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1.1 Introduction

Nutrition is the cornerstone of good health and has always been a core focus in natural medicine which helps people to achieve optimal health. Nutrition is essential to maintain our health and to shield ourselves from illnesses. A well-nourished body equally distributes the nutrients from food we eat to all parts of our body. If we do not get the nutrients that we need, our bodily processes will be affected and eventually will lead to an increased risk for illness. The diet should be such that it can maintain physical efficiency and good health. The well-being of an individual depends more on perfect nutrition than on anything else.

Children are the young saplings in the garden of life. To love them is to turn our minds to the bountiful creator. Their nurture and solicitude is our responsibility. They are the future citizens and their health is a nation’s wealth. There is a saying that “Nation marches on tiny feet of young children and no nation can flourish without due love and attention paid to its children.” Today’s children are tomorrow’s adults and it’s our prime duty to protect and promote their health, so as to help in achieving the goal of holistic health for the young population of India.

Sixty five years on, since India won independence in 1947, it has made substantial progress in human development but still confronting with
malnutrition among its under five children. The problem is so acute that despite rapid progress in food production, disease control and striking economic and social development, India today, with only one-fifth of the world’s population, accounts for 40 percent of the world’s malnourished children. Widespread in the heartland, it is a major factor affecting child health. (Chatterjee S, 2008)

The child population is most important section of the society which needs very careful nurturance. Children have the right to a caring and protective environment and to nutritious food and basic health care to protect them from illness and promote growth and development. (Mother, Infant and Young Child Nutrition and Malnutrition, Online 2009)

The convention on the rights of the child, drafted by the UN Commission on Human Rights in 1989 recognizes the right of all children to the highest attainable standard of health. India ratified this convention in 1992. Despite this, more than half of the children below 6 years of age continue to suffer from moderate to severe malnutrition in our country.

On May 2, (UNICEF /WHO, 2006) in its Progress for “Children World Report” on Nutrition show half of the world’s underweight children live in South Asia. In East Asia, China is leading the way in reducing under nutrition. Slow progress is being made in the West and Central African nations. In the Middle East, populous countries such as Iraq and Sudan are slipping backwards. (Parthasarathy A, 2009). The report also states that 57
million children in India are undernourished, either moderately or severely and it has the highest number of malnourished children in the world with Madhya Pradesh being the worst affected state (UNICEF /WHO, 2006). Malnutrition refers to deficiencies, excesses or imbalances in intake of energy, protein and/or other nutrients. (Ball JW, 2003).

It is an ecological problem and the end result of multiple overlapping and interacting factors - physical, biological, social and cultural environment and economic conditions (Begum MR, 2001). WHO defines malnutrition as “a pathological condition arising from coincidental lack in varying proportion of protein and calorie, occurring most frequently in infants and young children, commonly associated with infection. (Parthasarathy A, 2009)

Contrary to common usage, the term 'malnutrition' correctly includes both under-nutrition and over-nutrition (Protein-Energy Malnutrition. [Online, 2009).

Under nutrition is the result of insufficient food intake to meet dietary energy requirements, poor absorption and poor biological use of nutrients consumed repeated infectious diseases and lack of care. It stunts children’s growth and development and in girls, their later ability to bear healthy children. 53 percent of all newborn and infant deaths have under-nutrition as an underlying cause. It can also lead to long-term impact on health outcomes in their later lives (NFHS III, India 2005-06).
Malnutrition is frequently part of a vicious cycle that includes poverty and disease. The factors, viz., malnutrition, poverty and disease are interlinked in such a way that each contributes to the presence and permanence of the others. It makes its principal impact on young children in developing countries. These nations are facing great difficulties in uplifting the standards of living of its population because of unequal distribution of its resources. The result is widespread malnutrition. (NFHS III, India 2005-06)

Over-nutrition refers to a chronic condition where intake of food is in excess of dietary energy requirements, resulting in overweight and/or obesity. Malnutrition can also be identified into two constituents, Protein-Energy Malnutrition (PEM) and micronutrient deficiencies, where PEM is clearly observed in India and other developing countries. It not only leads to childhood morbidity and mortality but also leads to permanent physical impairment and possibility of retarded mental growth of those who survive. Further, early PEM can have lasting effect on growth and development of the child.

