

# **CHAPTER – 3**

## **MATERIALS AND METHODS**

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### 3.1: Study area:-

Undivided Medinipur is one of largest district of West Bengal after independence. It is covering 16% area of West Bengal. On 1<sup>st</sup> January 2002 Medinipur districts i.e. Purba and Paschim Medinipur. The Purba Medinipur district compact with four subdivisions Tamluk, Haldia, Egra and Contai. In the present study participants were inhabitant of river side area of Rosulpur and Haldi of Purba Medinipur district. The district has long costal line of 65.5 km. that is along southern and south eastern boundary. There major river are situated to south eastern direction. Such as Haldi, Rupnarayan, Rosulpur, Bagui and keleghai. For this cross-sectional study selected area was Desopran block and Haldia. Purba Medinipur has 5,094,238 populations (2011 census). According to 2011 census, district has literacy rate 87.66%. There are 219,794 and 32,965 children primary and middle school going children. Purba medinipur has more than 70% rural household and 24.7% below 15 years aged children. In rural area of Purba Medinipur district 75.2% women are literate. 66.7% household has proper sanitary facility. 6.6% household is using clean fuel for cooking (NFHS-4). NFHS-4 survey also reported that 7.1% children are suffering from diarrhea and 52.6% children are suffering from symptoms of ARI (Acute Respiratory Infection) in the last 2 weeks preceding the survey.

Purba Medinipur district is situated between 22°05'10" N and 21°36' 35" N latitude and 88°12' 40" E and 86°33'50" E longitude 65.5 Km area is costal line of the district. Head quarter of the district situated at Tamluk. Studied areas had been selected under two subdivisions Haldia and Contai nearest area of river side such as Haldi and Rosulpur. Haldia is situated between 22° 02' N 88°04' E 22.03° N 88.06°E. Haldia is a city and a municipality and a majour river port and industrial belt located near Hoogly River. Haldia is being developed as a trade port for Culcutta. There are several factories such as South Asian Petrochemicals, Haldia Petrochemicals, Tata Chemicals, IOCC, and some small industries. In 2011 census indicate that total population of Haldia is 200267. Haldia subdivision is divided into six clusters. Under these six clusters selected area is one municipality area. Maximum industrial employ live in township area. Contai is located 21° 47' N 87°45' E 21.78° N 87.75° E. Contai is as harbor, it is on bank of the river a

short distance from Rosulpur estuary. Later the harbor was being developed now represent as Contai town. Contai subdivision is famous for its tourism spots, fishing business and nut business. Contai subdivision consists eight blocks. In contai subdivision selected area is contain II block which is known as Deshapran block. This block consist eight Gram Panchayats. But its head quarter situated at Contai. This area has no proper facility of transport and communication system. Contain II block is not properly connected with town area. All children and people are coming town area for their proper education and they are also coming for better health and other facility.

But Haldia is connected to Kolkata by both bus and train. There is better education system. All type of health facility, which are available to inhabitants. Water system is also well. In comparison with Contai is more undeveloped than Haldia in all respects. All children are future of world. Nutritional status of the children and educational status are very important for us to develop our country. We assume that under 3-12 age group belong children categories, who are generally going to school for their inter-actual development. These children are influence by different environment. This is the proper time to make a real man, who can present their country as a famous one of the world.

**3.2: Data collection:-** Data was collected from two type of areas one is industrial (Haldia) and nonindustrial (Deshopran block). Purpose and process of the study was explained to BDO of Deshopran (Contai-II) bolock and Chairman of Haldia municipality and CDPO office of both areas for easily work and data collection. Structured and semi-structured questioner was used for anthropometric and socio-demographic data collection. Participants were selected from three colony (CPT, IOC and HREL) and Rairarchak of Township. Kultalia, Sikdarchak and Uttar Amtalia village of Contai -II was selected for data collection. For the present study participants were selected on the basis of opportunity sampling.

**3.3: Sample size and age groups:** For the present cross-sectional study data was collected from 1256 participants. 14 participants were excluded from present study due to incomplete data. Total participants of the present study were 1242 aged 3-12 years old. Out of 1242 participants 615 were boys, 627 were girls. Particular age calculated from date of birth to date of data collection and date of birth was collected from birth certificate or polio card.

