



Critical Reviews in Food Science and Nutrition

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/bfsn20>

Malnutrition in South Asia - A Critical Reappraisal

Saeed Akhtar^a

^a Department of Food Science and Technology, Bahauddin Zakariya University Multan - Pakistan

Accepted author version posted online: 01 Apr 2015.



[Click for updates](#)

To cite this article: Saeed Akhtar (2015): Malnutrition in South Asia - A Critical Reappraisal, Critical Reviews in Food Science and Nutrition, DOI: [10.1080/10408398.2013.832143](https://doi.org/10.1080/10408398.2013.832143)

To link to this article: <http://dx.doi.org/10.1080/10408398.2013.832143>

Disclaimer: This is a version of an unedited manuscript that has been accepted for publication. As a service to authors and researchers we are providing this version of the accepted manuscript (AM). Copyediting, typesetting, and review of the resulting proof will be undertaken on this manuscript before final publication of the Version of Record (VoR). During production and pre-press, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal relate to this version also.

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

Review Article

Malnutrition in South Asia - a critical reappraisal

Saeed Akhtar

Department of Food Science and Technology

Bahauddin Zakariya University Multan -Pakistan

Running Title: Malnutrition in South Asia

Keywords: Malnutrition, South Asia, Stunting, Wasting, Underweight, Micronutrient deficiencies

***Corresponding Author:** Saeed Akhtar, PhD

Department of Food Science and Technology,

Bahauddin Zakariya University Multan Pakistan

Email: saeedbzu@yahoo.com

ABSTRACT

Malnutrition continues to be a major public health challenge especially in South Asian developing countries. The aim of the present review is to spotlight the magnitude of the prevalence of malnutrition and its dynamics in South Asian region and to suggest potential approaches for the prevention and control of this issue of public health significance. An extensive review of literature, covering malnutrition and its determinants, health and economic consequences and pragmatic preventive strategies was performed on computer based bibliographic databases (PubMed, Google scholar, Scopus, Medline and Sciencedirect.com) to retrieve abstracts and full texts for India, Pakistan, Bangladesh, Sri Lanka and Nepal. All relevant titles and abstracts were examined and evaluated for malnutrition and its prevalence in South Asia. The results revealed malnutrition to be a major public health problem and a potential cause of high disease burden and mortality in South Asia. Compelling evidence suggests malnutrition to be the leading cause of stunting, wasting and underweight with drastic economic consequences among vulnerable populations. Reduced cognitive performance and low productivity have also been associated with micronutrients malnutrition. Suboptimal breastfeeding, inadequate food supply, micronutrient deficiencies, low household income, poor health care system, increased healthcare costs, illiteracy, unhygienic and substandard living, inappropriate child's care and the caregiver, food insecurity and on top of that vicious cycle of poverty, have been recognized as principal indicators for growing malnutrition prevalence in South Asia. Global organizations, local governments, program managers, NGOs, academia, industry in particular and the society at large need to take up the challenge to completely confiscate malnutrition from the region for economic prosperity and a healthier future.

INTRODUCTION

Escalating global population is estimated to reach nine billion heads by 2050 and feeding this rising number of people raises a grave concern in the context of nutritional quality and safety of the food (Buttriss & Riley, 2013). Apparently, it seems hard in the next few decades to ensure safe and sufficient food supply to the populations especially those from resource limited economies. These conditions may lead to poor nutrition that consequently weakens the immune system, negatively impacts growth and cognitive performance and eventually leaves a damaging effect on human health. Underdeveloped societies representing African and South Asian regions have been facing malnutrition which is highly prevalent in rural, tribal and urban slums of these regions. More pronounced effects of malnutrition have been witnessed on growing children (Srivastava et al., 2012). Evidently, stunting appears to be the most common outcome of malnutrition and 90% of all stunted children reside in 36 countries of the world. Asia is the house of around 70.0% of the world's malnourished children e.g. half of the preschool children in Bangladesh are malnourished. Amongst these countries, South Asia represents relatively greater portion of the total number of stunted children and India alone accommodates ~ 61 million stunted children (Black et al., 2008). Several causes of stunting have been identified including reduced food consumption, nutritionally poor diets and more frequent incidences of infections in childhood (Psaki et al., 2012; Khor, 2003; Akhtar, 2011b)

According to World Health Organization, malnutrition is considered an underlying cause of about 60% deaths among children under the age of five years in resource constrained countries. Half of the global population has been shown to be distressed by maternal and child undernutrition and micronutrient deficiencies, leading to intrauterine growth restriction (IUGR),

low birth weight and micronutrient deficiencies especially those of iron, iodine, vitamin A, and zinc (Ahmed et al., 2013). Faruque et al., (2008) reported 50.6 million children less than five years of age to be malnourished globally and of these, 90 % are dwelling in poorer settings of the developing world. Similarly, Black et al., (2008) attributed maternal and child undernutrition to 3.5 million deaths, 35% of the global disease burden among children under the age of five years and 11% of total global DALYs (disability-adjusted life-years). More recent estimate confirmed 6.9 million deaths worldwide among children under the age of five years besides 178 million stunted, 55 million wasted and 19 million predisposed to a higher risk of premature death (Bhutta & Salam, 2013).

India, Pakistan and Bangladesh represent the highest child malnutrition in the world that hampers their economic growth by disconcerting a considerable number of people in the region. Most common micronutrient deficiencies identified in South Asian region are of vitamins A and D, iron, iodine and zinc. The vulnerable population groups are the preschool-age and school children, commonly suffering from vitamin A deficiency (VAD). Available data suggested 84% of pregnant women in India to be affected by vitamin D deficiency (VDD). Around 70% of healthy Pakistani volunteers have been the victim of VDD. Zinc and iron deficiencies seem to be substantially damaging as no corrective measure are underway to overpower this nutritional issue of public health significance in South Asian populations (Akhtar, 2013; Akhtar et al., 2013; Akhtar, 2013a). Physiological effects of micronutrient deficiencies have been widely reported in literature ranging from impaired physical and mental growth among children, iron-deficiency anemia (IDA), and maternal mortality to reduced cognitive performance, poor productivity and blindness. Specifically VAD as a public health issue in developing countries has been ascribed

with economic instability, inadequate dietary intake and faulty absorption among vulnerable groups. (WFP 2006; Akhtar et al., 2013a).

Dietary adequacy is markedly significant to promote growth and development, however, evidence indicates a more positive outcome of a combination of nutrition interventions, stimulation and responsive care. Beneficial effects of psychosocial stimulation approaches would be achieved through nutrition education, training and advocacy especially among the poverty ridden population segments. These efforts are fundamental to potentially ameliorate stunted growth, poor cognitive loss, morbidity and mortality among children (Yousafzai et al., 2013; Akhtar et al., 2013).

Apart from clinical and public health consequences of malnutrition (stunting, wasting, underweight), decreased cognitive performance, mortality and associated economic loss remain to be determined in disadvantaged communities where precise and integrated system of monitoring and surveillance is literally absent. As malnutrition is closely linked with disease, therefore the cost of treatment, loss of productivity and number of DALYs would be taken into account while reckoning overall economic cost of malnutrition (Elia, 2006; Stratton et al., 2003). For example deficiency of zinc is highly prevalent in South Asia with the highest in Bangladesh (Akhtar, 2013) and the economic loss associated with this nutritional deficiency alone amounts to 16 million global DALYs (Black et al., 2008). Similarly, economic loss of IDA turns to be billions of dollars annually in the developing countries. Around 293 million children under the age of five years and 468 million non-pregnant women have been shown to be globally affected by IDA and the associated cost to cure the sufferers could be exceeding billions of dollars each year (Yakoob & Bhutta 2011; Akhtar et al., 2013b; Balarajan et al., 2012).

