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Review on Malnutrition: Impact and Prevention

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Abstract
The Malnutrition has been related with deficiency, poor diet and inadequate access to health care, and it remains as universal health issue that contributes to ill-health with 50 % of childhood deaths due to underlying malnutrition. Bio fortification, probiotic foods and food process methods have shown the potential to beat the deficiency disease. A recently developed home primarily based treatment for severe acute deficiency disease is convalescent the lives of many thousands of kids a year. Ready-to-use Therapeutic Food (RUTF) has modified radically the treatment of severe deficiency disease – providing foods that ar safe to use reception and guarantee fast weight gain in severely malnourished youngsters. This review of the literature throws lightweight on the causes of deficiency disease, prevalence, risk, and a few necessary methods like bio fortification, therapeutic diets, prebiotic foods to beat deficiency disease.

1. Introduction

Educatio World Food Programme has already focused on ensuring that energy and protein needs had met up the micronutrient fortification of processed commodities, such as cooking vegetable oil, flour and salt. The latest approach in Nutrition Improvement are directed towards meeting the nutritional needs of particular target groups. These include moderately malnourished individuals, pregnant and lactating women, two years children suffering from micronutrient deficiencies, and the chronically ill – people living with HIV/AIDS and tuberculosis (TB). Meeting their nutritionary desires is very important for his or her survival, likewise as for development. For making certain survival, it's most significant to treat or forestall matter deficiencies. Among youngsters below five, antiophthalmic factor and metallic element deficiencies are to blame for 0.6 million and 0.4 million deaths, severally, per annum [1].

Malnutrition can be acute, chronic or both. The indices that combine weight with height [weight-for-height (wasting) and Body Mass Index (BMI) (thinness)] are used to define acute under-nutrition and over-nutrition (overweight/obesity) for different age groups while height for age describes chronic under-nutrition (stunting). Acute under-nutrition is important since it results in a limited ability to respond to stresses such as infection. Acute under-nutrition has been reported to increase risk of dying with moderate and severe acute under-nutrition having mortality rates of 30-115 and 73-187/ 1000/year respectively according to data from Africa as well as Asia [2]. Consequences of stunting include cognitive impairment [3, 4, 5, 6] poor reproductive outcomes [7, 8] reduced economic productivity [9] and later risk of obesity as well as chronic diseases [10].

Currently, the WHO recommends a programme of using community based approach [11] for treatment of both acute moderate and severe malnutrition using ready-to-use-supplementary-food (RUSF) or ready-to-use-therapeutic-food (RUTF) respectively for children above 6 months. This programme consist of inpatient stabilisation care for management of complicated severe acute malnutrition (SAM), outpatient therapeutic component for uncomplicated SAM and supplementary feeding for moderate acute malnutrition (MAM) [12].

2. Global Prevalence of Malnutrition in Children

Malnutrition encompasses both under-nutrition and over-nutrition [2]. Under-nutrition describes growth failure often associated with macronutrient and micronutrient deficiencies as a result of poor nutrition. Over-nutrition represents excess nutrient and energy intake that results in adverse health outcomes. The global prevalence of stunting, underweight and wasting in under-five children has been declining since 1990 [13] contrasting with the prevalence of overweight which has increased during the same period.

Almost a quarter of the under-five children in the world are stunted [13]. Under-nutrition leads to delayed motor development, cognitive impairment, behavioural problems, social development deficiency, immunodeficiency, increased morbidity and mortality [13] Africa and Asia carry more than 90% of the burden of under-nutrition in under-fives globally [13]. For Africa this means that the high burden of under-nutrition is coexisting with a high prevalence of HIV/AIDS [14] since the majority of HIV infected people are found on this continent. HIV infection and under-nutrition are two important factors that contribute to a significant proportion of under-five mortality. Under-nutrition underlies almost half of the under-five childhood deaths [15] while HIV/AIDS is in the top 10 causes of under-five deaths globally and contributes about three percent to childhood deaths in sub Saharan Africa. In Africa, the prevalence of HIV infection is highest in the sub-Saharan region [14].

