Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 12, pp.44162-44166, December, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

REVIEW ARTICLE

MALNUTRITION – PREVALENCE AND MANAGEMENT

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ARTICLE INFO

Article History:
Received 04th September, 2016
Received in revised form
15th October, 2016
Accepted 20th November, 2016
Published online 30th December, 2016

Key words:

Malnutrition,
Morbidity,
Deficiency,
Poverty,
Management.

ABSTRACT

Malnutrition is a long-term year round phenomenon due to chronic inadequacies in food intake combined with high levels of illness. Malnutrition is the most common health problem affecting both children and adults. Malnutrition is a physical condition or process that results from the interaction of inadequate diet and infection and is most commonly reflected in poor infant growth, reduced cognitive development, anemia, and blindness in those suffering severe micronutrient deficiency, and excess morbidity and mortality in children. Children malnutrition is the single biggest contribution to under five mortality due to greater susceptibility to infection and show recovery from illness. Children who do not reach optimum size as adult may have less physical capacity for works. Micronutrient deficiencies are moderately high by regional standards and still represent a public health problem. Although poverty is an important factor in the poor nutrition situation, nutritional deficiencies are widespread even in households that are economically well off. Inadequate feeding practices for children make it difficult to achieve the needed improvements in children's nutritional status, and nutrition programmes have been unable to make much headway in dealing with these serious nutritional problems.

Citation: Varsha Kumari, 2016. "Malnutrition – Prevalence and management", *International Journal of Current Research*, 8, (12), 44162-44166.

INTRODUCTION

Malnutrition can be defined as the insufficient, excessive or imbalanced consumption of nutrients. Malnutrition is a phenomenon due to chronic inadequacies in food intake combined with high levels of illness (NNPD, 2003). Child malnutrition may be defined as a pathological state resulting from inadequate nutrition, including undernutrition (protein-energy malnutrition) due to insufficient intake of energy and other nutrients; overnutrition (overweight and obesity) due to excessive consumption of energy and other nutrients; deficiency diseases due to insufficient intake of one or more specific nutrients such as vitamins or minerals (young & Susanne 1995). Children whose weight-for-age (W/A), height-for-age (H/A) and weight-for height (W/H) is below minus two standard deviation (-2SD) from the median of the reference population (National Centre for Health Statistics) are considered to be underweight, stunted and thin or wasted respectively (UNICEF 2004). Malnutrition among under-five children is a major public health problem in India. 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. The World Bank estimates that India is one of the highest ranking countries in the world for the number of children suffering from malnutrition (world Bank, 2009). According to the World Health Organization (WHO), malnutrition is the gravest single threat to global public health (UNICEF, 2010). Several different nutrition disorders may develop, depending on which nutrients are lacking or consumed in excess. Malnutrition lowers the body's ability to resist infection by undermining the functioning of the main immune-response mechanism. This leads to longer, more severe and more frequent episodes of illness (UNICEF, 1998). Subnutrition occurs when an individual does not consume enough food. Poor diet may lead to a vitamin or mineral deficiency, among other essential substances. The child mortality estimate report 2012 released by the United Nations Children's Emergency Fund (UNICEF) shows India in a poor light. It let the whole world by recording deaths of 16.55 lakh children under the age of 5 in 2011. Child malnutrition is the single biggest contributor to under-five mortality due to greater susceptibility to infections and slow recovery from illness.

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Prevalence of Malnutrition

India leads in the greatest population of severely malnourished children in the world. Four hundred million children suffer daily, which is a greater problem than in Sub-Saharan Africa. It is also observed that the malnutrition problem in India is a concentrated phenomenon that is, a relatively small number of states, districts, and villages account for a large share of the