Modulating malnutrition issue seems to be extremely demanding especially in South Asian regions, a home to half of the world's poor, tallying 1.4 billion heads. Feeding so many people living in resource limited countries with nutritionally imbalanced food is a serious concern that requires rigorous and sagacious approach to address the issue. Present review predominantly represents a dismal picture of malnutrition and its health outcomes and is also an attempt to spotlight the current scenario of malnutrition in South Asian populations with a focus on the possible approaches that would help mitigate this public health issue. The review also provides a thumbnail picture of the potential economic and health consequences of malnutrition that hamper national growth and wellbeing of the vulnerable population groups. International scientific community, policy makers and local authorities need to initiate efforts to avert nutritional threats associated with malnutrition with a greater understanding of the dynamics that could lead to engender the nutrition-related risks in the region.

PREVALENCE OF MALNUTRITION IN INDIA

Voluminous literature is available to suggest malnutrition to be an important public health issue in India that virtually prevails throughout the life cycle among vulnerable population (Ramakrishnan et al., 2012). Malnutrition is more noticeable during childhood and adolescence leading to increased disease burden with 55% mortality in children under the age of five years. These data confirm deaths at a rate of 87 per 1000 live births that amounts to 2.1 million child deaths in India (Ray, 2005; Basit et al., 2012; Jones et al., 2006). Number of undernourished children is the highest in India and preschool children appear to be the most predisposed population group. Growth in terms of mean weight and height has been reported to be much lower among two years Indian children as compared to the international norms (Sen et al., 2012).

One retrospective study demonstrated high protein energy malnutrition (PEM) prevalence among various age groups in India suggesting the highest percentage among girls aged 11-19 years. The age group representing 13-15 years manifested moderate PEM followed by severe malnutrition in the age group of 11-13 (Krishnan et al., 2012). In another study by Sinha et al.,(2012), 43.8% children were reported to be suffering from moderate level of marasmus and kwashiorkor whereas 8.7% suffered from severe malnutrition.

Undernutrition continues to afflict children resulting in increased mortality rate in India especially among children under 3 years of age. Numerous studies demonstrated higher prevalence of undernutrition among boys belonging to low income families. Regional studies confirmed multiple parameters including ethnicity, gender differences, locations, profession and age to be influencing the nutritional status of the population. For example a study with 906 boys and 964 girls aged 5-12 years and belonging to the Rajbanshi, Tea-laborer and Bengalese Muslim communities from North Bengal, validated a significant variance in nutritional status based on gender differences between and within the communities (Mondal & Sen 2010). Similarly, one group of researchers investigated 309 Kamar children aged 4-12 years reporting high prevalence of undernutrition in the form of underweight, stunting and wasting (Mitra et al., 2007).

Compelling evidence suggests malnutrition to be deleteriously impacting a wide range of population groups in a variety of ways in Bareilly, Uttar-Pradesh-India e.g. joint family system, mothers' education and profession and location were recognized as potential determinants for an upsurge in malnutrition prevalence. Regional difference in the magnitude of prevalence of malnutrition was projected to be higher in less developed states such as

northeastern states of India (Bharati et al., 2011). Sufficient literature reported a number of factors influencing nutritional status of children under the age of five years in district Anand of Gujarat state including parental education, socio-economic status, prevailing environmental conditions and family size. Besides these epidemiological factors, safe drinking water, sanitary waste disposal and overcrowding were also shown to heighten the onset of common diseases (Bhandari & Choudhary 2006). A small representative study demonstrated increased prevalence of underweight (26.55%), stunting (31.38%) and wasting (7.59%) in Belgaum district (Mathad et al., 2011). Another community-based cross-sectional study from Medak district of Andhra Pradesh confirmed the prevalence of under-weight, stunting and wasting among 805 children to the extent of ~39%, 30% and 22%, respectively. In a similar study conducted with 2016 children, aged 3.0-5.9 years reported 48.20%, 10.60% and 48.30% children to be stunted, wasted and underweight, respectively (Biswas et al., 2009 ; Meshram et al., 2011).

There is a significant heterogeneity in the results of studies demonstrating gravity of malnutrition in different regions of India e.g. Bharati et al., (2008), by contrast with the foregoing results revealed 50.4% of 803 children under the age of five years to be underweight in Chandigarh, India in 2007 (Thakur et al., 2011). Bihar, Madhya Pradesh, Orissa and Uttar Pradesh, Assam and Rajasthan however, exhibited relatively low prevalence of malnutrition with the least in Goa, Kerala and Punjab. This ecological variance in the prevalence of malnutrition suggested low gender inequality and level of education as contributory factors for improved health of the citizens.

Multi-pronged strategies are essentially needed to overpower malnutrition in India with a focus on skill-based nutrition education and fortification of food items. A coordinated and

integrated effort to ensure effective infection control, training of public healthcare workers and delivery of unified and institutionalized programs needs to be initiated in India (Srivastava et al., 2012). In the same way, micronutrient supplementation, food fortification, and conditional cash transfers would play a pivotal role to combat malnutrition to a significant extent (Victora et al., 2012). Since, micronutrient malnutrition has been suggested to be a public health problem among children in rural India (Laxmaiah et al., 2013) therefore, promotion of breastfeeding practices, oral rehydration therapy, and adequate complementary feeding have been regarded a few effective interventions to curtail mortality rate especially among pre-school children in India. As reviewed by Jones et al., (2006) a significant reduction in child mortality was achieved in India and 50-70% of deaths were prevented at states level to reach Millennium Development Goals. Poverty alleviation does not suffice alone to reduce malnutrition in India rather than additional endeavors to promote female literacy rate, preventing infections through environmental and personal hygiene and to reduce the prevalence of anemia among children would be considerably important (Bharati et al., 2011; Meshram et al., 2012).

Current perspectives on prevalence of malnutrition in India are increasingly dismal and warrant a serious deliberation followed by some concerted attempts to be directed to curb the intimidating effects of malnutrition. Evidently, an urgent dietary intervention program is required to supplement the key nutrients necessary to ensure a good nutritional status among children and adolescents. Moreover, an integrated Socio-Psycho-Economic approach is needed on priority basis to stimulate target population factions, policy makers and international organizations for nutritional interventions to achieve Millennium Development Goals by 2015.

MALNUTRITION- A PAKISTAN'S SCENARIO

Despite the availability of huge natural resources and vast agricultural land for the production of sufficient food to feed the people, Pakistani population continues to tolerate severe malnutrition. This nutritional inadequacy is primarily linked with low socioeconomic status and inadequate economic capacity of the poorer communities to consume meat, milk, eggs, and dairy products in daily food patterns. According to the recent National Nutrition Survey Report of Pakistan, 45.3 million people (28 percent of the population) are victims of food insecurity in Pakistan (NNS 2011). Micronutrient deficiencies are widely existent and are now a significant public health problem in Pakistan. Preschool-age and school children are prone to VAD that affects around 70% of healthy volunteers in Pakistan. Similarly, IDA, zinc and iodine deficiency have been shown to gravely affect Pakistani population. Correspondingly, deficiencies of vitamins A and D, iodine, iron, and zinc are enormous in Pakistan. Simply, PEM, iodine, and iron deficiencies have been shown to result in 3-4% of Gross Domestic Product (GDP) loss in Pakistan in any given year (Akhtar et al., 2013). The magnitude of the prevalence of PEM among pre-school children in Pakistan has been estimated to be 59.5% in 1988 which was reduced to 51% by 2001 (GOP, 1988; UNICEF, 2001). There is no recent study available to precisely gauge the extent of PEM prevalence in Pakistan. Therefore, epidemiological studies and research investigations are needed to assess the degree of prevalence of PEM in Pakistan.

