CHAPTER-II

CONCEPTUAL AND THEORETICAL FRAMEWORK
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2.1 Introduction

Good nutrition is an indispensable component of healthy life and access to healthy diet and optimum nutrition are important to good health. Better nutrition means stronger immune systems, less illness and better health. Whereas developing countries such as India is experiencing micronutrient malnutrition and undernutrition. The negative externalities of undernutrition are many, especially among the younger age group. Nutritional deprivation and infectious diseases among preschoolers feature prominently among the major public health concerns in developing countries (UNICEF, 1998; WHO, 1999; Kuate-Defo, 2001). Poor child health and nutrition impose significant and long-term economic and human development costs, especially on the poorest countries and communities, further entrenching their status. Improving child health and nutrition is not only a moral imperative, but also a rational long-term investment. Under six years old children are most vulnerable section of the society and the present study focuses on these age groups.

2.2 Theoretical framework

The theoretical approach has its origins in Becker’s Microeconomic models of household production (Becker, 1965, 1981) in which households allocate goods and time to the production of commodities that are either sold on the market, consumed at home, or for which there is no market. This work was expanded to the demand for health by Grossman (1972) and it also modified by several economists like Behrman and Deolalikar (1989), Strauss and Thomas (1995) and Currie (2000).

Becker (1965) has proven in illuminating the household determinants of nutrition. A ‘nutrition production function’ relates the child’s nutritional status (measured in terms of height for age or weight for age) to a set of health ‘inputs’. These include the child’s nutrient intake, whether the child is breastfed and the duration of breastfeeding, preventive and curative medical care, and the quantity and quality of time of the mother or others in care-related activities. The quality of child care time in turn is likely to be functions of the caregiver’s age, experience, education, own health status and environmental factors are also enter the production function. The potentially conflicting effects of maternal labour supply on child nutrition are readily
seen within the production function framework. Greater income from mother’s employment translates into higher consumption of market-purchased inputs such as food and medical care that raise nutritional status, but reductions in the level or the quality of time in health-related activities reduce nutritional status.

A child’s nutritional status reflects the combined effects of many factors, including nutrient intake, health, birth order, and behavioural factors governed by parental preferences. In recognition of the interrelated variables are expressed child’s nutritional production function, they represented as

\[
\text{Child’s Nutritional status} = f \text{ (nutritional input, child’s health, child’s death, births, biological factors, childcare time, technology factors)}
\]

The model is estimated at two levels: at the household level and at the child level. Child nutritional status provides an indirect indicator of overall child health as well as a direct measure of access to adequate nutritious foods. Malnutrition is a vigorous indicator of the presence of severe child deprivation. Theories of social arrangements emphasized on the freedom, equality and justice in social order in the society. John Rawls’ ‘Theory of Justice’ proposes the universal access is called ‘social primary goods’ (like liberties, opportunities, self-respect etc) for all individuals in the society equally. One of the primary good, though not explicit in his theory but implicit, that has to be ensured to every citizen of the society is health. Moreover, it assumes primary significance in the perspectives of human capital, human development and human rights, the health and nutritional deprivation of children can have severe negative implications. But the unfinished reality is that even today many children in the developing societies are deprived in health and nutrition. Anthropometry is widely recognized as one of the useful techniques to assess the growth and nutritional status of an individual or population (Rao et al, 2001). Malnutrition is frequently part of a vicious cycle that includes poverty and disease. The three factors, viz., malnutrition, poverty and disease are interlinked in such a way that each contributes to the presence and performance of the others.

Anthropometric (body measure) parameters such as weight-for-age, height-for-age and weight-for-height are commonly used for assessing child nutritional status. In practical terms, anthropometric values need to be compared across individuals or populations in relation to an acceptable set of reference values. Controversy arises over
the use of an international population both as ‘reference’ and ‘standard’, which has given rise to the emergence of two groups of experts – one is influenced by the Genetic potential theory or Deprivation theory and the other by Heretic Views (Osmani, 1992). According to Genetic potential theory, each individual is endowed with a maximum potential of growth, especially in the case of children below 5 years of age. The failure to achieve the maximum genetic potential is believed to be affected by the socio-economic factors like nutrition, socio-economic condition, etc., thereby resulting in growth retardation. The exponents of the Heretic View, on the other hand argue that deviation from genetic potential does not entail any functional impairment. Instead, children or adults may be ‘small but healthy’ (Seckler, 1982). In this context, present study is attempts to correlate socio-economic variables are the basic determinant of poor genetical endowment on the part of preschool children in rural areas of Kasaragod district in Kerala.