malnutrition burden — only 5 states and 50 percent of villages account for about 80 percent of the malnutrition burden. Childhood malnutrition is a massive crisis caused by a combination of factors including inadequate or inappropriate food intake, childhood diseases, harmful childcare practices, and improper care during illness: all contributing to poor health and millions of deaths annually. A deficiency in the amount of food leaves millions starving, many of whom are children, unable to change their situation. PEM is the direct cause of 300,000 deaths per year worldwide, and is an indirect cause of 53 percent of child mortality worldwide. Degree of severity of PEM directly related to the high mortality (Rice, 2000; Müller, 2005). The new NFHS-4 data for 15 states shows that 37 per cent of children under the age of five in these states is stunted, a fall of just five percentage points in a decade. Bihar and Madhya Pradesh are the worst off, with 48 and 42 per cent respectively of children stunted. Malnourished children in India are 48 percent and 55 percent children are malnourished living in rural India compared to 45 percent of children in urban India. The situation is particularly grave in states like Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan. According to the Indian Council of Medical Research, there is a great lack of nutrition with many leaving out the most crucial nutrients from their diet. (Blakeman, 2005)

The prevalence of stunting among under five in India is 48 percent (moderate and severe) and wasting is 20 percent (moderate and severe) and with an underweight prevalence of 43 percent (moderate and severe) (UNICEF, 2013) it is the highest in the world. The majority of children suffering from undernutrition (80%) are the mild and the moderate forms which go unnoticed (Park, 2007) and the early ages are affected more which makes the process irreversible. According to the National Health Service (NHS), UK, it is estimated that around three million people in the UK are affected by malnutrition (UNICEF, 2010). According to the Food and Agriculture Organization (FAO), the number of people globally who were malnourished stood at 923 million in 2007, an increase of over 80 million since the 1990-92 base period (young, 2012). Acute malnutrition, as evidenced by wasting, results in a child being too thin for his or her height (NFHS- 3, 2005-6). The NFHS 3 (2005-06) results also indicates that malnutrition is more prevalent among children in the higher birth order category. The rural India is witnessing more malnutrition among children < 5 years as higher percentage of stunted, wasted and underweight children were reported from rural areas. The States with more than 50 percent children under five years of age underweight are Madhya Pradesh (60%), Jharkhand (56.5%) and Bihar (55.9%).

Sign and symptoms of Malnutrition

According to world health organisation (2014), following are the signs and symptoms of malnutrition. Loss of fat (adipose tissue)

- Breathing difficulties, a higher risk of respiratory failure
- Depression
- Higher risk of complications after surgery
- Higher risk of hypothermia - abnormally low body temperature
- The total number of some types of white blood cells falls; consequently, the immune system is weakened, increasing the risk of infections.
- Higher susceptibility to feeling cold
- Longer healing times for wounds
- Longer recover times from infections
- Longer recovery from illnesses
- Reduced muscle mass
- Reduced tissue mass
- Tiredness, fatigue, or apathy
- Irritability.

In more severe cases

- Skin may become thin, dry, inelastic, pale, and cold
- Eventually, as fat in the face is lost, the cheeks look hollow and the eyes sunken
- Hair becomes dry and sparse, falling out easily
- Sometimes, severe malnutrition may lead to unresponsiveness (stupor)
- If calorie deficiency continues for long enough, there may be heart, liver and respiratory failure
- Total starvation is said to be fatal within 8 to 12 weeks (no calorie consumption at all).
- Children who are severely malnourished typically experience slow behavioral development, even mental retardation may occur. Even when treated, undernutrition may have long-term effects in children, with impairments in mental function and digestive problems persisting - in some cases for the rest of their lives

Causes of Malnutrition

Social and Economic factors

Poverty is one of the major causes of PEM, which leads to low food availability and unsanitary living condition which is the root cause infections and other diseases. Amartyasen, the economist observed that, famine has always been a problem of food distribution, as there has not been sufficient food to feed the whole population of the world. Malnutrition and famine are more related to problems of food distribution and purchasing power (Sen, 1980). Improper child care, neglect etc may also lead to PEM. Misconceptions, food and fallacies, poor child rearing practices and lack of knowledge, lack of adequate feeding during illness may all lead to PEM. Studies on nutrition concerning gender bias within households look at patterns of food allocation, one study from 2003 suggested that women often receive a lower share of food requirements than men. Gender discrimination, gender roles and social norms affecting undernutrition which contribute to malnourished girl child (Khan and Kraemer, 2009). Gender inequality in nutrition in India is present in all stages of life (Dewan and manju, 2008)