Malnutrition seems to be more persistent in rural areas of Southern Pakistan where gender discrimination and fathers' occupation appear to engender the occurrence of malnutrition among school children. Stunting has been recognized as a known effect of malnutrition associated with reduced food intake, nutritionally poor diet and excessive childhood infections (Psaki et al., 2012). There have been several reports illustrating high prevalence of stunting and

its correlates among children in Pakistan e.g. Khuwaja et al., (2005) examined 1915 school children aged 6-12 years in the rural areas of Southern Pakistan and reported 300 to be stunted. Sex of the children and age were found to be the significant factors as female children were more disposed to stunting comparing with male; however male children attaining the age of 7 years were more susceptible to stunting. Similarly, children of government officials and businessmen were observed with high likelihood of stunting as compared to those of landlords. More recently, Aurangzeb et al., (2012) highlighted nutritional risk among 157 hospitalized children suggesting the manifestation of wasting (4.5%), stunting (8.9%), overweight (15.1%) and obesity (10.4%). Likewise, another investigation revealed stunting to affect children aged 25 to 36 months associating this public health issue with severe malnutrition in 42% cases (Ejaz & Latif, 2010)

Malnutrition and micronutrient deficiencies generally coexist in many population groups especially children under the age of five years. Deficiencies of vitamin A, zinc, iron and iodine have been associated with nearly 11% of all deaths among children under the age of five years (Akhtar et al., 2013; Bhutta 2008). Malnourished patients normally suffer from anemia and anemia in pregnancy has been observed as the most common public health problem leading to an extensively high number of maternal and foetal morbidity. A small study in Karachi, Pakistan demonstrated anemia to be the most common micronutrient deficiency observed among 78% of the tested patients. Calcium and vitamin D deficiency is another cause of morbidity in Pakistani population as of 150 malnourished children in Karachi, 36% patients indicated rickets. Vitamin A deficiency was present in 14% cases and 54.2% school going children and 37.1% pre-school

children were reported to be zinc deficient in Pakistan (Akhtar, 2013; Khan et al., 2010; Ejaz & Latif, 2010).

Evidence is available to underscore the significance of national policies and programs and corrective measures to be taken to undermine growing threat of malnutrition in Pakistan. Maternal malnutrition as a key contributor to promote poor fetal growth, low birth weight and infant morbidity has been widely recognized in the literature (Imdad & Bhutta, 2012). Amongst a few potential determinants that provoke malnutrition in Pakistan, mothers' literacy status is represented as a considerably contributing factor. For example, a significant difference in underweight between the children of illiterate mothers or having education up to primary level was assessed comparing with those having education above primary level. One similar study elucidated the rate of prevalence of stunting and wasting among such children to be closely linked with mothers' education. Socioeconomic inequality is another potential cause of malnutrition among primary school children as confirmed in a study from Lahore Pakistan indicating children age 5-11 years from lower socio economic class being comparably malnourished (Babar et al., 2010; Ali et al., 2005).

MALNUTRITION HITS BANGLADESHI CHILDREN

Globally, Bangladesh is ranked as one of the poorest countries with the highest rate of malnutrition, resulting in increased stunting, underweight and wasting among children. The devastating impact of malnutrition could be well gauged by the fact that it passes from one generation to the next, consequently malnourished mothers give birth to malnourished infants and if these are the girls, they turn to be malnourished mothers thereby continuing this vicious cycle. Therefore, adequate nutrition for adolescent girls might help modulate persistence of

malnutrition in Bangladesh. The economic consequences of malnutrition in Bangladesh are drastically upsetting with regard to massive loss of productivity and reduced cognitive performance among children. Such malnourished children remain physically weak and vulnerable throughout their lives. Eradication of extreme poverty and hunger is one of the fundamental Millennium Development Goals to be achieved for a reduction in mortality rate among children under the age of five years from 65 to 50 per 1,000 live births by the year 2015 (UNICEF 2013; Faruque et al., 2008).

Reliable data are widely available to explicate high prevalence of malnutrition in different settings and population groups based on age, gender, sociocultural and economic status in Bangladesh. For instance, amongst 600 children of primary school in Mymensingh district, examined for health attributes, 15.1%, 22.1% and 2.3% were shown to be wasted, stunted and both stunted and wasted respectively. Urbanization seemed to exert a mitigating effect on the onset of malnutrition as 62.1% and 65.6%; children from rural areas were severely underweight and moderately underweight corresponding to 37.9% and 34.4% in urban areas respectively. Malnutrition was shown to be higher among girls as compared to the boys (Hasan et al., 2013). In a similar study with 5333 children, the prevalence of acute malnutrition accounted for 10%, suggesting malnutrition to be a major public health problem in Bangladesh (Rahman et al., 2009).

Protein energy malnutrition has been prevalent among a substantial population especially children in Bangladesh. Evidently, 400 000 children under the age of five years were shown to suffer from severe form of protein energy malnutrition in Bangladesh (Ahmad et al., 2009).

However, overall occurrence of protein energy malnutrition remained to be 49.44%, in children under six years in the country (Joshi et al., 2011).

A foregoing study carried out with 8,885 children under the age of two years and their mothers, in Bangladesh confirmed 41%, 35% and 18% children stunted, underweight and wasted while 16%, 11.5% and 3% were severely-stunted, underweight and wasted, respectively. Poor household hygiene and low financial status of the families were ascribed to be the fundamental causes of stunting and underweight (Ahmed et al., 2012). Demographic, socioeconomic and environmental factors such as child's age, mother's level of education, father's profession, financial status of the family, breast-feeding practices, schooling performance and place of delivery were shown to be instrumental in aggravating stunting in Bangladesh (Alom et al., 2012; Khanam, et al., 2011). Additionally, restricted food intake, inaccessibility to food, poor maternal and child-care practices and insufficient availability of food for adolescent girls and pregnant women have been identified as some of the underlying causes of high prevalence of malnutrition in Bangladesh (UNICEF 2013).

A target of reducing malnutrition prevalence to 34% in Bangladesh by 2015 is a component of Millennium Development Goals (Jesmin et al., 2011), however current rate of reduction in child undernutrition of 1.27 % per year calls for accelerating efforts to accomplish this demanding task. This situation requires all the stakeholders including policy-makers, program managers, government and non-government organizations, and the academia to contribute for ensuring effective nutrition interventions such as promotion of breastfeeding, supplementation, fortification of micronutrients, deworming and good hygiene practices (Ahmed et al., 2012).

MALNUTRITION- A SRILANKAN PERSPECTIVE

Given a low level of per capita income, unprecedented attainment of high male and female literacy rate in Sri Lanka places her at the highest rung of development ladder among South Asian low middle income countries. However, nutritional inadequacy as regards PEM and micronutrients deficiencies has been lurking in Sri Lankan population leading to high prevalence of malnutrition. Malnutrition primarily hampers national growth and deters economic stability in developing countries in relation to reduced productivity, cognition and elevated treatment cost (Rajapaksa et al., 2011; World Bank, 2006). Evidence is mounting to confirm prevalence of increased stunting, wasting, and underweight as a result of malnutrition that continues to prevail in Sri Lanka alike neighboring South Asian countries. A comprehensive treatise titled 'Nutritional status in Sri Lanka, determinants and interventions' compiled by Rajapaksa et al, (2011) provides an eloquent and more vivid picture of malnutrition among Sri Lankan population.

According to some careful estimates, adolescents account for 21% of Sri Lankan population however little is known about the nutritional status of this major population fraction in Sri Lanka (Niranjala & Gunawardena 2011; Annual report, 2008). The prevalence rates of underweight, stunting, and overweight were reported to be 47.2%, 28.5% and 2.2%, respectively among this population fraction. Likewise, malnutrition among children is exacerbated by micronutrient deficiencies especially of iron and vitamin A therefore; focused attempts need to be directed to control nutritional problems among adolescents in Sri Lanka (Jayatissa & Ranbanda, 2006; Akhtar et al., 2013).