PEM is a syndrome characterized by its progressive onset and a series of symptoms and signs that encompass a continuum, ranging from clinically undetected manifestations to the full-blown clinical picture of marasmus and kwashiorkor. It is a clinical spectrum of pathological changes resulting from lack of protein and energy in varying proportions, frequently occurring in
young children and commonly associated with infections and infestations. (Protein-Energy Malnutrition: 2009). The great majority of cases of protein energy malnutrition, nearly 80 percent, are the intermediate ones that are the mild and moderate cases which frequently go unrecognized (Parthasarathy A, 2009).

PEM may be present at any time during the life cycle, but it is more common in the extreme ages, i.e., during the infancy/childhood and in the elderly. Early detection and proper management of the diet can prevent malnutrition and its morbidity.

It is also classified as marasmus, kwashiorkor, or a combination of both. In marasmus, conditions are characterized by extreme wasting of the muscles and a daunt expression; where kwashiorkor is identified as swelling of the extremities and belly, which is deceiving to their actual nutritional status (Begum MR, 2001).

The 'germ' of malnutrition infects a foetus in the intra-uterine life due to lack of sufficient antenatal care on part of the mother. The condition deteriorates further when after birth the infant is deprived of exclusive breast feeding or initiation of weaning is early or delayed. Weaning should be started after the age of 6 months and should contain energy rich semi-solid food. Every time an innocent child suffers the curse of malnutrition, the responsibility goes to the mother, the family and to the community due to their faulty or no knowledge regarding the harmful effects of prelacteal...
feeding, benefits of exclusive breast feeding and initiation of proper weaning at the correct time. (Chatterjee S, Saha S, 2008)

PEM is primarily due to

a) An inadequate intake of food (food gap) both in quantity and quality (K Park: 2012). The causes of malnutrition is a lack of understanding of the child's food requirements, the number of times the child needs to be fed and absence of the mother or other older persons for feeding and caring for the child. Even if the mother is at home, feeding of baby does not far better due to ignorance of child's food requirements.

b) Infections, notably diarrhoea, respiratory infections, measles and intestinal worms which increase requirements of calories, protein and other nutrients, while decreasing their absorbing and utilization. It is a vicious cycle- infection contributing to malnutrition and malnutrition contributing to infection, both synergistically. Malnutrition in childhood diminishes the proper development of the immune system response mechanism. The cellular immune responses are markedly impaired leading to a higher mortality from the seemingly common infections (K Park: 2012).

c) Social factors such as poverty, poor environmental conditions, large families, poor utilization of maternal and child health services.
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Ignorance and the ability to provide adequate food also seem to be important contributory factors (Tripathi MS, Sharma V. 2006).

1.2 Magnitude of the Problem


The World Bank estimates that India is one of the highest ranking countries in the world for the number of children suffering from malnutrition. The prevalence of underweight children in India is among the highest in the world, and is nearly double that of Sub-Saharan Africa with dire consequences for mobility, mortality, productivity and economic growth. ("World Bank Report-2009).

Despite all time high economic growth, improving literacy and even declining infant mortality, India continues to have the dubious distinction of being among the worst off in the world: a high percentage of malnourished children.
Indian children are twice as likely to be malnourished as even those in sub-Saharan Africa and five times more likely to be than children in China. (Parthasarathy A, 2009).

According to NFHS-III almost half of the Indian children 48 percent under five years of age were stunted and 43 percent were underweight. Of the underweight children (0 - 59 months) 19.8 percent were wasted and 48 percent stunted, 43 percent are from rural area and 33.7 percent from urban area. (NFHS III, India 2005-06).

The findings also revealed that the WFA (<-2SD), undernutrition was most pronounced in Madhya Pradesh (60%), Bihar (55.9%) and Jharkhand (56.5%). As per report, in North East India, Assam ranks second in undernutrition of under-five age group children next to Meghalaya. It also ranks second in under five mortality and child mortality next to Arunachal Pradesh. The incidence of under nutrition in Assam is 36.4 percent, 46.5 percent and 13.7 percent on the basis of WFA, HFA and WFH respectively. (NFHS III. Assam 2005-06).

The most common age of PEM is between 6 months and 2 years and around 50 to 60 percent children are malnourished by 2 years; stunting is a major problem and observed in almost half of children. (Parthasarathy A, 2009).

About 6,600 under five children die every day of malnutrition in India. PEM accounts for death in about 7 percent of cases and is underlying cause of
death in 46 percent cases below 5 years of age. Majority of PEM 60 - 70 percent is of mild to moderate degrees. And severe form is only 2 - 5 percent cases.