Environmental Factors

Overcrowding of living space along with unsanitary living conditions lead to frequent infections like diarrhoea. Respiratory infection and diarrohea are the common diseases that cause PEM and death. Parasite infections particularly intestinal worm infections (helminthiasis), can also lead to malnutrition. Diarrohea and other infections can cause malnutrition through decreased nutrient absorption, decreased intake of food, increased metabolic requirements and direct nutrient loss (Baro and Dautell, 2006; Musaiger *et al*., 2011)

Biological factors

Maternal malnutrition before and during pregnancy may already make the child vulnerable to under nutrition and proper care and nutrition if not provided post birth may cause PEM. A 2008 review of interventions estimated that universal supplementation with calcium, iron and folic acid during pregnancy could prevent 105,005 maternal deaths. Frequent pregnancies with short intervals between them and long periods of breastfeeding add additional nutritional burden (Food and agriculture, 2014; Bhatta *et al*., 2008). NFHS 3 indicates that 43 percent of children under age five years are underweight for their age. Higher is the percentage of underweight female children (< 5 years) than male children, whereas females are in a slighlty better position compared to male children (< 5 years) while considering stunting and wasting.

Role of free Radicals and Aflatoxins

Free oxygen radicals potentially are toxic to all cell membranes and are produced in the body during infections. These free radicals are not combatted well when the diet of the child is deficit in micronutrients like Vitamin A, C and E. There is thus an accumulation of toxic free radicals and aflatoxins in the body which harm the liver cells and may cause kwashiorkor (Rahman *et al*., 2010)

Age of the host

Adequate food is the most important requisite for growth. While it is important throughout childhood, it is more crucial during the first 5 years of a child's life especially during the first 3 years when the growth is rapid. PEM in pregnant and lactating women can affect the growth of the baby. In 2010 malnutrition caused about 1.5 million deaths in women and children (Lozano *et al*., 2012; Lim *et al*., 2012) Elderly population may also suffer from PEM due to alteration in their gastrointestinal system as they age

Forms of malnutrition

Undernutrition and overnutrition

Malnutrition is caused by eating a diet in which nutrients are not enough or are too much such that it causes health problems (Nikolas 2014). It is a category of diseases that includes undernutrition and overnutrition (WHO 2012).

Protein-energy malnutrition

Undernutrition is sometimes used as a synonym of protein–energy malnutrition (PEM) (Young, 2012) While other include both micronutrient deficiencies and protein energy malnutrition in its definition. It differs from calorie restriction in that calorie restriction may not result in negative health effects. The term "severe malnutrition" or "severe undernutrition" is often used to refer specifically to PEM. PEM is associated with micronutrient deficiency (WHO, 2012). Two forms of PEM are kwashiorkor and marasmus, and they commonly coexist (Nikolas, 2011).

Marasmus

Marasmus ('to waste away') is caused by an inadequate intake of protein and energy. The main symptoms are severe wasting, little or no edema, minimal subcutaneous fat, severe muscle wasting, and non-normal serum albumin levels. Marasmus can result from a sustained diet of inadequate energy and protein, and the metabolism adapts to prolong survival (Nikolas, 2011).

Kwashiorkor

Kwashiorkor is one of the most acute protein malnutrition disease in the world. It is also said to be a protein calories malnutrition similar to marasmus, but it differs from marasmus by the presence of edema that is typically seen in the feet. Other signs of this disease include a distended abdomen, an enlarged liver, thinning hair which is normally end up (coarse) in texture, loss of teeth, skin depigmentation and dermatitis. Children suffering from this condition normally end up developing irritability and anorexia (Holmes, 2007).