Retrospective studies demonstrated high prevalence of acute malnutrition among children under the age of five years in Jaffna district of Sri Lanka. Wasting, stunting, and underweight among 878 children were noted at the rate of 16.1%, 20.2%, and 34.7% with a higher prevalence of each indicator in boys as compared to girls respectively. Displaced children remain to be highly neglected in relation to their nutritional needs therefore; a more concerted plan needs to be chalked out to scale up nutritional surveillance and monitoring of such children and mothers in Sri Lanka (Jayatissa et al., 2006; Jayatissa et al., 2012). A massive study, assessing health status of 2528 school children aged 9-10-year old reported 15.5% of children to be stunted, 52.6% thin, 3.1% overweight, 12.1% anemic and 0.3% having Bitot's spots (Pathmeswaran et al., 2005).

MALNURITION- A NEGLECTED ISSUE IN NEPAL

The nutritional status of Nepalese population especially children under the age of five years is unsatisfactory. Malnutrition remains to be a problem of public health significance and is one of the leading causes of child morbidity and mortality. Evidently, no significant improvement could be seen in the nutritional status of children as half the children are stunted and 11% are wasted. Severe malnutrition in Mugu district, one of the most remote and least developed districts of Nepal, has been documented, associating it with food scarcity, poor hygiene and ignorance on damaging effects of improper child feeding. Last three decadal reports revealed limited health coverage, leading to high infant mortality rate i.e. 118 for 1,000 births. Similarly, women are also predisposed to malnutrition due to seasonal food shortage and restricted availability of fruits and fresh vegetables, a source of potential minerals and antioxidants. Food inadequacy results in micronutrients malnutrition leading to morbidity, poor

health and perverse socio-economic status (FAO 2013; Sharma, 2012; Gautam, 2010; Ismail et al., 2012). Protein energy malnutrition has been much damaging for children and is still a serious threat to child development and survival in Nepal (Joshi et al., 2013).

Deficiencies of micronutrients especially of vitamin A, iron and zinc have recently inflicted citizens in Terai region (Parajuli et al., 2012). Iron status of 6-10 years old Nepalese children was measured through hematological and biochemical parameters and milder iron deficiency among stunted Nepalese children was observed in addition to a deficiency of serum protein, serum folate and vitamin B among undernourished children (Ghosh et al., 2012). Ghosh et al., (2008) elucidated increased prevalence of stunting (45.57%) and underweight (52.46%) among the tested boys and girls reporting a high prevalence of undernutrition with no gender based difference.

Poverty, illiteracy and inadequacy of appropriate foods have been recognized as potential determinants of malnutrition prevalence in Nepal where hunger and poverty trigger the conditions leading to malnutrition. Development of strategies and sagacious approaches are needed to overpower nutritional challenges in rural Nepal. International organizations, government and NGOs, policy makers and program managers need to critically focus on the local needs for ameliorating nutritional inadequacy among various population segments especially children under the age of five years. The goals for national growth and socioeconomic progress would not be achieved in the absence of a precise, coordinated and institutionalized system of nutritional wellbeing of the masses.

MALNUTRITION- HAMPERING AFGHANISTAN'S PROGRESS

Malnutrition is chronically prevalent in Afghanistan especially among children under the age of five years and seems to be one of the potent markers to impede Afghanistan's socioeconomic progress and prosperity. Growth stunting, under weigh and wasting are the known consequences of malnutrition distressing 60.5 % of the total children by stunting. Similarly, 41.9 % infants aged 6-12 months were shown to be stunted, suggesting poor feeding and health care at an early stage of life in Afghanistan. Underweight among children under the age of five years has been a known outcome of child under-nutrition as ~ of young children appeared to be malnourished and 33.7 % of such children suffered from underweight (Bartlett et al., 2002). Likewise, Black et al., (2008) associated of the child deaths with infection in conjunction with malnutrition whereas CSO (2009) reported a high mortality among infants (111 per 1000 live births) and children under the age of five years (161 per 1000 live births). Wasting seems to be seriously damaging as 13.5% infants aged 6-12 months were affected in Afghanistan (Fenn, 2011).

Micronutrient deficiencies are widely prevalent in all age groups in Afghanistan. Approximately 71.9 % of school age children were shown to suffer from iodine deficiency in peripheral areas of Kabul (Levitt et al., 2011). Anemia, one of the most common nutritional deficiencies worldwide, has badly affected the health of children aged 1-2 years as 59.6 % of such children suffered from anemia in Afghanistan (MOPH, 2009). Similarly, non-pregnant women indicated 48.4 % and 24.7 % iron deficiency and anemia respectively whereas pregnant women appeared to be more predisposed to iron deficiency and anemia accounting for 65.3 and 25.7 % respectively (Bartlett et al., 2002).

High prevalence of iron deficiency and anemia among different population groups is a plausible explanation of the prevalence of other micronutrients deficiencies in Afghanistan. Food insecurity has been chiefly linked with high prevalence of malnutrition and seasonal variation such as winter season (Dec- March) particularly exacerbates the food insecurity resulting in food depletion. Other determinants, engendering malnutrition in Afghanistan include poor health care system where most of the households do not have access to primary healthcare units. Breast feeding practices and the significance of breast feeding as a means to overpower malnutrition at very early stage of live are not promoted. Poor child and maternal health lead to vicious cycle of malnutrition; therefore awareness on nutrition education among mothers in tandem with a global support to promote the responsiveness to control and prevent malnutrition is imperative for a healthier and prosperous Afghan society.

DETERMINANTS FOR HIGH PREVALENCE OF MALNUTRITION IN SOUTH ASIA

Human development is largely based upon the supply of sufficient and balanced diet. There is a multitude of reasons why socioeconomic growth and health outcomes in the developing societies are discouraging. Fundamental cause to explain this requires a thorough understanding and deep insight of those determinants that provoke poverty, food insecurity, and lack of appropriate health facilities, poor maternal and child health, repeated infectious illnesses and unhygienic environmental conditions. Unquestionably, accumulative impact of these determinants intensifies the gravity of malnutrition in the region. Controlling malnutrition in low middle income South Asian developing countries is essentially challenging and entails a substantial commitment and seriousness by the governments in terms of priority setting and revamping of the whole socioeconomic and health infrastructure to advance in this globalized

world. In addition to political strife, little or no interest in taking malnutrition as an issue of public health significance has been witnessed in the region. Poor socioeconomic status, poor education and limited access to health facilities, supply of unclean water, repeated infections are other underlying factors that heighten malnutrition. Scaling up direct nutrition interventions compounded with eliminating female illiteracy, improving livelihood, ensuring women's empowerment and proper hygiene and sanitation would help improve nutritional status of the population (Akhtar et al., 2013; Akhtar, 2013).

BREAST FEEDING

One of the underlying causes of malnutrition identified in developing countries has been the lack of exclusive breastfeeding for a period of six months. Abundant literature confirms the role of breastfeeding in attenuating the risk of diarrheal infections which cause 1.34 million childhood deaths worldwide (Black et al., 2010; Lamberti, et al., 2011). The immunological role and the benefits associated with breast milk entail a significant decrease in child infection. In the face of tremendous campaigning and advocacy on immense health benefits for the infants, there seems a little impact on the existing tendency of exclusive breast feeding. Breast feeding practice as a means to curtail malnutrition would be improved by improving educational standard of the caregivers and by promoting birth spacing (Basit et al., 2012; Akhtar et al., 2013). A foregoing study illustrated the importance of educating women in the time of weaning period on effectiveness of complementary feeding to infants in relation to improvement in weight gain. The study concluded that adequate complementary feeding and preventing microbial contamination of weaning foods are potential ways to curtail the likelihood of malnutrition among infants (Brown et al., 1992).

POVERTY AS A ROOT CAUSE OF MALNUTRITION

Malnutrition is directly linked with low socioeconomic status of the vulnerable populations in South Asia. Malnutrition emanates from the inability to afford nutritionally rich foods due to poverty thus leading to inadequate food consumption and results in the onset of disease. Low-income families typically expend most of the total family income on food. In such instances, least bit of income is left for healthcare thereby diminishing any residual income for food. Poverty and food shortage not only catalyze food insecurity but also contribute to disease epidemics. Alleviating poverty equates eliminating malnutrition and nutritional education further accelerates and helps achieving better living standards among have-nots and poverty ridden communities in South Asian regions (Akhtar, 2013).