2.3 Approaches to the Measurement of Undernutrition

The different approaches to the measurement of undernutrition are illustrated in figure 2.1; the main sets of reasons why an individual may be undernourished are listing in the left most column (1) of the figure. The columns 2-4, where different ‘indicators’ of undernutrition are listed. In principle, there are three levels at which a person’s energy balance can be estimated. One is to estimate energy intake and or expenditure directly (column 2). The second is to explain anthropometric measurements and other symptoms which indirectly reflect an inadequate energy balance (column 3). The third is to find measurable indicators of negative consequences of an unduly low energy balance (column 4). The way figure is drawn reflects the causal links in the economics-nutrition-health complex (Svedberg, 2000).
Figure 2.1 Causes, Symptoms and Consequences of Undernutrition

- **Household Income**
- **Physical inactivity**
  - Habitual energy intake < required expenditure
  - Impairment of cognitive and psychometric capabilities

- **Impaired work capacity in adulthood**

- **Health**
  - Wasting (W/H)
  - Underweight (W/A)
  - Stunting (H/A)

- **Excess mortality risk**

2.4 Methodological Issues

There are mainly two approaches to measure the incidence of malnutrition among vulnerable groups of the society. (i) Calorie/nutrition intake approach (Sukhatme, 1977, 1982; Gopalan, 1992; Seckler, 1982, 1984), and (ii) Anthropometric approach (Strauss and Thomas, 1995; Kakawani, 1997; Svedberg, 2001; Pal, 1999; Osmani, 1992). Dietary approach is taken in to consider one nutritional element only. viz the energy (calorie) content in the food. But over the years it has been agreed upon that anthropometric approach is a better measurement than calorie approach. The present study focuses on anthropometric approach which is considered as more reliable measurement over calorie intake approach due to the following grounds.

1. Calorie intake approach is based on data collected from households, on their consumption of major food items in last 7 days or 30 days. This is called reference period. In India, NSSO collects data on calorie consumption of the people. This approach ignores the requirement of calorie of a person in terms of age and sex. It also does not take in to account the variation due to the factors like body weight, nature of work, state of current health of the person concerned.

2. In Calorie intake approach, anybody consuming below the required norm is considered undernourished. It ignores the effects of inter-personal and intra-personal variations in calorie requirement. One individual’s calorie requirement might vary from time to time in given period due to change in climatic condition, changing work pattern, and state of the health of the individual. Calorie requirement among individuals from similar age, sex, work pattern, and health status also likely to vary due to difference in their genetics.

3. Calorie-adequate diet is not necessarily a balanced diet containing adequate amount of protein, fat and other micro-nutrients like vitamins, minerals etc.

Nutritionists argue that the energy intake is a poor measure of nutritional status, which depends not only on the nutrient intake but also on non-nutrient food attributes, privately, and publicly provided inputs and health status (Martorell and Ho, 1984). The non-food factors which influence biological absorption are also considered as important for food security as food factors. It is suggested that the assessment of malnutrition should be based on outcome measures rather than input measures. The
suggested outcome measures include anthropometric measures, clinical signs of malnutrition, biochemical indicators and physical activity. Outcome indicators are more closely related to health and functional capacity. Among the outcome measures, anthropometric measures are considered to have an advantage over other indicators since body measurements are sensitive to even minor levels of malnutrition whereas biochemical and clinical indicators, on the other hand, are useful only when the level of malnutrition is extreme.

Anthropometric observations as measurements and indicators of undernutrition have come to dominate increasingly since the early 1980s. Information about nutrition is often collected with the explicit aim of selecting people for targeted intervention. Then it need to know who is undernourished and who is not, and standardized dietary intake norms cannot be used to detect undernutrition in individuals. For this purpose, anthropometric and related methods have to be applied. Nevertheless, most development economists and contemporary nutritionists seem to believe that anthropometric measures provide more reliable and useful indications of nutritional status than do dietary intake measurements. The basic advantages of the anthropometric approach are simplicity and accuracy. Until recently, the anthropometric approach was used almost exclusively to estimate undernutrition among children under the age of five.