Countrywide data on prevalence of malnutrition in urban slums is lacking. Data collected from 15 major cities of the country revealed slum population to be the worst off in dietary and nutritional profiles with only 13 percent of children having normal weight for age. (NNMB report, 1984)

The prevalence of severe malnutrition was found to be very high in the urban slums. Most data on prevalence of malnutrition in urban slums is available from community based individual studies. Overall, the prevalence of underweight among under five children was 52- 68 percent with the exception of a study from Delhi reporting a prevalence of 82 percent. (NNMB report, 1984)

The National Institute of Nutrition’s Jabalpur and Calcutta study reported a higher prevalence of PEM (94% and 92% respectively) as per Gomez classification. (NFI Scientific Report, 1988). It is evident that the prevalence of malnutrition in urban slums is much higher than national average for rural and urban areas. (Ghosh S, Shah D, 2004)
1.3 Background of the study

India has experienced a high rate of urbanization since independence due to the industrial and economic growth oriented policies. Rising urban population has resulted in ever increasing number of slum dwellers causing tremendous pressure on urban basic services and infrastructure. The urban population is also rapidly expanding because of large-scale migration to cities for a possible better life. The cities and towns are also expanding but the sheer volume of people compromises the ability of the city to meet their basic needs. A large proportion of this migrating population ends up residing in slums in inhuman conditions. As a result, urban poverty and hunger are increasing in many developing countries.

India's urban population is increasing at a faster rate than its total population. As per the census 2001 the slum population constitutes 4 percent of the total population of the country. The slum dwellers in the country constitute nearly a seventh of the total urban population of the States and Union Territories. India’s more than 6 million children are living in the slums in the country and they constitute 16.4 percent of total child population of the urban areas of 26 States and Union Territories. In other words, every sixth urban child in the country in the age group 0 - 6 is a slum dweller. (Slum Population-Census 2001).
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Slum population living in adverse conditions represent nutritionally vulnerable groups that need immediate attention. It is projected that more than half of the Indian population will live in urban areas by 2020 and nearly one third of this urban population will be of slum dwellers. (NFHS-2, India, 1998-99, Gopalan C, 2003)

Presently, Guwahati is witnessing a tremendous growth of urbanization and its impact on the present settlement has been such that the development effort and the growth cannot be balanced. The local authorities have tried to prepare and implement various infrastructure planning schemes and also efforts are made through City Development plans. Yet the rate of urbanization is too fast for the planning efforts to cope with. The migration and undocumented immigration is the major characteristic of Guwahati. The fruit of this urbanization were forced on the city in the form of slums or alike living conditions. The state of Assam is connected to seven national states and two international boundaries. The crisis in Bangladesh and Bhutan and the availability of better job opportunities has resulted in huge migration to the city. These undocumented migrants have no other options but to stay in slums. Moreover, there is no proper documentation of land records with the Government, which in turn has resulted in ownership disputes leading to illegal encroachment.
Guwahati has been recognized as one of the fastest growing cities of India and presently the ongoing infrastructural development require huge labour force. These labourers migrate from the surrounding districts and states.

The poor in urban area have so diverse traits that they cannot be called a homogenous lot as ‘slum’. A slum is only based on the social-economic level of the population that lives in an area. The characteristics of a slum include unemployment, low level education, low level income and low quality housing. Slum dwellers lack basic amenities like safe drinking water, proper housing, drainage and excreta disposal make this population vulnerable to infections which further compromise the nutrition of those living in the slums. A slum is not based on the race, ethnicity or religion of the people in the area.

The available data from urban slums suggest that the most common causes of malnutrition include inadequate breastfeeding, delayed and insufficient complementary feeding, impaired utilization of nutrients due to infections and parasites. Underlying these factors are various inadequacies with respect to household and community level access to food, health, environmental and caring resources. (Gopalan C, 2003)

Issues pertaining to slum children are multidimensional in nature. Broadly, the factors contributing to the poor nutritional status of the urban slum
children could be categorised as inadequate food intake, improper infant feeding practices, lack of exclusive breastfeeding, late introduction of solid mushy foods, dilution of milk, inequitable intra-familial distribution (gender differences), illness (recurrent diarrheal and ARI morbidity), poor environmental and housing conditions, lack of hygiene and sanitation facilities, inadequate access and utilization of health care, deleterious caring practices, poor food hygiene, absence of responsible adult caregiver, lack of knowledge regarding food requirements, traditional beliefs and parental illiteracy.