Malnutrition has been shown to have more deleterious effect at an early age that subsequently reinforces itself through the vicious cycle of poverty. Usually, the poor would hardly escapes this poverty cycle for an extended length of time. Health damages incurred due to undernutrition in earlier part of life extend to adulthood (Bradshaw, 2006). This was further explained by Victora et al., (2008) who reported that earlier onset of malnutrition may lead to poor fetal growth that jeopardize adult health in the later years of life. Therefore, first two years of life appear to be the most vital period for nutrition intervention, since it is during this critical time, improved nutrition can help avoid permanent damage.

FOOD SECURITY

Malnutrition and food insecurity go hand in hand as most of the foods containing minerals and vitamins are less accessible to a vast majority of population with limited income in developing countries. Insufficient food intake reinforces the likelihood of infections such as malaria, measles, persistent diarrhea and pneumonia which eventually restrict the body from absorbing nutrients from food (Fosu 2009; Akhtar et al., 2012). A sizable body of literature is available to corroborate the impact of rural/urban disparities, income inequality, consumer price stabilization, and mothers' literacy as potential determinants to reduce malnutrition in resource constrained communities. Evidently, undernutrition may be averted to a greater extent in the presence of public action triggered by media exposure (Gaiha et al., 2012). Poverty stems from unemployment, low wages, or lack of education and subsequently results in household food insecurity and poor health outcomes (Black et al., 2008; Akhtar, 2013).

STRATEGIES TO PREVENT AND CONTROL MALNUTRITION

Government responsiveness to the needs and demands for action by the social organizations is instrumental to preventing and controlling malnutrition in developing countries. Obviously, nothing seems to work effectively in the absence of a high degree of participation by the government in addressing to community demands. However, South Asian developing economies badly lack an infrastructure to appreciably establish a system of responding to such needs that are fundamental to control malnutrition. Political strife and poor governance are a few underlying factors for an unsustainable and inconsistent nutritional and health status of the populations in low income societies. International organizations and local NGOs are engaged in tandem to raise voice for eliciting action to be taken to prevent and control malnutrition in the region (Akhtar et al., 2013). Focused legislation and framing of clear cut policies and their

implementation in South Asian countries to fight malnutrition are needed to evolve as healthier nations (Mishra 2012). Moreover, the entire onus to ensure food security and eliminate malnutrition must not be on the governments rather than everyone can play a role and contribute to curtail this nutritional imbalance (Zuberi and Thomas, 2012).

Role of communities and individuals

A common notion prevails that the individual and the community are helpless in addressing the issue of malnutrition for being resource less and powerless in developing world. Moreover, in most of the instances, a series of actions to fight malnutrition require government support which the ordinary people fail to win, leading to a development of disappointment and pessimism. However, this concept does not absolutely stand valid as individuals may have some influence and control in terms of ensuring household nutrition security, nutrition education and care. The advantage of nutrition education are enormous for the communities and it is imperative that nutrition as a subject may be added to medical and nursing curricula.

The role of media campaigning as a strategy to raise voice and develop awareness is critical in realizing the significance of the issue as a known barrier for national growth and development. Nothing matches the unequivocal role of academia and research organizations in suggesting effective remedies against nutritional chaos among populations residing in poor settings of South Asian regions. These professional may propose some line of actions, required to implement effective programs for the control and prevention of malnutrition. The private industrial or business sector constitute another considerably important social segment that may come up and can play a pivotal role through public private partnerships (Uauy et al., 2002; Akhtar et al., 2013). Natural calamities such as floods and earthquakes result in congregation of

thousands of people, increasing the risks of disease and severe malnutrition among the victims. This requires the services of well-trained humanitarian and community outreach workers who could systematically provide relief through ready-to-use therapeutic food to these communities (Collins et al., 2006).

Women empowerment

Malnutrition still remains one of the most distressing enigmas in the world especially for women and children. Literature is rampantly available to elucidate two billion people to be undernourished globally. Mothers' role in early nutrition of the child is pivotal and leaves an impact on the child's life. As primary caregivers, women's own nutrition and childcare practices are closely linked and lead to a better nutritional status of the family. Equitable and non-discriminatory social status tremendously empowers women and contributes to improved household nutrition. Women's status in South Asia is not encouraging and stands as the lowest in the world. Women generally lag behind in education, mobility and decision-making whereas nutritional wellbeing of children is predominantly associated with mothers' health, education, and social status in South Asia (Smith et al., 2003).

Several studies demonstrated women's education and status to be enormously contributing to reduce child underweight and improvement in women's status may have a positive impact on child nutrition on account of women's tendency to expend larger proportion of their income on food of the family as compared to men (Smith & Haddad 2000; IDRC, 2004).

Health and sanitation

Supply of clean water and appropriate disposal of human excreta and household wastes promote environmental health conditions and reduce the likelihood of infection. Similarly,

availability of services especially in rural areas of the developing countries, is not promising therefore infection control is more challenging in these areas. Moreover, little is known about treating malnutrition at hospital level and only a few doctors and nurses are trained in managing malnourished children in pediatric hospital wards in developing countries. Unfortunately, the clinical significance of malnutrition has not been solely realized in South Asian countries and malnutrition is speculated to be an outcome of poverty, an uncontrollable social problem not lying in the domain of health. It is normally witnessed that physicians seem to be more inclined to individual treatment for a better financial gain rather collectively looking into this issues of public health importance.

Food fortification programs

Human body depends upon a multitude of nutrients such as minerals, vitamins, fiber etc. to meet its physiological requirements. Deficiencies of vitamin A, iron, zinc and iodine have been widely prevalent in developing countries and are the most important risk factors for illness and death. The manifestations of such micronutrients deficiencies are vitamin A deficiency syndrome, anemia and goiter (Müller & Krawinkel, 2005; Akhtar et al., 2011). Food fortification is an economic and socially acceptable approach to overcome micronutrient malnutrition and consumption of fortified whole wheat flour has shown promising results in combating iron deficiency in several parts of the world. Therefore, more focused approach would be to fortify flours in addition to others foods as a means of fighting hidden hunger in South Asian developing countries. In Khyber Pakhtunkhwa province of Pakistan, flour fortification program has been successfully implemented, suggesting the strategy to be equally beneficial for South Asian states (Akhtar et al., 2011; Akhtar, 2011a; Akhtar, 2013)

There is a need to pay special attention to ensuring that new fortification programs are introduced and coverage is expanded in relation to nutritional interventions. Moreover, greater investments need to be made on monitoring and evaluation process of these programs (Victora et al., 2012). Iron-folate and multiple micronutrient fortification to combatting early pregnancy and to ensure infant and young child nutrition have been suggested alongside capacity building and training, operational research and advocacy to promote and spotlight the significance of these programs in South Asian developing countries (Mason et al 2012; Akhtar et al., 2011)

Macroeconomic food policies

One retrospective study illustrates that poverty apparently is not the sole cause of malnutrition and poverty reduction does not guarantee a success to mitigate malnutrition in the under developed world. Therefore, simply relying on the conception that poverty needs to be eliminated to override malnutrition may not be a realistic approach as malnutrition is not only a determinant but also a consequence of poverty and reducing malnutrition contributes by itself to poverty reduction (Fogel 1984). Evidence is available to elucidate that the nations with a higher per capita gross national product (GNP) such as Indonesia comparing with China manifested higher prevalence of malnutrition and same stood true with Brazil where significant economic growth even could not attenuate malnutrition in children less than 6 years of age over the past decade (Weisstaub et al., 2008).