**3.4: Anthropometric Measurements:** - There are several anthropometric measurements were used for assessment of nutritional condition of the school going children of the studied area. Anthropometric measurements were recorded using standard procedure with parental verbal concern. Given below-

**3.4.1: General Assessments:** - Stature or Height (cm), Body Weight (Kg), Sitting Height (cm), Knee Height (cm)

**3.4.2: Circumference:** - Mid Upper Arm Circumference (cm), Waist Circumference (cm) and hip Circumference (cm)

**3.4.3: Skin Fold measurements:** - Triceps (mm), Biceps (mm) and Sub scapular (mm)

**3.4.4: Derive variable:** - Body Mass Index ( $\text{kg}/\text{m}^2$ ), waist hip ratio, Waist Height ratio, Conicity Index, all these measurements were taken on the left side of Each Subjects. All Anthropometric measurements were taken followed by standard anthropometric technique. (Lohman et al., 1988)

### **3.5: The techniques of taking anthropometric measurements**

**3.5.1 Stature (cm):**-Stature is a major indicator of general body size and which is very important for disease and nutrition. It was measured to the nearest. Martin Anthropometer used for take the measurement. The Subject stood on plane surface keeping the subject on an erect posture and measurements were taken from back position. The anthropometer was placed at back position between heel of the subject and set up to possibly close. Before taking the measurement it was checked.

**3.5.2: Body Weight (kg):**- Weight is commonly recorded anthropometric variable. Weight is composite measure of total body size. It is important to screening for unusual growth, obesity, under growth. A subject was stood without any support and standing with erect posture. Taking the measurements before position was checked.

**3.5.3: Sitting Height (cm):**- Sitting Height is a measure to the distance from the seating surface to the vertex, subject was seated and an upper extremity was rest in position and lower extremities were put on plain floor surface. When measurement was taken anthropometer was

put on back position of the subject and measure taken distance between sitting surface and vertex.

**3.5.4: Knee Height (cm):-** Knee height measure was made with a sliding caliper. This device consists of an adjustable measuring stick with a blade attached to each end at 90° angle. Knee height is the distance from the bottom of the umbilicus (navel) to the highest point in the inner ankle (medial malleolus).

**3.5.5: Waist Circumference (cm):-**When this measurement was taken subject stands erectly with light dress up and with abdominal relaxed. Minimum circumference was measured between ribs and iliac crest by tape. Waist circumference is an important index of deep adipose tissue and it is related to fat free mass.

**3.5.6: Hip Circumference (cm):-** The Subject stands erectly and light dress up. The measure squats at the side of the subject so that the level of maximum by the tape. The measurement was recorded to the nearest 0.1cm. This measurement reflects adipose tissue in this region.

**3.5.7: Arm Circumference (cm):-**The subject stands erectly and light dress up without sleeves. This measurement was taken from midpoint of upper arm. This is important for measure of body energy storage and protein mass.

**3.5.8: Triceps Skin fold (mm):** - Triceps skin fold measurement was taken from posterior aspect of the arm. This is situated midpoint of the arm and over the triceps muscle. This is correlated of body fat.

**3.5.9: Biceps Skin fold (mm):** - biceps skin fold was measured anterior aspect of the arm. This is vertical fold over the biceps muscle. This is also correlated of the body fat of the subject.

**3.5.10: Sub Scapular Skin fold (mm):** - This skin fold was picked up on inferior laterally 45° in the horizontal plane. This is situated inferior angle of the scapular. The thickness was recorded by the skin fold caliper.

**3.5.11: Body Mass Index (kg/m<sup>2</sup>):-**

$$\frac{\text{Weight in kg}}{\text{Height in (m)}^2}$$

### 3.5.12: Wais hip ratio (WHR):-

$$\frac{\text{Minimum Waist Circumference (cm)}}{\text{Maximum Hip Circumference (cm)}}$$

### 3.5.13: Waist Height ratio (WHtR) :-

$$\frac{\text{Waist Circumference (cm)}}{\text{Height (cm)}}$$

### 3.5.14: Conicity Index (CI):-

$$\frac{\text{Waist Circumference (m)}}{0.109 \sqrt{\frac{\text{Body Weight (kg)}}{\text{Height (m)}}}}$$