The present study concentrates on the following few factors associated with urbanization which adversely affects the nutritional status of the under five children. Some of these are being discussed below.

1.3.1 Impairment of infant nutrition

Unlike in the rural setting, women in urban slums usually go for employment outside their homes such as in factories, shops or as unskilled labourers and domestic servants etc. Indeed, a good proportion of women may work as ‘casual labourers’ or ‘domestic servants’ and would, therefore, they are not protected by labour laws regarding maternity or sick leave, hours of work, etc. It is inevitable, under the circumstances that a majority of poor infants in urban locations deprive of breast feeding at day time and they receive not more than two breast-feeds and that too only at nights. As a
result breast milk supplements need to be introduced at an early age. There is an increasing use of commercial baby foods in early infancy in the urban slums. These foods are likely to be fed in inadequate amounts and in unhygienic ways. This could impair the state of infant nutrition. The occupation pattern of working women in urban slums has a propensity to erode breastfeeding and child-rearing practices. Infants are often taken care of by the older siblings or other personnel living at home. Therefore, data from urban slums and resettlement colonies repeatedly documented that although the breastfeeding was very common, exclusive breastfeeding was practiced only in 30-40 percent of infants younger than 4 months of age. (Ghosh S, Shah D, 2004). The majority of children are first put to breast on the 3rd day after birth and colostrums were discarded in up to 90 percent of children of the urban slums. (Subbulakshmi G, 1990). Use of feeding bottles, animal milk and commercial milk formulae for feeding the young infant was very common in urban slums. Many mothers lack the knowledge of preparing the formula feed. Also, those giving their infants formula milk diluted it excessively. (Kumar S, 2001). When animal milk is given, plain water is mostly added to the animal milk in the ratios upto 3:1. The bottle feeding becomes hazardous as mothers lack proper knowledge regarding hygiene.
Introduction of complementary feeding is markedly delayed and the foods lack the consistency, energy density and fed in inadequate amounts and in unhygienic ways. It is observed almost one third of the urban slum children were not receiving the solid mushy foods even by the age of one year. A study from South Delhi resettlement colony it was observed that the average age for introduction of semisolid food was 10.3 months and 34% of the children were not weaned until after they reached their 1st birthday. The children were at substantial risk of malnutrition because of the tendency to introduce semisolid foods later than the recommended age. (Subbulakshmi G, 1990)

1.3.2 Risk of infections

The poor state of environmental sanitation, poor housing, often characterised by multi-occupancy and overcrowding, improper ventilation in urban slums leads to recurrent infections – both in alimentary and respiratory tract. The frequency of infectious episodes in infancy and childhood may be major contributory factor to increase the malnutrition.

1.3.3 Increasing consumption of ‘Fast’ foods

It is observed that the consumption of fast food is increasing among slum dwellers as both the man and woman of the household have to go for
rigorous working hours. At the price in which such foods are sold are relatively poor in quality in terms of nutritional and hygienic points of view.

1.3.4 Dietary Intake

Most of the countrywide data related to dietary intake is available from rural areas. The median intakes of food and nutrients, in general, were below the recommended dietary intakes (RDI). This is expected considering that the main source of calories and of protein in the habitual diets of the poor is nearly the same - consisting of a single staple cereal with insignificant amount of fat (calorie-rich) and protein-rich food like pulses or meat. Wide variations in nutrient intake were apparent with the region and socio-economic status. Inexpensive imitations of fashionable non-traditional ‘fast foods’ could pose problem due to contamination in such cheap fast foods.

PEM is a significant problem in urban poor children and there does not appear to be a positive nutritional transition in this population. It is important to understand various etiological determinants of malnutrition in order to formulate meaningful strategies to combat the problem.

1.3.5 Water Supply and Sanitation

The present situation with respect to water supply, sewage disposal and sanitation in major metropolitan cities of the country is indeed far from
satisfactory. Almost a third or more of the urban populations of some major cities are living in slums under extremely unhygienic conditions of overcrowding and insanitation.

1.4 Significance of Study

The science of epidemiology is not new to medical and other allied profession but its use has been sporadic and its power for analyzing problems in the field of community has remained unexploited by health professional. There is an increasing need for the health professional working in the community or other health care settings to do epidemiological exploration of malnutrition and plan, organize, manage and evaluate need based service for prevention and control of malnutrition among children of under five at the primary level.

The world today views malnutrition among under five children as a burning issue which needs immediate concern and utmost priority. As the malnutrition have lasting effect on growth and development of under five children, it is necessary to understand the root cause of malnutrition in which under five children are trapped.