Based on the above arguments the anthropometric approach is preferred to calorie-intake approach because it reflects the past nutritional status in terms of stunting, wasting, underweight, body mass index and mid upper arms circumference (MUAC). The nutritional status of infants and small children, in particular, has proved almost impossible to estimate accurately through calorie intake approach. For these age groups, it is generally agreed that anthropometric method provides more reliable estimates (Sen, 1984; Svedberg, 2000).

2.5 Conceptual framework

Mothers of selected preschool children who were willing to participate in the study were interviewed for collecting the desired information. Causes of malnutrition in children are complex, ranging from biological and social to environmental factors (Wamani et al, 2005; Engle and Haddad, 1999; Mosley and Chen, 1984; Smith and Haddad, 2000). To handle the complex hierarchical inter-relationships between these
variables which are risk factors of ill health in children, particularly in less developed countries, Victoria et al have proposed the use of frameworks and models for studying and predicting the risk factors of health outcomes (Victoria et al, 1997). Based on the previous research about the causes of malnutrition, here constructed a conceptual hierarchical framework of the determinants of nutritional status. Variables in this model (figure 2.2) can be divided into three groups: socio-economic variables (place of residence, religion, community, mother’s education status, maternal employment status, household deprivation status etc), intermediate factors include environment variables (type of house, house structure, type of latrine, sources of water etc), and maternal variables (mother’s age at birth, mother’s nutritional status, mother’s knowledge on nutrition), and proximal factors which include weight at birth, birth order, weight-for-age, height-for-age and weight-for-height.
According to the conceptual model, socioeconomic factors may affect directly or indirectly on all other groups of risk factors with the exception of sex and age. These include environmental factors (such as type of house, house structure, type of latrine, sources of water), maternal factors (mother’s age at birth, mother’s nutritional status, mother’s knowledge on nutrition, role of food habits and beliefs) and proximate factors (weight at birth, birth order, time of initiation of breast-feeding and duration of exclusive breast feeding, weight-for-age, height-for-age and weight-for-height). These variables, in turn, may affect the nutritional status of preschool children.
The causes of nutritional deprivation are diverse, multi-sectoral, interrelated and entail biological, social, cultural and economic factors, and their influences operate at various levels such as child, family, household, community and nation. In this context, the present study constructed a household deprivation score (HDS) based on the socio-economic status of household. The index of deprivation is based on simple measurement of deprivation of the households in three dimensions of deprivation: 1) basic economic assets; 2) basic amenities and 3) basic communications with the outside world. This deprivation index is not a direct measure of the economic condition of the household as the per capita income or expenditure or the standard of living index but a measure of the extent to which the household is deprived in the above three dimensions. The household deprivation score (HDS) is based on six variables at the household level. The variables used in each of these three dimensions are in a binary scale. They are 1) whether the household has a pucca and semi-pucca/kutcha house, 2) whether the household has some land, 3) whether the household has electricity, 4) whether the household has drinking water facilities in the residence, 5) whether there is at least one literate adult member in the household and, 6) whether the household has a radio, a T.V, or a newspaper. In modern market oriented economy the possession of basic economic, social and physical necessities of life could be considered as the basis of a dividing line of different levels of deprivation. The advantage of such a classificatory system is that it is based on actual physical or social possessions (adult literacy) rather than income data and can be used to measure the changes in deprivation levels over time (Srinivasan and Mohanty, 2004, 2008). The total score is an addition of the six variable scores and ranges from 0 to 6. household which does not have any of the above six possessions as in ‘abject deprivation’ (AD); those which have one or two of the possessions in ‘moderate deprivation’ (MD); three or four as in ‘just above the deprivation’ (JAD) and 5 or 6 items in ‘well above deprivation’ (WAD). The two categories AD and MD together constituting the deprived sections of the population. Table 2.1 provides detailed discussion of the variables in the construction of the deprivation index.
Table 2.1
Variables used in computing Household Deprivation Score (HDS)