Devising and implementing macroeconomic food policies could be effective to promote nutrition of the poor population factions in the developing countries. Compelling evident exists to support the strategy as untaken in Bangladesh where data collected under the Nutritional Surveillance Project exhibited the impact of rice price on child underweight. The results of the

study on a total of 81,337 children aged 6-59 months in rural Bangladesh substantiated how rice expenditure was positively correlated with the percentage of underweight children. The researchers confirmed a decline in percentage of underweight children in instances where rice prices declined. The study finally concluded that macroeconomic food policies may be effective in reducing child underweight (Torlesse et al., 2003).

CONCLUSIONS

Malnutrition affects physical growth and development and is an underlying cause of increased morbidity and mortality in developing countries. Estimates indicate two billion people to be distressed worldwide due to malnutrition. Childhood deaths resulting from various forms of malnutrition amount to 2.6 billion suggesting an enormous global disease burden. Malnourishment is highly prevalent among Asian children as Asia is thought to accommodate 70 % of the world malnourished children. Stunting, wasting and underweight continue to be the conspicuous outcomes of malnutrition. The causes of malnutrition are complex as vicious cycle of poverty continues to play a major role for the dominance of malnutrition in developing societies. Food insecurity largely troubles population groups of low socioeconomic status and poorer families may not be able to have access to nutritious foods due to poverty. However, fundamental determinants for the occurrence of malnutrition may vary within different communities and households in developing countries of South Asia including family food shortages, inadequate child's care, gender based discriminative social status of the women, unhygienic environment and to top it all, substandard health services. Plausible measures and strategies to prevent and control malnutrition problem in South Asian countries encompass adequate dietary intake, exclusive breast feeding and appropriate complementary feeding,

micronutrient fortification and supplementation, improved rate of literacy, nutritional education of adolescent girls and mothers, immunizations to prevent infectious disease and ensuring poverty alleviation and food security.

ACKNOWLEDGEMENTS

The author greatly acknowledges Higher Education Commission of Pakistan for continued financial support pertaining to Food and Nutrition in Pakistan. The review is the sole effort of author Saeed Akhtar however; special thanks are due to my senior colleagues who helped in proof reading of the manuscripts.

REFERENCES

1. Ahmed, T., and Ahmed, A. M. (2009). Reducing the burden of malnutrition in Bangladesh. *Brit Med Journal*. **339**; b4490.
2. Ahmed, T., Hossain, M., and Sanin, K. I. (2013). Global Burden of Maternal and Child Undernutrition and Micronutrient Deficiencies. *Ann Nutr Metabol*. **61**(Suppl. 1) : 8-17.
3. Ahmed, T., Mahfuz, M., Ireen, S., Ahmed, A. S., Rahman, S., Islam, M. M., and Cravioto, A. (2012). Nutrition of children and women in Bangladesh: trends and directions for the future. *J Health Popul Nutr*. **30**(1) : 1-11.
4. Akhtar, S. (2013). Zinc status in South Asian populations- An update. *J Health Popul Nutr*. **31** : 139-149.
5. Akhtar, S. (2013a). Vitamin D status of South Asian populations- risks and opportunities- *Crit Rev Food Sci Nutr*. (DOI:10.1080/10408398.2013.807419).
6. Akhtar, S., Ahmed, A., Ahmad, A., Ali, Riaz, M., and Ismail, T. (2013b). Iron Status of Pakistani Population-Current Issues and Strategies. *Asia Pac J Clin Nutr*. (In Press).
7. Akhtar, S., Anjum, F. M., and Anjum, M. A. (2011). Micronutrient fortification of wheat flour: Recent development and Strategies. *Food Res Intern*. **44** : 652-659.
8. Akhtar, S., Anjum, F. M., Rehman, Z. U., and Riaz, M. (2011a). Effect of zinc and iron fortification of feed on liver and thyroid function. *Biol Trace Elem Res*. **144** : 894-903.
9. Akhtar, S., Sarker, M. R., and Hossain, A. (2012). Microbiological food safety: a dilemma of developing societies." *Cri Rev Microbiol*. **00** : 1-13.
(doi:10.3109/1040841X.2012.742036).

10. Akhtar, S., Tariq, I., Atukorala, S., and Arlappa, N. (2013). Micronutrient deficiencies in South Asia-current status and Strategies. *Trends Food Sci Tech.* **31** : 55-62.
11. Akhtar, S., Tariq, I., Atukorala, S., and Arlappa, N. (2013a). Prevalence of vitamin A deficiency in South Asia- causes, outcomes and possible remedies. *J Health Popul Nutr.* (Accepted).
12. Akhtar,S. (2011b). Food Safety Challenges -A Pakistanø Perspectiveö. *Crit Rev Food Sci Nutr.* (DOI: 10.1080/10408398.2011.650801)
13. Ali, S. S., Karim, N., Billoo, A. G., and Haider, S. S. (2005). Association of Literacy of Mothers with Malnutrition among Children Under Three Years of Age in Rural Area of District Malir, Karachi. *J Pak Med Assoc.* **55**(12) : 550-3.
14. Alom, J., Quddus, M. A., and Islam, M. A. (2012). Nutritional Status of Under-Five Children in Bangladesh: A Multilevel Analysis. *J Biosoc Sci.* **44**(5) : 525-35.
15. Annual report. (2008). Social infrastructure policies, institutional frame work and performance, S. Swarnajothi, Central bank of Sri Lanka, Janadipati mawatha, Colombo, Sri Lanka.
16. Aurangzeb, B., Whitten, K. E., Harrison, B., Mitchell, M., Kepreotes, H., Sidler, M., and Day, A. S. (2012). Prevalence of malnutrition and risk of under-nutrition in hospitalized children. *Clin Nutr.* **31**(1) : 35-40.
17. Babar, N. F., Muzaffar, R., Khan, M. A., and Imdad, S. (2010). Impact of Socioeconomic Factors on Nutritional Status in Primary School Children. *J Ayub Med Coll Abbottabad.* **22**(4) : 15-8.

18. Balarajan, Y., Ramakrishnan, U., Ozaltin, E., Shankar, A. H., and Subramanian, S. V. (2012). Anemia in low-income and middle-income countries. *Lancet*. **378** : 2123-35.
19. Bartlett, L., Mawji, S., Whitehead, S., Crouse, C., Bowens, S., Ionete, D., & Salama, P. (2002). Maternal mortality in Afghanistan: magnitude, causes, risk factors and preventability. Preliminary Findings, UNICEF-CDC November (2002).
20. Basit, A., Nair, S., Chakraborty, K. B., Darshan, B. B., and Kamath, A. (2012). Risk factors for under-nutrition among children aged one to five years in Udupi taluk of Karnataka, India: A case control study *Australas Med J*. **5**(3) : 163-7.
21. Bhandari, D., Choudhary, S. K. (2006). An epidemiological study of health and nutritional status of under five children in semi-urban community of Gujarat. *Indian J Public Health*. **50**(4) : 213-9.
22. Bharati, S., Pal, M., and Bharati, P. (2008). Determinants of nutritional status of pre-school children in India. *J Biosoc Sci*. **40**(6) : 801-14.
23. Bharati, S., Pal, M., Chakrabarty, S., and Bharati, P. (2011). Trends in socioeconomic and nutritional status of children younger than 6 years in India. *Asia Pac J Public Health*. **23**(3) : 324-40.
24. Bhutta, Z. A. (2008). Micronutrient needs of malnourished children. *Curr Opin Clin Nutr Metab Care*. **11**(3) : 309-314.
25. Bhutta, Z. A., and Salam, R. A. (2013). Global Nutrition Epidemiology and Trends. *Ann Nutr Metabol*. **61**(Suppl. 1) : 19-27.
26. Biswas, S., Bose, K., Mukhopadhyay, A., and Bhadra, M. (2009). Prevalence of undernutrition among pre-school children of Chapra, Nadia District, West Bengal, India,

measured by composite index of anthropometric failure (CIAF). *Anthropol Anz.* **67**(3) : 269-79.

27. Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., and Rivera, J. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet.* **371**: 243-260.
28. Black, R. E., Cousens, S., Johnson, H. L., Lawn, J. E., Rudan, I., Bassani, D. G., and Mathers, C. (2010). Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet.* **375**: 1969-1987.
29. Bradshaw, T. (2006). Theories of poverty and anti-poverty programs in community development. *Rural Poverty Res Center.* Working Paper No. 06-05.
30. Brown, L. V., Zeitlin, M. F., Peterson, K. E., Chowdhury, A. M., Rogers, B. L., Weld, L. H., and Gershoff, S. N. (1992). Evaluation of the impact of weaning food messages on infant feeding practices and child growth in rural Bangladesh. *Am J Clin Nutr.* **56** : 994-1003.
31. Buttriss, J., and Riley, H. (2013). Sustainable diets: harnessing the nutrition agenda. *Food Chemistry.* **140**(3) : 402-7
32. Collins, S., Sadler, K., Dent, N., Khara, T., Guerrero, S., Myatt, M., and Walsh, A. (2006). Key issues in the success of community-based management of severe malnutrition. *Food Nutr Bull.* **27** : S49682.
33. CSO (Central Statistics Office). 2009. National Risk and Vulnerability Assessment 2007/8, October 2009. Afghanistan-Kabul Ministry of rural rehabilitation and development.

34. Ejaz, M. S., and Latif, N. (2010). Stunting and micronutrient deficiencies in malnourished children. *J Pak Med Assoc.* **60**(7) : 543-7.
35. Elia M. (2006). Nutrition and health economics. *Nutr.* **22** : 576-578.
36. FAO. (2013). Country Nutrition Profiles-Nepal. Available at http://www.fao.org/ag/agn/nutrition/nep_en.stm. Retrieved on June 28, 2013
37. Faruque, A. S. G., Ahmed, A. S., Ahmed, T., Islam, M. M., Hossain, M. I., Roy, S. K., and Sack, D. A. (2008). Nutrition: basis for healthy children and mothers in Bangladesh. *J Health Popul Nutr.* **26**(3) : 325-39.
38. Fenn, (2011). Research for Save the Children's report, *A Life Free From Hunger: Tackling child malnutrition.*
39. Fogel, R. W. (1984). Economic growth, population theory, and physiology: The bearing of long term processes on the making of economic policy. *Am Econ Rev.* **84** : 369-94.
40. Fosu, A.K. 2009. Inequality and the impact of growth on poverty: Comparative evidence for Sub-Saharan Africa. *J Deve Stud.* **45**(5) : 726-45.
41. Gaiha, R., Kulkarni, V.S., Pandey, M. K. (2012). On hunger and child mortality in India. *J Asian Afr Stud.* **47**(1) : 3-17.
42. Gautam, K. C. (2010). 10+ 2 agenda for public health in Nepal. *JNMA, J Nepal Med Assoc.* **49**(178) : 174-177.
43. Ghosh, A., Adhikari, P., Chowdhury, S. D., and Ghosh, T. (2008). Prevalence of undernutrition in Nepalese children. *Ann Hum Bio.* **36**(1) : 38-45.
44. Ghosh, A., Chowdhury, S. D., and Ghosh, T. (2012). Undernutrition in Nepalese children: a biochemical and haematological study. *Acta Paediatrica.* **101**(6) : 671-676.

45. GOP. (1988). National Nutritional Survey; 1985-86. Nutrition Division National Institute of Health, Govt. of Pakistan, Islamabad.
46. Hasan, M. M., Hoque, M. A., Hossain, M. A., Mollah, A. H., Islam, M. N., Ahsan, M. M., and Chowdhury, B. (2013). Nutritional Status among Primary School Children of Mymensingh. *Mymensingh Med J. MMJ.* **22**(2) : 267-274.
47. IDRC, (2004). Gender Inequality and Poverty Eradication: Promoting Household Livelihoods . Available at: web.idrc.ca/fr/er-42966-201-1-DO_topic.html.
48. Imdad, A., and Bhutta, Z. A. (2012). Maternal Nutrition and Birth Outcomes: Effect of Balanced Protein-Energy Supplementation. *Paediatr Perinat Epidemiol.* **26**(s1) : 178-190.
49. Ismail. T., Sistelli. P., and Akhtar, S. (2012). Pomegranate peel and fruit extracts: A review of potential anti-inflammatory and anti-infective effects. *J Ethnopharmacol.* **143** : 397-405.
50. Jayatissa, R., and Ranbanda, R. M. (2006). Prevalence of challenging nutritional problems among adolescents in Sri Lanka. *Food Nutr Bull.* **27**(2) : 153-160.
51. Jayatissa, R., Bekele, A., Kethiswaran, A., and De Silva, A. H. (2012). Community-based management of severe and moderate acute malnutrition during emergencies in Sri Lanka: Challenges of implementation. *Food Nutr Bull.* **33**(4) : 251-260.
52. Jayatissa, R., Bekele, A., Piyasena, C. L., and Mahamithawa, S. (2006). Assessment of nutritional status of children under five years of age, pregnant women, and lactating women living in relief camps after the tsunami in Sri Lanka. *Food Nutr Bull.* **27**(2) : 144-152.

53. Jesmin, A., Yamamoto, S. S., Malik, A. A., and Haque, M. A. (2011). Prevalence and determinants of chronic malnutrition among preschool children: a cross-sectional study in Dhaka City, Bangladesh. *J Health Popul Nutr.* **29**(5) : 494-9.
54. Jones, G., Schultink, W., and Babilie, M. (2006). Child survival in India. *Indian J Pediatr.* **73**(6) : 479-87.
55. Joshi, H., Joshi, M., Singh, A., Joshi, P., Khan, N. I. (2011). Determinants of protein energy malnutrition (PEM) in 0-6 years children in rural community of Bareilly. *Indian J. Prev. Soc. Med*, **42**(2): 154-158.
56. Joshi, P. C. (2013). Malnutrition in Children: A Serious Public Health Issue in Nepal. *Health Prospect*, **11**: 61-62.
57. Khan, D. A., Fatima, S., Imran, R., and Khan, F. A. (2010). Iron, folate and cobalamin deficiency in anaemic pregnant females in tertiary care centre at rawalpindi. *J Ayub Med Coll Abbottabad.* **22**(1) : 17-21.
58. Khanam, R., Nghiem, H. S., and Rahman, M. M. (2011). The impact of childhood malnutrition on schooling: evidence from Bangladesh. *J biosoc sci.* **43**(4) : 437-51.
59. Khor, G. L. (2003). Update on the prevalence of malnutrition among children in Asia. *Nepal Med Coll J.* **5**(2) : 113-122.
60. Khuwaja, S., Selwyn, B. J., and Shah, S. M. (2005). Prevalence and correlates of stunting among primary school children in rural areas of southern Pakistan. *J trop pediatr.* **51**(2) : 72-77.

