no gap between tape and mid arm.
- The free end of the tape was inserted into the slot in the vernier tape so that it fitted the mid-upper arm snugly

- The non-stretch tape was brought over the middle of the vernier scale so that the circumferential measurement was taken without any obliquity
  - The left end of the vernier scale was held with the right thumb and forefinger
  - The right end of the vernier scale was held with the non-stretch tape over it
  - The measurement at the zero marking of the vernier scale was read.
- **Precautions Taken while Measuring Waist Circumference**
- It was ensured that the arm was loosely hanging by the side
  - Measurement was not taken on the right arm because more amount of work is done by right arm and there may be variation due to muscle mass.



**Plate VI: Measuring Mid Upper Arm Circumference**

**f. Waist Circumference:**

Waist circumference (WC) was used as an indicator for assessing abdominal adiposity. A tape with a vernier scale which provided accurate measurement and allowed the investigator to read marking from far away was used for the measurement. A person with a wider waist than hip was assessed to be at greater risk for non-communicable diseases

Using a tape with a vernier scale prevented obliquity and made the reading more accurate. It also allowed the investigator to read the markings from a distance leaving a space between the investigator and the person being measured.

➤ **Methodology for Measuring Waist Circumference**

- Waist circumference was measured over thin cloths worn in summer.
- Person who was measuring stood in front of the person being measured
- Person measured stood straight with weight evenly distributed on both feet
- Waist was identified as the smallest circumference in the trunk between the costal margin and the iliac crest.
- Tape was wound horizontally without any obliquity
- The tape was wound snugly around the waist but care was taken not to compress the soft tissue.
- The fingers were passed along the tape to ensure that there was no gap between the tape and waist and it was not too tight to cause a bulge of the abdomen
- The deviation from horizontal plane was eliminated by ensuring that the tape lied horizontally on the vernier scale
- Circumference was now readily and accurately readable.



**Plate VII: Measuring Waist Circumference**

**g. Hip Circumference**

Hip circumference measurement was used as an indicator of the truncal adiposity. A fiber glass tape with a vernier scale was used for the measurement and considered for calculation of Waist Hip Ratio of all the enrolled women for the study.

➤ **Methodology for Measuring Hip Circumference**

- Hip circumference was measured over thin cloths worn in summer.
- Staff responsible for measuring stood on one side of the of the person being measured
- Person being measured stood straight with weight evenly distributed on both the feet
- Hip was identified as the largest circumference in the hip region.
- The tape was wound horizontally without any obliquity
- The tape was wound snugly around the hip without compressing the soft tissue
- The fingers were passed along the tape to ensure there were no gaps between the tape and hip.
- It was ensured that the tape was not wound too tightly resulting in a bulge of the abdomen
- The deviation from horizontal plane was eliminated by ensuring that the tape lied horizontally on the vernier scale
- Hip circumference wasnowreadily and accurately readable on the tape.It is 84.2 cm.

➤ **Precautions taken**

- The tape snugly encircled the hip but not forcefully otherwise it will compress the soft tissue



**Plate VIII: Measuring Hip Circumference**

#### **h. Waist Hip Ratio:**

WHR was used as a measurement of detecting obesity, which is responsible for metabolic diseases. The WHO states that **waist-hip ratio** above 0.90 for males and above 0.85 for females.

WHR= waist measurement divided by hip measurement ( $W \div H$ ).

At the time of enrollment of NPNL and lactating women, following data were gathered

- Record Socio Demographic Profile
- Measured weight by digital weighing balance, height by stature meter
- Measured MUAC, waist circumference and hip circumference by fibre glass tape with vernier scale

Follow ups for NPNL and Lactating women

- **Lactating women (0-11month)**
  - Recorded weight every month
  - Measured MUAC, Waist and hip circumference every month.
- **Lactating women >11 months & non pregnant non lactating women**
  - Recorded weight once in three months.
  - Measured MUAC, Waist and hip circumference once in a three months.
- **In all women**
  - Circumferential measurements were not carried in winters as the women wore heavy woollens.

