

The Ethiopian Journal of Health Development

Original article

Review of the status of malnutrition and trends in Ethiopia

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Abstract

Background: The problem of malnutrition in Ethiopia is on the increase due to low agricultural production, low and inadequate food consumption and high disease burden.

Objective: To synthesize available information on nutritional assessment in Ethiopia.

Methods: Trends in nutritional status assessed from three National Nutrition Surveys conducted in 1983, 1992 and 1998 by the Central Statistical Authority (CSA) and other pocket surveys on Protein Energy Malnutrition (PEM) and Micronutrient deficiencies.

Results: For the nation as a whole no major progress has been made in reducing the prevalence of child malnutrition over the last 17 years. The mean prevalence of stunting (low height for age) for all the regions increased from 59.8% in 1983 to 64% in 1992. The very recent survey of 1998 showed a decline in the level stunting i.e. 52% compared to the previous years. The prevalence of underweight children among 6-59 months olds fell from 37.3% in 1983 to 46.9% in 1992 and to 42% in 1998. Prevalence of wasting for all the regions combined had also increased. Breast-feeding and weaning practices revealed that the problem of early stunting in Ethiopia is mainly due to delayed introduction of complementary foods in the first year of life. Pocket studies on the prevalence of micronutrient deficiencies indicate that iron deficiency anemia, Iodine Deficiency Disorders and vitamin A deficiency are of major problems of public health significance.

Conclusion: To reduce malnutrition rapidly requires focused and systematic action in the areas of health, food security, child and maternal care. A co-ordinated effort of all sectors will be needed to overcome the problem. Due to this lack of co-ordination both in addressing the problem and addressing the basic and underlying causes, malnutrition is on the increase in this country. [*Ethiop. J. Health Dev. 2001;15(2):55-74*]

Introduction

Ethiopia is one of the poorest and least developed countries in the world. The economy is based on small landholder agriculture, with more than 85% of the population of 63 million living in rural areas under very poor conditions. A large part of the population is concentrated in the highland areas in central and northern regions. There are 76 various ethnic groups with 286 different languages. Real

economic growth has been around six percent in recent years. Coffee accounts for about 60 percent of export revenues (1).

Ethiopia is also one of the countries in the Sub-Saharan Africa with the highest rates of malnutrition. Malnutrition results from the interaction between poor diet and disease and leads to most of the anthropometric deficits observed among children in the world's less developed countries (2). In Ethiopia, no progress has been made in reducing child malnutrition over the past 17 years. There could be several underlying and basic causes for the problem some of which could be due to low agricultural production, low and inadequate food consumption, disease and falling gross national product per capita. Drought, civil war and political instability are also the major contributing factors.

The prevalence of stunting is on the increase in Ethiopia. This has serious implications, because child health goals for the early part of the next century have specifically targeted at improvements in the rates of stunting. One of the five health outcome targets (out of eleven total targets for health) given by the World Health Organisation (WHO) in its recently revised "Health for all in the 21st century" has envisaged to reduce the percentage of children under five years who are stunted to be less than 20% in all specific sub-groups within countries by the year 2020(3).

The main aim of this review is to organise and present available information on malnutrition in this country. Therefore, the trends in malnutrition in Ethiopia in the last two decades are described. This review is meant to appreciate the negative changes and discuss possible contributing factors.

Methods

Sources of information and reliability of data: To assess trends in the nutrition situation in Ethiopia, survey data collected by the CSA on nutritional status of children under five years were consulted and reviewed. Data were available for 1983, 1992 and 1998(4,5,6). Data for the three indicators of Protein Energy Malnutrition (PEM) were summarised for estimation of trends. Different pocket studies on PEM and findings of the recent Demographic Health Survey (DHS) of Ethiopia, 2000 were also highlighted to enrich the information.

Micronutrient deficiency data was reviewed from data on some national and pocket studies. Data on vitamin A deficiency has a wider coverage than iron and iodine. Very limited data was available on Zinc deficiency.

In analysing the data the main form of macro nutrient deficiency, which is PEM is expressed using the three main indicators, i.e. Weight-for-age (Underweight), Height-for-age (Stunting) and Weight-forheight (Wasting). The method used for comparison was a generalisation of percentage change as absolute prevalence change between survey years. For the two survey years that were done in the same geographical demarcation (1983 & 1992), estimation of regional trends in the prevalence of the three forms of PEM, and the nation as a whole was made. Since consecutive national data on micronutrient deficiencies is unavailable, it was difficult to discuss trends, but summary of studies done was presented to show the significance of the problem from public health point of view.

Operational definitions

Acute malnutrition or wasting:- A nutritionally deficient state of recent onset related to sudden food deprivation or mal-absorption or poor utilisation of nutrients which results in rapid weight loss. The highest prevalence occurs in times of famine, during seasonal food shortages or during severe illness. Weight-for-height reflects body weight relative to height. Wasting refers to low weight-for-height <-2 Standard deviations (SD) of the median value of the National Centre for Health Statistics /World Health Organisation (NCHS/WHO) international weight-for-height reference.