61. Krishnan, M., Rajalakshmi, P. V., Kalaiselvi, K. (2012). A study of protein energy malnutrition in the school girls of a rural population. *Int J Nutr Pharmacol Neurol Dis.* **2**:142-6.
62. Lamberti, L. M., Walker, C. L. F., and Noiman, A. (2011). Breastfeeding and the risk for diarrhea morbidity and mortality. *BMC Public Health.* **11**(S3) : S15-27.
63. Laxmaiah, A., Arlappa, N., Balakrishna, N., Galreddy, C., Kumar, S., Ravindranath, M., and Brahman, G. N. V. (2013). Prevalence and Determinants of Micronutrient Deficiencies among Rural Children of Eight States in India. *Ann Nutr Metabol.* **62**(3) : 231-241.
64. Levitt, E. (2011). Malnutrition in Afghanistan: Scale, Scope, Causes, and Potential Response. World Bank Publications.
65. Mason, J. B., Saldanha, L. S., Ramakrishnan, U., Lowe, A., Noznesky, E. A., Webb Girard, A., and Martorell, R. (2012). Opportunities for improving maternal nutrition and birth outcomes: synthesis of country experiences. *Food Nutr Bull.* **33**(2 Suppl) : S104-37.
66. Mathad, V., Metgud, C., and Mallapur, M. D. (2011). Nutritional status of under-fives in rural area of South India. *Indian J Med Sci.* **65**(4) : 151-6.
67. Meshram, I. I., Arlappa, N., Balakrishna, N., Laxmaiah, A., Rao, K. M., Reddy, C. G., and Brahman, G. N. V. (2012). Prevalence and determinants of undernutrition and its trends among pre-school tribal children of Maharashtra State, India. *J Trop Pediatr.* **58**(2) : 125-32.
68. Meshram, I. I., Laxmaiah, A., Gal Reddy, C., Ravindranath, M., Venkaiah, K., and Brahman, G. N. V. (2011). Prevalence of under-nutrition and its correlates among under

- 3 year-old children in rural areas of Andhra Pradesh, India. *Ann Hum Biol.* **38**(1) : 93-101.
69. Mishra, S. (2012). Hunger, ethics and the right to food. *Indian J Med Ethics.* **9**(1) : 32-7.
70. Mitra, M., Kumar, P.V., Chakrabarty, S., and Bharati, P. (2007). Nutritional status of Kamar tribal children in Chhattisgarh. *Indian J Pediatr.* **74**(4) : 381-4.
71. Mondal, N., and Sen, J. (2010). Prevalence of undernutrition among children (5-12 years) belonging to three communities residing in a similar habitat in North Bengal, India. *Ann Hum Biol.* **37**(2) : 199-217.
72. MOPH, UNICEF, CDC and National Institute for research on food and nutrition-Italy and Tuft University 2009. 2004 Afghanistan National Nutrition Survey Atlanta CDC.
73. Müller, O., and Krawinkel, M. (2005). Malnutrition and health in developing countries. *Can Med Assoc J.* **173**(3) : 279-286.
74. Niranjala, A. M. S., and Gunawardena, N. S. (2011). Nutritional Status of Adolescent Females in Estates in Haliela, Sri Lanka. *ICAN.* **3**(5) : 260-267.
75. NNS., (2011) National nutritional Survey Pakistan. Nutrition Wing, Cabinet Division, Government of Pakistan.
76. Parajuli, R. P., Umezaki, M., Watanabe, C., Anttolainen, M., Javanainen, J., Kaartinen, P., and Shreshtra, R. K. (2012). Diet among people in the terai region of nepal, an area of micronutrient deficiency. *J biosoc sci.* **44**(4) : 401-15.
77. Pathmeswaran, A., Jayatissa, R., Samarasinghe, S., Fernando, A., De Silva, R. P., Thattil, R. O., and De Silva, N. R. (2005). Health status of primary schoolchildren in Sri Lanka. *Ceylon Med J.* **50**(2) : 46-50.

78. Psaki, S., Bhutta, Z. A., Ahmed, T., Ahmed, S., Bessong, P., Islam, M., and Checkley, W. (2012). Household food access and child malnutrition: results from the eight-country MAL-ED study. *Popul Health Metrics*. **10**(1) : 24.
79. Rahman, A., Chowdhury, S., and Hossain, D. (2009). Acute Malnutrition in Bangladeshi Children Levels and Determinants. *Asia Pac J Public Health*. **21**(3) : 294-302.
80. Rajapaksa, C. L., Arambepola, C., and Gunawardena, N. (2011). Nutritional status in Sri Lanka, determinants and interventions: a desk review 2006-2011.
81. Ramakrishnan, U., Lowe, A., Vir, S., Kumar, S., Mohanraj, R., Chaturvedi, A., and Mason, J. B. (2012). Public health interventions, barriers, and opportunities for improving maternal nutrition in India. *Food Nutr Bull*. **33**(2 Suppl) : S71-92.
82. Ray, S. K. (2005). Action for tackling malnutrition: growth monitoring or surveillance? *Indian J Public Health*. **49**(4) : 214-7.
83. Sen, P., Bharati, S., Som, S., Pal, M., and Bharati, P. (2011). Growth and nutritional status of preschool children in India: a study of two recent time periods. *Food Nutr Bull*. **32**(2) : 84-93.
84. Sharma, K. R. (2012). Malnutrition in children aged 6-59 months in mugu district. *J Nepal Health Res Counc*. **10**(21) : 156.
85. Sinha, N. K., Maiti, K., Samanta, P., Das, D. C., and Banerjee, P. (2012). Nutritional status of 266 year old children of Kankabati grampanchayat, Paschim Medinipur district, West Bengal, India. *Sri Lanka J Child Health*, **41**(2) :60-64.

86. Smith, L. C. and Haddad, L. (2000). Explaining Child Malnutrition in Developing Countries: A Cross-country Analysis. *IFPRI Research Monograph* 111, IFPRI, Washington, DC.
87. Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L. J., and Martorell, R. (2003). The Importance of Women's Status for Child Nutrition in Developing Countries. Washington, DC: International Food Policy Research Institute.
88. Srivastava, A., Mahmood, S. E., Srivastava, P. M., Shrotriya, V. P., and Kumar, B. (2012). Nutritional status of school-age children - A scenario of urban slums in India. *Arch Public Health*. **17**(1) : 70-8.
89. Stratton, R. J., Green, C. J., and Elia, M. (2003). Disease-Related Malnutrition. An Evidence-Based Approach to treatment. Cabi.
90. Thakur, J. S., Prinja, S., and Bhatia, S. S. (2011). Persisting malnutrition in Chandigarh: decadal underweight trends and impact of ICDS program. *Indian Pediatr*. **48**(4) : 315-8.
91. Torlesse, H., Kiess, L., and Bloem, M. W. (2003). Association of household rice expenditure with child nutritional status indicates a role for macroeconomic food policy in combating malnutrition. *J Nutr*. **133**(5) : 1320-1325.
92. Uauy, R., Hertrampf, E., and Reddy, M. (2002). Iron fortification of foods: Overcoming technical and practical barriers. *J Nutr*. **132** : 849S-52S.
93. UNICEF (2013). Health and Nutrition, Bangladesh .Available at http://www.unicef.org/bangladesh/health_nutrition_377.htm.
94. UNICEF., (2001). The State of the World's Children (2001) available at: www.unicef.org/sowc01/tables/.

95. Victora, C. G., Barros, F. C., Assuncao, M. C., Restrepo-Mendez, M. C., Matijasevich, A., and Martorell, R. (2012). Scaling up maternal nutrition programs to improve birth outcomes: A review of implementation issues. *Food Nutr Bull.* **33**(Supplement 1) : 6-26.
96. Weisstaub, G., Magdalena, Araya., Ann Hill and Ricardo Uauy. (2008). Childhood Malnutrition: Prevention and Control at the National Level. In: *Nutrition in Pediatrics*, 4th ed. pp.143-152. Duggan, C., Watkins, J. and Walker, W. A., BC Decker Inc Hamilton, Ontario, Canada.
97. WFP, World Food Program. (2006). Micronutrient fortification: WFP experiences and ways forward. *Food Nutr Bull.* **27**(1) : 67-75.
98. World Bank. (2006). Repositioning Nutrition as Central to development- A strategy for large scale action.
99. Yakoob, M. Y., and Bhutta, Z. A. (2011). Effect of routine iron supplementation with or without folic acid on anemia during pregnancy. *BMC Public Health.* **11**(suppl 3) : S21.
100. Yousafzai, A. K., Rasheed, M. A., and Bhutta, Z. A. (2013). Annual Research Review: Improved nutrition--pathway to resilience. *J Child Psychol Psychiatry.* **54**(4) : 367-77.
101. Zuberi, T., & Thomas, K. J. (2012). *Demographic Change, the IMPACT Model, and Food Security in Sub-Saharan Africa* (No. 2012-003).