<table>
<thead>
<tr>
<th>Variables used</th>
<th>Description</th>
<th>Categorization of households on deprivation based on total score</th>
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</thead>
</table>
| 1. Adult literacy | 0 = No adult literate in the household  
1 = Presence of any adult literate in household | 0: Abject deprivation (AD)  
1-2: Moderate deprivation (MD)  
3-4: Just above deprivation (JAD)  
5-6: Well above deprivation (WAD) |
| 2. Type of house | 0 = Katcha house  
1 = Semi Pucca/ Pucca house | 3-4: Just above deprivation (JAD)  
5-6: Well above deprivation (WAD) |
| 3. Electricity | 0 = House is not electrified  
1 = House is electrified | |
| 4. Drinking water facility | 0 = No arrangement in the residence  
1 = Own arrangement in the residence | |
| 5. Radio or T.V or newspaper | 0 = No radio or T.V or newspapers  
1 = At least one of these | |
| 6. Land Holding | 0 = No land  
1 = Have some land | |


In this context, the present study constructed a household deprivation score (HDS) based on the socio-economic status of household. The index of deprivation is based on simple measurement of deprivation of the households in three dimensions of deprivation. In HDS-I, those which have no above six possessions or have one or two possessions, it indicates moderate deprivation (MD) and it indicates the deprived sections of the population. Three or four as in HDS-II indicate just above deprivation (JAD) and five or six items in HDS-III indicate well above deprivation (WAD). This simple measure of deprivation at the household level shows health and nutrition conditions and income levels are highly related. Against this background, this study is designed in an attempt to examine variations among communities in childhood deprivation, and to investigate how the household deprivation index (HDS) of communities and that of households affect child nutritional status regardless of their individual characteristics, and how they interact in this process.
2.6 Research Design

2.6.1 Locale of the study: Rural areas of Kasaragod district

The overwhelming majority of the people of Kerala lives and works in villages. The working and living conditions of the rural people are different from that of their urban counterpart (Taylor and Adelman 1996) in other Indian states. The rural areas in Kerala are in general characteristically different from their apparent urban traits. For instance, the transport infrastructure in rural Kerala is more developed and integrated compared to most of the Indian states and the less unequal distribution and spread of the rural roads have minimized access problems and progressively increased the utilization of health services. Nevertheless, in backward districts like Kasaragod the rural-urban differences are more revealing.

Kasaragod is one of the backward districts of Kerala. Within the district, there are variations in natural conditions and socio-economic and demographic conditions. Some areas in the district are well developed and the others are in poor condition. Out of the 14 districts, the rank of Kasaragod has been one of the lowest and much below the state average defined in terms of socio-economic and health development indicators. Though Kerala is in the forefront of all health and nutritional indicators compared to other states in India, the rural areas of Kasaragod district of Kerala suffers severe handicaps in the health and nutritional arena. In this context, the present study is confined on rural areas of Kasaragod district in Kerala.

2.6.2 Sample Selection

According to Gupta (2003) sampling is simply the process of learning about population on the basis of a sample drawn from it. Under this, small group of the universe is taken as the representative of the whole mass and the results are drawn. It is a method to make social investigation which is practically applicable.

At the first stage of sampling, Kerala was classified on the basis of human development index, high HDI districts (Ernakulam, Kottayam, Pathanamthitta, Alappuzha and Thrissur), medium HDI districts (Kollam, Kannur, Kozhikode, Thiruvanthapuram and Palakkad) and low HDI districts (Kasaragod, Idukki, Wayanad and Malappuram). Kasaragod district was one of the low HDI districts. Within the district, there are variations in natural conditions and socio-economic and demographic conditions. Some areas in the district are well developed and the others are in poor
condition and thus the present study was confined in rural areas of Kasaragod district. In the present study, the total sample size comprised of 400 preschool children in rural areas of Kasaragod district in Kerala. The required numbers of samples (below 6 years children) were selected from various households through stratified sampling techniques. According to Best and Khan (2001), the characteristics of the entire population, together with the purposes of the studies, must be carefully considered while applying the stratified sampling techniques. In Kasaragod district comprises of two taluks- Kasaragod and Hosdurg. Almost all child development indicators were poor in hosdurg taluk and majority of the rural people lived in this taluk. After the selection of rural areas of Kasaragod district, the next step was to select the primary health centres/community health centres (PHC/CHC). Total 22 PHC in Hosdurg taluk, 5 PHC were selected on random basis and in each PHC 50 samples were taken. These PHCs include Narkkilakkad, Vellarikundu, Cheruvathoor, Panathoor and Ajanoor. Among the three CHCs two were selected randomly which include, Thrikkaripur and Nileshwar and 75 samples were drawn from each of them.