Chronic malnutrition or Stunting:- reflects long term cumulative effects of inadequate nutrition and health. Shortness in height refers to low height-for-age that may reflect either normal variation in growth or a deficit in growth. Stunting refers to shortness that is a deficit or linear growth retardation. Stunting is defined as low height-for-age at <-2 SD of the median value of the NCHS/WHO international growth reference. Severe stunting is defined as <-3 SD.

Underweight:- An anthropometric index of weight-for-age represents body mass relative to age. Weight for age is influenced by the height and weight of a child and is thus a composite of stunting and wasting, making interpretation of this indicator difficult. Underweight refers to a deficit and is defined as low weight for age at <-2 SD of the median value of the NCHS/WHO international reference.

Trends in nutrition

1. PEM

Underweight

Weight-for-age is commonly used as an indicator for malnutrition because weight is easier to measure than height. Weight-for-age reflects linear growth and weight accumulation achieved pre-and postnatally over a long term as well as weight accumulation in the short term. Therefore, low weight-for-age may reflect either normal variation in growth or a deficit in growth. Underweight is usually defined as weight <-2 SD below that expected on the basis of the international growth reference. The mean prevalence of underweight in developing countries is 31%, ranging from 6.5% in South America to around 50% in South Asia (7). In Ethiopia, the trends for underweight have been estimated by comparing the 1983 and 1992 surveys done by CSA for each region and including the 1998 survey for all regions combined. The prevalence of underweight reported in the 1998 survey was 42% (6). This shows that the number of underweight children in Ethiopia is still higher than the mean for developing countries.

For the country as whole, the prevalence of underweight children increased from 37.3% in 1983 to 46.9% in 1992 in children among 6-59 months of age. During this period the prevalence had increased by 1.07 percentage points per year. The 1998 prevalence rate in children 3-59 months reported by CSA is 42% (Fig 1). Children aged from birth to 59 months do not form a homogeneous group. Hence, prevalence estimates are affected by the distribution of ages included in the survey. From 1992-1998, the prevalence seems to decrease by nearly 5 percentage points, but it is difficult to say that we are here observing a real decrease by 5% since the age group included is not the same i.e. the 1998 survey included the lower age group starting from 3 months onwards indicating the inclusion of a more safer group (3-6 months), which may have lowered the estimate. Comparing it with the 1992 survey, it can be concluded that the prevalence rate has still increased by almost 6% comparing regional differences, the regions of Gonder Gojam, Sidamo, and Wellega had an underweight prevalence between 50% to

60% in 1992. These levels are among the highest prevalence reported in Africa outside of refugee/displaced camp populations (8). The prevalence of underweight was 47.1% from EthiopiaDHS, 2000, showing that the situation is no more different from the 1992-prevalence (9).

In the 1998 survey, the prevalence of underweight is 54.4% and 52.4% for Tigray and Amhara respectively. From these observation one can say that no progress was made in reducing the prevalence of underweight in the last 17 years.

Stunting

Height-for-age is one of the three anthropometric indices commonly used as an indicator of malnutrition. Height-for-age reflects linear growth achieved pre-and post-natally, and effects of inadequacies of health, diet, or care. Shortness in height refers to a child having low height-for-age, which may reflect either normal variation in growth or a deficit in growth. Stunting refers to shortness that is a deficit, i.e. linear growth that failed to reach genetic potential as a result of suboptimal health or nutrition conditions (11).

Stunting is associated with impaired mental development and poor school performance. Stunting in childhood also leads to reduce adult size and reduced work capacity. This in turn has an implication on economic productivity at national level. Women of short stature has a greater risk of obstetric complications because of small pelvic size and also to a greater risk of delivering a low birth weight infant (11). National prevalence of stunting in Ethiopia was as high as 64.2% in 1992 and decreased to 52% in 1998. The process that leads to stunting is thought to occur pre-natally and post-natally, primarily during the first two to three years of life. The causes of stunting probably vary in different settings depending on which nutrient (or nutrients) may be limiting and the frequency of infection. Deficiencies of protein, energy, zinc as well as iron have been implicated as causes of stunting as has prolonged infection (11)

The mean prevalence of stunting for all the regions increased from 59.8% in 1983 to 64% in 1992. The recent survey of 1998 showed a relative decline in the level of stunting, i.e. 52% compared to the preceding years. Overall, the prevalence has decreased by 12% percentage points in 1998 survey (Fig 2). This reduction doesn't really show an improving trend in the level of stunting since in this survey both urban and rural areas were included. The preceding surveys assessed the nutritional status of under five year old children only in the rural areas. The recent Demographic Health Survey (DHS) of Ethiopia gives a similar picture of the state of malnutrition as that of the survey of 1998. In this survey, the prevalence rate of stunting was 51.2%(9).