**3.6: Child Anthropometry and assessment of nutritional status:** - The anthropometric measurements( height in cm, knee height in cm, sitting height in cm weight in kg, MUAC in cm, HC in cm, WC in cm) were taken from participant in one time and one by one according to standard procedure Lohman et al 1988. Some derived variables were using for assessment nutritional status of participator Weight-for-age Z-score (WAZ), Weight-for-height Z-score (WHZ) and height-for-age Z-score (HAZ) were calculated based on NCHS (1983). Thinness categories were also using for nutritional assessments such as Grade-III, Grade-II, Grade-I, Normal, Over- Weight and Obese. (Cole et al., 2000 and 2007)

#### 3.6.1: CIAF:-

Anthropometric failure was calculated on the basis of seven groups of categories (Nandy et al 2005). There was various indicator used for evaluated nutritional status among the school going children that was Stunting (Low Height-for-Age), wasting (Low Weight-for-height), under weight (Low Weight-for-age) as per NCHS, 1983 guidelines and CIAF (Composite Index of Anthropometric Failure) was also computed as per standard methodology to assess the all indicators of undernutrition among the school going children This group is given below

**Table 3.1:- Classification of children with anthropometric failure (CIAF)**

<b>Group name</b>	<b>Description</b>	<b>Wasting</b>	<b>Stunting</b>	<b>Under-weight</b>
<b>A</b>	No Failure	No	No	No
<b>B</b>	Wasting Only	Yes	No	No
<b>C</b>	Wasting & Underweight	Yes	No	Yes
<b>D</b>	Wasting, Stunting & Underweight	Yes	Yes	Yes
<b>E</b>	Stunting & Underweight	No	Yes	Yes
<b>F</b>	Stunting Only	No	Yes	No
<b>Y</b>	Underweight Only	No	No	Yes

This classification is following Nandy et al., 2005.

**3.7: Independent Variables or Scio-demographic characteristics:** -A pre-structured schedule was used for socio-demographic data collection from participant. A recent study reveal that mothers' education, fathers' occupation, economic status and sanitation, all these factors were negatively associated with under-weight, but working mothers were showed positively associated (Pal et al., 2017). Monthly income, expenditure are influence child nutrition (Khan and Raza, 2013) For the proposed study some socio-demographic data were collected from participants such as family size, parental education, parental occupation, monthly income, sanitation, fuel type.

**3.7.1: House ownership:** - House type is also important factor. On the basis of present data, two type of house ownership that was own and rental.

**3.7.2: Living Room:** - Frequency distribution was based on quartile (33.0 & 99.0). Categories were (33.0 = 1 room and 99.0 = above 5 room) used for over all present study. But for nonindustrial area, categories of living room that was (33.0 =1 room and 99.0 = above 5 room). Another categories were (33.0 = 2 rooms & 99.0 = above 4rooms) used for industrial area.

**3.7.3: Family Members:** -For the proposed study number of family members was categorized on the basis of 25.0 and 75.0 percentile. Family size categories were based on family members. Family size is also influence on nutritional status. Some participants were belonging to 1 to 4 members, 5 to 6 members and above 7 members. That was 25.0 = 4 members & 75.0 = 7

members for overall study. But these categories were used separately for industrial area that was 25.0 = 3 members & 75.0 = 6 members.

**3.7.4: Earning Members:** - For the present study number of employed person were categorized on the basis of quartile. That was 33.0 = 1 person and 99.0 = 4 persons that were used for overall study and nonindustrial area. Another categories were used for industrial area that is 33.0= 1person and 99.0 = 3 persons.

**3.7.5: Parental Education:** - When we are discussion about child health education of parents is very vital aspect. Role of mother education is positively effect on child health in developing countries. Education is seen as key indicator which is overall better planning for reducing malnutrition in developing countries (Sharma et al., 2016; Caldwell, 2002). But mother education has positive role in child nutrition that is not universal. Now some study represent that educated mother and others are working outside the home, which is negative role in child care and breast feeding. (Popkin, et al., 2003 and Koch et al., 2002). Educational status of the father and mother of the participants were classified into different categories such i.e. Illiterate (no formal education), Primary (Completed IV class), Upper Primary (Completed VIII class), Secondary (completed X class), Higher Secondary (Completed XII class), Graduation and above.