After the selection of PHC/CHC, the next step was to list out various households in the PHC/CHC area. The lists of households were obtained from the concerned panchayth offices and anganwadis in the study area. Then, through stratified sampling techniques, the households in the lists were divided into strata to ensure effective sampling from each corner. Subdivision of the population into smaller homogeneous group, known as strata, would ensure more accurate representation. Form each stratum, households comprising children in the age group from birth to six years old were identified and a total of 400 preschool children were thus listed out. In the case of households having more than one eligible preschool child, only one preschool child was selected.
Figure 2.3 Structure of Sample Design

High HDI districts (Ernakulam, Kottayam, Pathanamthitta, Alappuzha, Thrissur)

Medium HDI districts (Kollam, Kannur, Kozhikode, Thiruvanthapuram, and Palakkad)

Low HDI districts (Kasaragod, Idukki, Wayanad Malappuram)

Kasaragod District

Kasaragod Taluk

Hosdurg Taluk

PHC-1 50
PHC-2 50
PHC-3 50
PHC-4 50
PHC-5 50
CHC-1 75
CHC-2 75

Source: Survey data
Note: * The classification of high, medium and low HDI districts is based on the Human development indicators, Human development report-Kerala 2005
For the collection of data, an interview schedule is developed on the basis of extensive review of available literature and discussions with experts in the field. The schedule is divided into different sections, viz, descriptive identification of the household, demographic particulars, housing and environment conditions, nutritional status of children and child care, parental characteristics etc. Under each section, several relevant questions are raised to elicit all possible information about each of the selected samples under study. The information is gathered from 400 samples using well-structured schedule through survey method.

The preliminary version of the schedule is pre-tested for its validity and precision and suitable modifications were made in the schedule of questions wherever found necessary. This re-structured schedule is used for the collection of data of the survey. The collection of data was done by the investigator himself and thereby the non-sampling was also minimized to the extent possible. The data for this study was collected during four months from November 2008 to February 2009.

2.7 Assessment of Nutritional status using Anthropometry method

Data were gathered by a combination of a structured questionnaire and the collection of anthropometric data through measurements of height and weight was measured. The anthropometric measurement by National Center for Health Statistics (NCHS) and WHO standards (WHO, 1995) were used for the determination of nutritional status of preschool children. Standard deviation of scores (Z-scores) for weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) were calculated. The Z-score (SD score) is calculated as follows.

\[
Z \text{ score} = \frac{\text{individual value} - \text{median value of reference population}}{\text{SD value of reference population}}.
\]

For each of the anthropometric indicators of malnutrition a cutoff point of -2 standard deviations (-2 SD) below the median of that of the NCHS/WHO reference population was used. Anthropometry has an important place in nutritional assessment (Jelliffe and Jelliffe, 1989; Gibson, 1990), and clinical setting (Gibson, 1990) is used in nutritional screening, surveillance and monitoring. The literature on anthropometric measurement and interpretation are used in child nutritional status (Cameron, 1984; Lohman et al, 1988; Jelliffe and Jelliffe, 1989; Gibson, 1990; Norton and Olds, 1996;
Ulijaszek, 1997). Anthropometric indices are used as the main criteria for assessing the adequacy of growth and hence optimal nutritional status in infancy and childhood. Assessment of the nutritional status of the child by nutritional anthropometric indicators of growth has been used not only to provide information on the nutritional and health status of children, but also as an indirect measure of the quality of life of the entire community. Anthropometric method is a quantitative method; it also considers the different types of measurements like, height-for-age, weight-for-age and weight-for-height.