#### **C. Imparting Nutrition Education to Women**

To Lactating women Nutrition education was given by using Mother Child Protection Card. The MCP Card is a maternal and child care entitlement card, a counselling and family empowerment tool which would ensure tracking of mother and child cohort for health, nutrition and development purposes (<https://nhm.gov.in> accessed on 07.01.2021)

- Under Nourished Women: the number of under nourished women is less so it was very easy to find the under nourished women in the area. Factors

responsible for being under nourished were identified. Women and her family were informed about improving their nutritional status prior to pregnancy as it will improve the nutritional status of women and her offspring whenever she becomes pregnant.

- For normally nourished: about 50% of women were normally nourished so they were informed to continue their dietary habits and physical activity and also keep an eye on the weight once in a three month. If there was persistent weight gain, factors responsible for gaining weight were identified and nutrition counseling was provided. It was emphasised that weight reduction among over-nourished women is very difficult.
- For over-nourished women: nearly 70% of women belongs to 50 and above age groups were over-nourished. It is happening because they spend a very little time and energy in household chores. Most of household chores are taken over by either daughter or daughter in law. They spend their time in talking to neighbors, watching videos on TV and talking to their relatives by using mobile. Majority of women believe that weight gain with increasing age was normal and after menopause further weight gain is inevitable.

#### **D. Statistical analysis and Interpretation**

##### **a. Data Collection and Cleaning**

Data entry was done using MS-excel. NFI staff undertook the task of entering data in the excel sheets. Data cleaning was done step wise to ascertain uniformity of data. It took nearly one and half years to clean the data as every single entry has to be checked, verified, renumbered and prepared for analysis. After repeated data cleaning, analysis was done to refine data consistency using parameters where we can assess the errors in the data. The parameters assessed were Height, Weight, BMI and Waist hip ratio. The steps followed in data cleaning were:

- After checking the comments, the rows which had no data on height or weight were removed.
- All the data pertaining to women was entered in rows one below the other.

- Alternate colours were given to consecutive women unique identification number (WUIN) as it is easier to check an individual child data.
- Date of Visits were entered in the same date format. (Either January or Jan, it was same throughout).
- At every stage, every step filter was applied and checked for errors.
- After the data was cleaned and sorted according to the WUIN and DOV, the data was given serial number, so that it is easier for future sorting and arranging the data for analysis.
- For Lactating Women date of birth of child (DOB) was entered and the durations of lactation were calculated.

➤ **Allotting Unique Identification Number**

All the women who were enrolled for the study were given a unique identification number. The number consists of 8 digits. The first digit is the Anganwadi area, second and third digits were the Anganwadi number, fourth, fifth and sixth digit is the family number, seventh digit is family wise child number and eighth digit is to recognize whether mother or child. If the last digit is 2, the details belong to mother and if it is one details belong to the child.

Example: WUIN (Women Unique Identification Number): 10100112.

(First digit) 1	=	Area of Nebsarai
(Second and third digits) 01	=	Anganwadi of Pramod
(Fourth, fifth and sixth digits) 001	=	Family number 001
(Seventh digit) 1	=	First women enrolled in the family
(Eighth digit) 2	=	women details

**b. Data Analysis**

By using T test Means and standard deviations were calculated and by using Chi Square Test Categorical values were compared. Height, Weight, BMI, MUAC, Waist and Hip circumference and Waist Hip Ratio were used for the assessment of nutritional status.

➤ **MS-Excel**

MS-Excel was used to enter the data from hard copy to soft copy, cleaning the data and to analyse the data.

➤ **SPSS Statistical Tool**

All the analysis carried out in Excel had been reanalyzed with the help of SPSS-16 statistical tool. All the results from the three software's had been checked to ensure the validity of the results.