Management

Food

Specially formulated foods are useful in moderate acute malnutrition. In children with severe acute malnutrition ready-to-use therapeutic food should be provided rather than normal diet. They may have some benefits in humanitarian emergencies as they can be eaten directly from the packet, do not require refrigeration or mixing with clean water, and can be stored for years (Lazerrini *et al*., 2013, Schoonies *et al*., 2013) In those who are severely malnourished, feeding too much too quickly can result in refeeding syndrome. This can result regardless of route of feeding and can present itself a couple of days after eating with heart failure, dysrhythmias and confusion that can result in death (Viana *et al*., 2012)

Micronutrients

Treating malnutrition, mostly through fortifying foods with micronutrients (vitamins and minerals), improves lives at a lower cost and shorter time than other forms of aid. In those with diarrhoea, once an initial four rehydration period is completed, zinc supplementation is recommended. Daily zinc increases the chances of reducing the severity and duration of the diarrhoea, and continuing with daily zinc for ten to fourteen days makes diarrhea less likely recur in the next two to three months (WHO, 2005) In addition, malnourished children need both potassium and magnesium. This can be obtained by following the above recommendations for the dehydrated child to continue eating within two to three hours of starting rehydration and including foods rich in potassium as above (IPHN, 2008). Home products such as salted and unsalted cereal water, salted and unsalted vegetable broth can be given early during the course of a child's diarrhoea along with continued eating. Vitamin A, potassium, magnesium, and zinc should be added with other vitamins and minerals (Bally *et al*., 2015)

Diarrhoea

The World Health Organization (WHO) recommends rehydrating a severely undernourished child who has diarrhea relatively slowly. The preferred method is with fluids by mouth using a drink called oral rehydration solution (ORS). The oral rehydration solution is both slightly sweet and slightly salty and the one recommended in those with severe

undernutrition should have half the usual sodium and greater potassium. Fluids by nasogastric tube may be use in those who do not drink. Intravenous fluids are recommended only in those who have significant dehydration due to their potential complications. Breast feeding and eating should resume as soon as possible. To prevent dehydration readily available fluids, preferably with a modest amount of sugars and salt such as vegetable broth or salted rice water, may be used. In 2003, WHO and UNICEF recommended a reduced-osmolarity ORS which still treats dehydration but also reduced stool volume and vomiting. Reduced-osmolarity ORS is the current standard ORS with reasonably wide availability. (WHO, 2002; ORS, 2014)

Low blood sugar

Hypoglycemia, can be treated with a mixture of sugar and water. If the child is conscious, the initial dose of sugar and water can be given by mouth. If the child is unconscious, glucose is given intravenously. If seizures occur after despite glucose, rectal diazepam is recommended. Blood sugar levels should be re-checked on two hour intervals (NPHN, 2008)

Hypothermia

The child can be kept warm with covering including of the head or by direct skin-to-skin contact. Warming methods are usually most important at night (NPHN, 2008)

Effect of malnutrition

Malnutrition remains one of the most common causes of morbidity and mortality among children throughout the world (World Health Organization, 1999). Malnutrition is the underlying cause of one third of the 7.6 million child deaths each year before their fifth birthday. Meeting this challenge is doubly urgent because among children who survive, chronic malnutrition causes devastating and irreversible damage (Chesire *et al*., 2008). Lack of nutritious food, coupled with infection and illness, which resulted to underdeveloped bodies and brains and at least 170 million children are affected by stunting (Global Monitoring Report, 2012; Amuta *et al*., 2009; Garba and Mbofung, 2010; Reji *et al*., 2011). Well over two-thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life (WHO, 2002). Worldwide trends show that malnutrition and lack of sanitation contribute to over half of all under-five deaths (UNICEF, 2012). Children malnutrition is the single biggest contribution to under five mortality due to greater susceptibility to infection and show recovery from illness. Children who do not reach optimum size as adult may have less physical capacity for works. Their brains are affected and they are at greater risk of infection which kills many children during their early years (Susskind, 2009). Deficiencies in nutrition inflict long-term damage to both individuals and society. Compared with their better-fed peers, nutrition-deficient individuals are more likely to have infectious diseases such as pneumonia and tuberculosis, which lead to a higher mortality rate. Low productivity not only gives them low pay that traps them in a vicious circle of under-nutrition, but also brings inefficiency to the society, especially in India where labour is a major input factor for economic production (World bank, 2012). On the other hand, over-nutrition also has severe consequences. In India national obesity rates in 2010 were 14 percent for women and 18 percent for men with some urban areas having rates as high as 40 percent. Obesity causes several non-communicable diseases such as cardiovascular diseases, diabetes, cancers and chronic respiratory diseases (WHO, 2012)

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