**3.7.6: Parental Occupation:** - In industrial area maximum parents were working in industry. Some were officer and some industrial labour. But in nonindustrial area maximum parents were self employed (i.e. Fisary business or any other business) and some were labourers in agriculture or brick made field. In that study maximum parents were carried out their life style through this type of occupational categories. All type of occupation was divided into two categories manual and no manual.

**3.7.7: Monthly income and expenditure:** - Monthly income and expenditure are also associated with child nutrition. In the present study monthly family income were based on total earning member of the family. For the present study monthly income and expenditure was convert through per capita that is calculated on the basis of this formula total income and expenditure divided by total family member. Per capita income was categorized by quartile (33.0 = 15,000Rs, 99.0 = 10,000Rs for income and 33.0= 1,400Rs, 99.0 =9,433Rs for expenditure) frequency distribution on the basis data of per capita income and expenditure of the present study. But for



these two areas categories of income and expenditure were used in different. For nonindustrial area, categories of income and expenditure were (33.0 = 1400Rs, 99.0 = 8333Rs for income) and (33.0= 1,250Rs, 99.0=6,874Rs for expenditure). Another categories were (33.0 = 1750Rs, 99.0 = 10926Rs for income) and (33.0 = 1666Rs, 99.0 = 10926Rs for expenditure) for industrial area.

**3.7.8: Sanitation:** - Sanitation was categorized on the basis of usually people were used for their sanitary purpose such as open, septic and pucca.

**3.7.9: Drinking Water:** - In the studied area some people were used towel and supply water or tape for their drinking water. On the basis of main source of water that was towel and tape.

**3.7.10: Fuel Type:** - Fuel Material was mainly deepened on local source (solid type). Family of the participants of nonindustrial areas were used Cow dung, wood and different types of material but family of another area were used mainly gas for their cooking purpose.

**3.7.11: Disease:** - All types of disease were divided into two types of categories such as communicable and non-communicable disease.

**3.7.12: Illness:** - Participants were suffering from different type of disease within one year. Data was collected on the basis of participants were ill within five month and above five month.

**3.7.13: Hospitalization:** - Data was collected on the basis of participants were taken facility from Govt. hospital or not.

**3.8: Statistical Analysis:** - For the present study, all statistical analysis was analyzed through SPSS-16 software Windows. Mean and standard deviation were calculated for quantitative variables in order to age of both sex and area. Student's t test executed for significance of differences between two sex and areas. ANOVA were also used for analysis of significance of differences between age and area. Chi square test was done to assess sex difference between prevalence of under and normal nutritional status. The *p*- value of <0.05 considered to be statistically significant. Chi square test was also used for calculation of difference between socio economic statuses of two areas. And also it was used the calculation of relationship with nutritional status and socio economic parameter. Those variables which showed a significant association in the  $\chi^2$  test were tested to predict effective predictor variables using binary logistic regression analysis. Binary logistic regression (BLR i.e. univariate analysis) was used to

determined relationship between anthropometric failure with socio-economic and socio-demographic factors and to estimate odd ratios (ORs), minimum 95% confidence intervals (CIs) and assess to possible risk factors associated with children. Those variables which showed a significant association in the binary logistic regression analysis were further tested to predict more effective predictor variables using step wise multiple logistic regression analysis. Step wise logistic regression (forward conditional model) was used to identify the probable risk factor for undernutrition. In this analysis, depended variable was represented that '0' indicates 'Not Anthropometric Failure' and '1' indicates overall 'Anthropometric Failure'. The predictor variables were entered into the regression equation as following setup parental education (above upper primary and up to upper primary), house ownership (own and rental), number of living room (>2 rooms, ≤2 rooms), sanitation (properly present, not properly present), illness (above three month and within three month) and cooking fuel type (smokeless and smoke) for non-industrial area. The predictor variables were entered into the regression equation as following setup for industrial area parental education (Above Secondary and Up to Secondary), father occupation (non-manual and manual), house ownership (own and rental), number of living room (>2 rooms, ≤2 rooms), sanitation (properly present, not properly present), monthly family income per capita (≤2500 Rs., >2500 Rs.) and monthly family expenditure per capita (≤2500 Rs., >2500Rs.).