3. Indicators

When assessing the nutritional status of a child, there are many growth indicators that can be used, but, for the purpose of this paper, two main anthropometric indicators will be focused on for assessing acute and chronic malnutrition. Wasting is, in most cases, the result of an abrupt significant weight loss endured by the infant, with or without nutritional edema, and leads to a primary outcome of infant mortality. Severe acute malnutrition (SAM), the worst form of AM, is defined as a child six to 59 months of age that either has a mid-upper-arm circumference (MUAC) less than 115mm, or a WHZ less than -3 standard deviations from the median of the WHO Child Growth Standards, independent of nutritional edema [12]. It is difficult to quantify the actual number of children under 5 years of age who die each year due to AM. Deaths are often recorded as infectious diseases such as malaria, tuberculosis and pneumonia, rather than a combination of AM and infectious disease due to the infant's compromised immune system.

Stunting, defined as height-for-age z-score (HAZ) less than -2, as an indicator of CM. Stunting is a reflection of insufficient health and/or nutritional conditions that, ultimately, resulted in a sustained failure to reach the infant's growth potential. Unlike AM, CM does not suddenly develop, but rather occurs over a period of time and is defined as a child, zero to 59 months of age, who is greater than -2 standard deviations from the median of the WHO Child Growth Standards (e.g. HAZ <-2) [12]. CM is not life threatening, but is still a significant factor that exposes vulnerable infants to preventable lifelong consequences. Undernutrition, as a whole, (limited fetal growth, CM, SAM, vitamin A and zinc deficiencies and less than ideal breastfeeding practices) accounts for nearly 3.1 million deaths worldwide each year in children under 5 years of age, translating to about 45% of all deaths in this age range of children [15].

4. Micronutrient Deficiencies

Various micronutrient deficiencies accompany malnutrition [16, 17]. Iodine, Vitamin A, Iron, Zinc and folic acid are some of the common micronutrient deficiencies which can contribute to morbidity and mortality in under-nourished children. HIV infected and uninfected children under 5 years from the low income countries [18]. However, it has been demonstrated that HIV infected children from these low income countries have a higher burden of

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multiple micronutrient deficiencies compared to their HIV uninfected peers [19] and this could worsen their health outcomes. Nineteen percent of the under-fives had Vitamin A deficiency (retinol binding protein). Hence, identification and treatment of these micronutrient deficiencies is important for children living in low income countries

5. Developmental Consequences of Childhood Malnutrition

Disease and inadequate dietary intake play a vital role in early childhood malnutrition, beginning at the time of conception, with the greatest possibility of a decline in length-for-weight occurring during the first 24 months of life [20]. It is estimated that over 200 million children under 5 years of age worldwide are not reaching their full developmental potential [21]. A child who is poorly nourished enters into a 'vicious cycle' where s/he becomes more susceptible to infection and disease, which can then lead to higher levels of malnourishment. Short term effects of infection can reduce infant appetite and intestinal absorption and increase catabolism, the reallocation of nutrients toward immune response and away from growth [22], leading to poorer psychomotor and mental development [23]. The Lancet on Child Development in Developing Countries reported an association between reduced years of schooling and both stunting and poverty. Additionally, stunted children have been shown to learn less per year than those who are not stunted [3].

6. Nutritional Requirements of the Moderately Malnourished

Moderate acute malnutrition affects a total of 11% of children worldwide under the age of 5 years. Acute malnutrition is a major risk factor for child mortality, and is implicated in up to 50% of all deaths in children under the age of 5 years. Proper treatment of moderate acute malnutrition can reduce or prevent the progression towards severe acute malnutrition, which has the potential to reduce child mortality and morbidity. Moderately malnourished children have different nutritional requirements than healthy children with good nutritional status. In addition to the nutritional requirements for regular growth and development, the moderately malnourished child also has increased needs to account for catch- up growth in weight and height, and increased needs to fight off infection and disease. Based on these considerations, specific nutrient recommendations have recently been proposed for moderately malnourished children living in developing countries. These recommendations for moderately malnourished children are divided into two groups; nutrient intakes that should be provided by the child's home diet and intakes that should be provided by a supplementary or complimentary food ration in order to treat moderate malnutrition. The proposed nutrient compositions of both the home diet and supplemental food for moderately malnourished children (expressed in absolute amounts) compared to the FAO/WHO.

7. Severe Acute Malnutrition

Severe Acute Malnutrition (SAM) can be said to be an extreme form of under nutrition usually a WHZ of 70% below the median, three or less standard deviation from the normal National Centre for Health Statistics reference values, bilateral pitting oedema of nutritional origin, or a MUAC ≤ 110mm in children between the ages of 6-59 months [24]. Being a top class worldwide public health concern, it's undeniable to notice that SAM is highly associated with childhood mortality and morbidity and always increasing disease burden within population [25].