Moreover Millenium MDG includes reducing infant and child mortality rate by two third Development Goals(MDG) have become the most widely accepted yardstick of development efforts by Government,
donors and NGOs. The MDG are a set of numerical and time-bound targets related to key achievements in human development. The current scenario of Indian achievement towards the MDG is inadequate for it to achieve the desired targets on the human development parameters by 2015.

Therefore, there is need to conduct research study on prevalence of PEM among under five children and its influencing factors such as socio demographic, maternal and child health practices, feeding and dietary practices, environmental factors in slums of Guwahati city. Keeping all these views in mind, the present study was undertaken to know magnitude of PEM and various factors which influence PEM among children 6 months to 5 years of age in slums of Guwahati city.

The need to do a study on PEM was also result of the investigator’s own experience. She observed during her clinical experience that parents often brought their children either to the Gauhati Medical college hospital (Pediatric OPD) or urban health centre for treatment of diarrhea and respiratory infections with nutritional problems.

Review of literature in this area (presented in the next chapter) revealed that prevalence of PEM have been conducted in different slums of India but little work has been done so far in slums of Guwahati city specially for the under five children with PEM and its associated factors.
In-depth study is essential to gain an insight into the actual picture of the children of under five in slums of Guwahati city so that specific problems can be identified and appropriate corrective measures can be undertaken timely for implementing better health care strategies, amongst this particular segment of population as well as prepare a ground for future research.

The age group 6 months to 5 years were selected because the young children are in transitional period as regard to diet. They are psychologically dependent on their parents. Their cell mediated immunity is underdeveloped rendering the non immune children exposed to infection. And also as it is the period of rapid growth there is a high nutritional need particularly protein and calorie related to their size.

In regards to the choice of the slums of Guwahati city, it is a well-known fact that numbers of slums of city have increased over the past few years. As per recent survey by Guwahati Municipal Corporation (GMC) on slums revealed that the total number of slums in under the jurisdiction of the GMC is ninety. As per report the number of slum dweller in the city is 1, 67,796 with approximate 27,966 houses in ninety numbers of slum pockets of Guwahati city.( Govt of Assam, Guwahati Development Department,2009) Identification and appropriate nutrition and health intervention among the
“At risk” group and undernourished children of slums are essential for optimal result. Because of these reasons slums of Guwahati city was selected as a study area for the present study.

1.5 Objectives

The general objective of this research is to study the epidemiology of Protein Energy Malnutrition (PEM) among children 6 months to 5 years of age in slums of Guwahati city. With this aim in view, the present study was carried out to meet the following specific objectives:

1. To assess the socio-demographic characteristics of children 6 months to 5 years of age in slums of Guwahati city.
2. To assess the maternal health practices.
3. To assess the child health practices and morbidity pattern of children 6 months to 5 years of age of slums of Guwahati city.
4. To know the feeding and dietary practices among children of 6 months to 5 years of age in slums of Guwahati city.
5. To assess the environmental condition of slums where children resides.
6. To determine the prevalence of Protein Energy Malnutrition among the children 6 months to 5 years of age in slums of Guwahati city.
7. To determine the association between grades of PEM among the children 6 months to 5 years of age in slums of Guwahati city and
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selected epidemiological factors like socio-demographic characteristics, maternal and child health practices, feeding and dietary practices and environmental conditions.

8. To examine the significance difference between the different categories of protein energy malnutrition under different selected epidemiological factors.

9. To determine the correlation between grades of protein energy malnutrition among the children 6 months to 5 years of age in slums of Guwahati city and selected variables like age of the child, birth order, family size, education of the mother, socio-economic status, duration of exclusive breast feeding (EBF), Initiation of complementary feeding, occurrence of diarrhoea, RTI and worm infestations and purification of drinking water.

The ultimate aim of this study is to provide the policy makers with a data base regarding the prevalence of protein energy malnutrition among the slum dweller children in 6 months to 5 years of age, so as to assist them in framing of health indices and policies for this section of the society.
1.6 Delimitations

1) Slum children of 6 months to 5 years of age from ten selected slums of Guwahati city.

2) Verbal responses obtained through structured interview schedule.

3) Assessment of protein energy malnutrition, in terms of clinical examination findings and anthropometric measurements such as weight, height, mid upper arm circumference, chest circumference and head circumference.

4) Children and parents who were present at home during the period of data collection.