1. **Height-for-age (HAZ)**

   Low height-for-age index identifies past undernutrition or chronic malnutrition. Height-for-age (HAZ) is an indicator of stunting, which can result from chronic malnutrition, but genetic factors are also related to it. It cannot measure short-term changes in malnutrition. Stunting is associated with a number of long-term factors including chronic insufficient protein and energy intake, frequent infection, sustained inappropriate feeding practices and poverty.

2. **Weight-for-age (WAZ)**

   Low weight-for-age index identifies the condition of being underweight, for a specific age. This index reflects both chronic and acute undernutrition. Underweight is based on weight-for-age, is a composite measure of stunting and wasting and is recommended as the indicator to assess changes in the magnitude of malnutrition over time. There is relation between prevalence of underweight and several factors such as gross national product, infant mortality rate, energy intake per capita, female education, governmental social support, child population, food sources of energy, distribution of income, access to safe water, female literacy rate and region.

3. **Weight-for-height (WHZ)**

   The weight-for-height (WHZ) index is an indicator of thinness or wasting. Wasting is short-term malnutrition due to acute starvation or severe disease, famine etc., but it may result also from chronic dietary deficiency or disease. Wasting indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. It is associated with the causes include inadequate food intake, incorrect feeding practices, diseases and infection.
The nutritional status of a child is normally expressed in the Z-score of the concerned indicator. Weight and height of children of a certain age group follow more or less the normal distribution. In the present study Z-scores for the three anthropometric indices height-for-age, weight-for-age and weight-for-height are used to assess the nutritional status of children. The height-for age Z-score compares the height of a child of a certain age with the median height of a healthy reference population of that age group, the weight-for-age Z-score does the same for height; and the weight-for-height Z-score compares the weight of a certain height with the reference median weight for a child with the same height. A Z-score of -2 was used as a cut-off point for estimation of status of malnutrition of children. The Z-score is defined as the deviation of the value observed for an individual from the median of the reference population, divided by the standard deviation (SD) of the reference population. The reference standards most commonly used to standardize measurements were developed by the US National Center for Health Statistics (NCHS) and are recommended for international use by the World Health Organization. The Nutrition Foundation of India support that the WHO standard is applicable to Indian children (Dibley et al, 1987; Agarwal et al, 1991).

The basic idea is to assume that the given child comes from a healthy population. Under this null hypothesis, the z-score showed follow the child is too low as to give it a very small probability of occurring child as malnourished. The usual cut off point is to classify the child as malnourished. Deviations of Z-scores less than –2 SD (standard deviation) from the international reference population were used to classify children as moderately low weight-for-age, low height-for-age and low weight-for-height, Deviation of Z-scores less than – 3SD put children in the severe undernutrition category.

**WHO system**

- < -1 to > -2 Z-score: Mild Malnutrition
- < -2 to > -3 Z-score: Moderate Malnutrition
- < -3 Z-score: Severe Malnutrition
2.8 Method of Analysis

Both bivariate and multivariate analysis are employed to identify the determinants of underweight, stunting and wasting in preschool children in rural areas of Kasaragod district in Kerala. These analysis focus on two outcomes of nutritional status for children: whether they are undernourished or not. In the bivariate analysis, the Chi-square test was employed to see the association between each of the independent variables under study and the nutritional status of preschool children as measured by underweight, stunting and wasting, and p-values less than 0.05 were considered as significant. The Chi-square analysis does not consider confounding effects and therefore, the net effects of each independent variable are estimated controlling other factors using the logistic regression multivariate analysis. Logistic regression predicts the probability that the dependent variable event will occur given a subject’s scores on the dependent variables. Logistic regression analysis is especially useful when the distribution of responses on the dependent variable is expected to be nonlinear with one or more of the independent variables.

2.9 Statistical Analysis

The statistical programs SPSS and GRETL were used to descriptive statistics, statistical significance was set at p < 0.05. It was used for the analysis of anthropometric measures. Weight, height and age data were used to calculate weight-for-age, height-for-age and weight-for-height Z-scores based on the National Center for Health Statistics/WHO reference data (Center for Disease Control and Prevention and National Center for Health Statistics, 2002).