8. Possible Risk Factors for SAM

Research have shown that factors such as low birth weight, socio-demographic characteristics, inadequate food intake, inappropriate feeding practices, incomplete Vaccination, political and environment instability and emergency situation are seen to be closely associated with SAM and as such can be considered its risk factors [26]. According to studies, children who are not well fed with breast milk and the right kind of complementary foods are more likely to become severely malnourished. According to Sandeep and Mona [27], infants and young child feeding practices (IYCF) and water and sanitation hygiene (WASH) cannot be left out when it comes to identifying the risk factors for SAM. Studies by Islam [28] and Patel [29] have all established that when caregiver's education level is low, child stands a higher risk of becoming wasted. Children of illiterate parents have a higher risk of SAM especially when it has to do with the care giver.

9. How to Prevent SAM

9.1 Giving Adequate Nutrition and Disease Prevention

In the prevention of SAM exclusive breastfeeding should not be compromised because of its relevance with the developmental process of early childhood [26]. However nutrition education is the fuel that powers the preventive intervention. Promotion of supplementation schemes and addressing micronutrient deficiency through food-based strategies such as dietary diversification through home gardens or through other means like micronutrient fortification [1, 26].

9.2 Prevention of SAM with the use of Therapeutic Foods

Therapeutic foods such as F75 and F100 are special foods of milk origin usually used in the treatment of SAM in inpatient settings. Children who need to be stabilized are given the F75 at inpatient treatment centres. In inpatient treatment, children are usually given about 80 to 100 kcal/kg/d spread over eight to 12 meals in a day for three to seven days. F100, is the one given at the rehabilitation phase of inpatient treatment of SAM, which gives child about 100200 kcal/kg/d for three to four weeks.

Due to the fact that F75s and F100s will require some preparation and also because of its high moisture content, they are not stored for long at a temperature of 25 degree Celsius. Besides they are not also given to caregivers to prepare at home for children (UNICEF catalogue). The development of ready-to-use foods (RUFs) is what has propelled the establishment of the community-based treatment model. Unlike the F75s and F100s RUTFs are also more nutrient dense than available home foods but requires no preparation. They however have very low moisture content and are resistant to microbes.

List of items given at the treatment centers includes;

- Ready-to-use therapeutic foods (RUTFs) like formulated bars, pastes, or biscuits
- Ready-to-use supplementary foods (RUSFs)
- Lipid-based nutritional supplements (LNS)
- Plumpy'Doz, Plumpy'Sup, and Plumpy'Nut, which are common RUFs used to prevent or treat MAM and SAM, are given to supplement children's diets:
  - Plumpy'Doz, designed to prevent or treat MAM in infants
  - Plumpy'Sup, designed to treat MAM in infants
  - Plumpy'Nut, designed to treat MAM or SAM in infants

For MAM treatment, children receive one to two 92 gram sachets (doses) per day. For SAM treatment, children receive two to three sachets per day. The extent of Plumpy'Nut for treating. SAM is intended to meet up a child's full daily nutritional requirements (Nutriset). Supercereal Plus, once called Corn Soy Blend PlusPlus (CSB++) can be given as food rations to families for the prevention of MAM [30].

10. Ready-to-Use Therapeutic Food (RUTF) for the treatment of moderate malnutrition

The considerable evidence supporting the use of RUTF for the treatment of severe acute malnutrition has now led to the consideration of these ready-to-use foods for the treatment of moderate malnutrition in supplementary feeding programs [31]. The successes of the CMAM approach, (increased coverage associated with decentralizing community based care) suggests that it could be used for supplementary feeding programs that have larger and more widespread programmatic applications. Although RUTF was

originally created as a therapeutic food for treating severe malnutrition, it has also been used to treat moderate and mild malnutrition and most recently, has been used in large-scale distributions to prevent malnutrition in 'at risk' populations. Ready-to-use therapeutic foods (RUTF) and ready-to-foods (RUSF) are very similar in nutritional content and micronutrient composition [32]. The major difference between the two is not the food itself, but the context in which it is used and how much is used. RUTF is conventionally used for treatment of severe acute malnutrition and the dosage is weight-dependent to provide a child with the full daily nutritional requirements for recovery. RUTF is conventionally used for the treatment of moderate malnutrition and the dosage is a standard 500 kcal/day ration, regardless of the child's weight, to provide a supplement in addition to the regular daily intake.

The most commonly used RUTF is Plumpy' Nut a ready-to-use therapeutic spread produced by Nutriset and presented in individual sachets. It is a paste of groundnut composed of vegetable fat, peanut butter, skimmed milk powder, lactoserum, maltodextrin, sugar, mineral and vitamin complex. Plumpy' Nut is specifically designed to treat acute malnutrition without complications and has the following characteristics: It is tasty and nutritionally equivalent to F-100 (therapeutic milk used for in-patient care in Phase). One sachet has an energy value of 500KcalOne sachet has a weight of 92 g. Each carton of Plumpy' Nut contains 150 sachets (around 15.1 kg).

11. Conclusions

Bio fortification has been introduced to beat the organic process problem and to form the vital substance bio-availability. It rectifies many health issues like anaemia and alimentation deficiency diseases. Probiotic is a way to produce the health edges to consumers and it will offer adequate health edges and a number of other diseases square measure controlled by victimization the therapeutic diets like Fructose oligosaccharides, F100, RUTF etc. Several studies had proven the effectiveness of RUTF (with adjusted dosage for supplementary ration) for the treatment of mild or moderate acute malnutrition. Studies have been conducted using RUTF for moderately malnourished children in supplementary feeding programs, however, there is very limited research conducted on the use of RUSF for treatment of moderate acute malnutrition in supplementary feeding programs.

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References

[1] RE Black, LH Allen, ZA Bhutta, LE Caulfield, M De Onis, M Ezzati, C Mathers, J Rivera. Maternal and child undernutrition: global and regional exposures and health consequences, Lancet, 371, 2008, 243–260.

[2] S Amsalu, Z Tigabu. Risk factors for ever acute malnutrition in children under the age of five: a case-control study, Ethiopian Journal of Health Development, 22(1), 2008, 21-25.

[3] S Grantham-McGregor, YB Cheung, S Cueto, L Richter, B Strupp. Developmental potential in the first 5 years for children in developing countries, The Lancet, 369, 2007, 60-70.

[4]BR Kar, SL Rao, BA Chandramouli. Cognitive development in children with chronic protein energy malnutrition. Behavioural and Brain Functions, 4, 2008, 31-43.

[5] JA Maluccio, JF Hoddinot, JR Behrman, R Martorell, AR Quisumbing. The Impact of Improving Nutrition During Early Childhood on Education among Guatemalan Adults, The Economic Journal, 119(537), 2009, 734-763.

[6] R Martorell, BL Horta, LS Adair, AD Stein, L Richter, CH Fall, SK Bhargava, SK Biswas, L Perez, FC Barros, CG Victora. Weight gain in the first two years of life is an important predictor of schooling outcomes in pooled analyses from five birth cohorts from low- and middle-income countries, The Journal of Nutrition, 2010, 140(2), 348-354.

[7] JA Rivera, R Martorell, MT Ruel, JP Habicht, JD Haas, Nutritional supplementation during the preschool years influences body size and composition of Guatemalan adolescents, The Journal of Nutrition, 125(4), 1995, 1068S-1077S.

[8] DG Schroeder, R Martorell, JA Rivera, MT Ruel, JP Habicht. Age differences in the impact of nutritional supplementation on growth, The Journal of Nutrition, 125(4), 1995, 1051S-1059S.

[9] JR Behrman, MC Calderon, SH Preston, J Hoddinott, R Martorell, AD Stein. Nutritional supplementation in girls influences the growth of their children: prospective study in Guatemala, The American Journal of Clinical Nutrition, 90(5), 2009, 1372-1379.

[10] J Hoddinott, JA Maluccio, JR Behrman, R Flores, R Martorell. Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults, The Lancet, 371(9610), 2008, 411-416.

[11] MP Prasad. In-vitro analysis of the microbial-load in raw meat and finished products, International Journal of Current Microbiology and Applied Sciences, 3(12), 2014, 643-648

[12] S Collins, N Dent, P Binns, P Bahwere, K. Sadler, A. Hallam, Management of severe acute malnutrition in children, The Lancet. 2006, 368(9551), 1992–2000.

[13]M De Onis, A Onyango, E Borghi. Worldwide implementation of the WHO Child Growth Standards. Public Health Nutrition, 15(9), 2012, 1603–1610.

[14] L Bakamjian. Global report: UNAIDS report on the global AIDS epidemic 2013, Journal of the American Board of Family Medicine, 26(2), 2013, 187-195.

[15] RE Black, CG Victora, SP Walker, ZA Bhutta, P Christian, M De Onis, M Ezzati, S Grantham-McGregor, J Katz, R. Martorell, R. Uauy, Maternal and child undernutrition and overweight in low-income and middle-income countries, The Lancet, 2013, 382(9890), 427-451.

[16] MS Ejaz, N Latif, Stunting and micronutrient deficiencies in malnourished children, The Journal of Pakistan Medical Association, 60(7), 2010, 543-547.

[17] M Hettiarachchi, C Liyanage. Coexisting micronutrient deficiencies among Sri Lankan pre-school children: a community-based study, Maternal & Child Nutrition, 8(2), 2012, 259-266.

[18] MK Chhagan, JV Broeck, KA Luabeya, N Mpontshane, A Tomkins, ML Bennish. Effect on longitudinal growth and anemia of zinc or multiple micronutrients added to vitamin A: a randomized controlled trial in children aged 6-24 months, BMC Public Health, 10, 2010, 139-145.

[19] PS Suchdev, LJ Ruth, BA Woodruff, C Mbakaya, U Mandava, R Flores-Ayala, ME Jefferds, R Quick. Selling Sprinkles micronutrient powder reduces anemia, iron deficiency,and vitamin A deficiency in young children in Western Kenya: a cluster-randomized controlled trial, The American Journal of Clinical Nutrition, 95(5), 2012, 1223-1230.

[20] KG Dewey, SL Huffman. Maternal, infant, and young child nutrition: combining efforts to maximize impacts on child growth and micronutrient status, Food and Nutrition Bulletin, 30, 2009, S187–S189.

[21] PL Engle, MM Black, JR Behrman, M Cabral de Mello, PJ Gertler, L Kapiriri, R Martorell, ME Young. Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world, The Lancet, 369, 2007, 229-242.

[22] KH Brown. Diarrhea and malnutrition, The Journal of Nutrition, 133, 2003, 328S–332S.

[23] A Abubakar, P Holding, FJ Van De Vijver, C Newton, A Van Baar. Children at risk for developmental delay can be recognized by stunting, being underweight, ill health, little maternal schooling or high gravidity, Journal of Child Psychology and Psychiatry, and Allied Disciplines, 51, 2010, 652–659.

[24] GS Thakur, HP Singh, C Patel. Locally prepared ready-to-use therapeutic food for children with severe acute malnutrition: a controlled trial. Indian Paediatrics, 50(3), 2013, 295-299.

[25] C Schofield, A Ashworth. Why have mortality rates for severe malnutrition remained so high? Bulletin of the World Health Organization, 74(2), 1996, 223–229.
[26] LM Lenters, K Wazny, P Webb, T. Ahmed, Z. A. Bhutta, Treatment of severe and moderate acute malnutrition in low- and middle-income settings: a systematic review, meta-analysis and Delphi process, 13, 2013, S23-S28.
[27] S Sandeep, V Mona. Nutritional rehabilitation using energy dense local food as ready to use therapeutic food in hospitalized malnourished children: Case for primary prevention at grass root levels, Journal of Medicine in the Tropics, 16(1), 2014, 22-26.
[28] MM Islam, M Alam, M Tariquzaman, MA Kabir, R Pervin, M Begum, MM Khan. Predictors of the number of under-five malnourished children in Bangladesh: application of the generalized poisson regression model, BMC Public Health, 13, 2013, 11-18.
[29] MP Patel, HL Sandige, MJ Ndekha, A Briend, P Ashorn, MJ Manary. Supplemental feeding with ready-to-use therapeutic food in Malawian children at risk of malnutrition, Journal of Health, Population and Nutrition, 23(4), 2005, 351-357.
[30]R Pongou, M Ezzati, JA Salomon. Household and community socioeconomic and environmental determinants of child nutritional status in Cameroon, BMC Public Health, 6, 2006, 98-105.
[31] S Desai, S Alva. Maternal education and child health: is there a strong causal relationship? Demography, 35(1), 1998, 71–81.
[32] MJ Manary. Local production and provision of ready-to-use therapeutic food (RUTF) spread for the treatment of severe childhood malnutrition, Food and Nutrition Bulletin, 27, 2006, S83-S89.