Generally speaking, access of the child population to health care facilities, exposure of parents to health education messages transferred through different medias will have a positive impact on the urban areas. Besides, these, the level of education and income of the families in the urban centres will definitely play a positive role towards improved nutritional status of the urban population than the rural. Therefore, combining the two in the recent survey might have contributed to the seemingly decreasing rate of stunting in the 1998 survey. As evidence to this fact, in the 1998 survey, it was found that the prevalence of stunting was more than twice among children of mothers with no formal education compared to those whose mothers have completed grades 9-12.

Considering Ethiopia's position in the rate of stunting in Sub-Saharan Africa, Ethiopia had the highest rate of stunting. Two countries, Nigeria and Ethiopia, accounted for about half (52%) of the stunted

children in sub-Saharan Africa in 1995(7). The progress in trends from 1992 to 1998 should be viewed on the basis of nutritional goals set for the 1990's at the World Summit for children (7), which states as halving mild and moderate malnutrition by the year 2,000. We are now in the millennium already onto 2001 and no progress has been made towards this end.

Wasting

The proportion of children wasted in 1998 survey was slightly higher (9.3 percent for rural areas) than the corresponding proportion observed in the 1992 National Rural Nutrition Survey (8 percent). The proportion of wasting in 1998 ranged from 13% in Tigray to 6 percent in Addis Ababa. Since wasting is a nutritional deficiency of recent incidence caused by inadequate food intake, this may be attributed to the recent drought situation. Similar to stunting the highest prevalence rate of wasting was observed for children whose mothers had no education. In all the survey periods stunting is a far more wide spread nutritional problem than wasting in Ethiopia. The rate of malnutrition is the highest among the 12-23 month olds for all the three forms of PEM. This may be due to insufficient and inappropriate supplementary foods and recurrent infections such as diarrhoea, due to unsanitary environment. For the whole country, the prevalence of wasting has increased by one percentage point from 1992 to 1998 (fig 1). This is evidence of the acute food shortages that prevail usually due to drought and war. We can conclude that no progress has been made in the last 17 years in reducing the prevalence of wasting in Ethiopia, may be it has worsened as the findings of DHS, 2000 indicate a prevalence rate of 10.7%(9). This has several implications especially with regards to addressing food insecurity problems.

Regional variations

According to the survey done in 1998, the prevalence of stunting was found to be highest in the Amhara region (60%) but lowest in Dire Dawa (32%). In the 1992 survey regions, the highest rate of stunting were recorded for South Gonder (75%). East and West Gojam, North Wollo, Tigray, Sidamo, Illubabour, North Gonder and South Shewa all had rates above 66%, while the lowest rate recorded was for South Omo (49%). The regions most affected by stunting were South Gonder and East Gojam. These areas are known for their surplus production of grain crops, which explains the importance of other variables like health care, maternal education and care, other than ensuring household food security. The factors that contribute to the highest rate of stunting in these regions need further investigation. Surprisingly, the regions which had the highest rates in 1983 continue to do so in 1992(Gonder, Wollo and Gojam) (Table 1). The results for 1992 showed that Gonder and Wollo had a slight decline in stunting during the decade, whereas Gojam showed an increase by 6 Percentage points. In all the surveys done stunting is more common in rural areas than urban areas.

For all regions combined there was no significant change in wasting prevalence over the years, 8.1%, 8.0% and 9% for 1983,1992 and 1998 respectively. Illubabour and Wellega had the highest rates of stunting in 1983 and continue to do so in 1992. Similarly Arsi and Bale had low rates of wasting in both surveys. In 1998, the proportion of wasting ranges from 13 percent in Tigray to 6 percent in Addis Ababa. More than 10% of the children in Tigray, Benshangul-Gumuz, Somalie and Gambella regions were observed to be wasted.

Underweight increased in all regions, without exception from 1983 to 1992 by a significant amount. The size of the increase ranges from 4 to 17 percentage points, with most regions having an increase from 5 to 10 percentage points. In 1998, around 50% of children under five were underweight in Tigray and Amhara regions compared with 20% in Addis Ababa.

Situation of PEM from pocket surveys

A study done in 1995 in Jimma town on 669 under five children revealed that about half (47.5%) were found to be malnourished. The prevalence of underweight, wasting and stunting were 36%, 9% and 36%, respectively (12). In this study, poor socio-economical background, poor housing condition, nonavailability of latrine, unprotected water source, an attack of pertussis, not completing immunisation, prolonged breast feeding and nutritionally inadequate diet were implicated as risk factors for PEM. The prevalence of underweight and stunting in this study is relatively lower compared to the 1998 CSA survey data, which was 42% and 52% respectively. This may be due to effect of urbanisation, since this survey was merely conducted in the big town of Jimma and the

later includes Semi-urban centres as well or the malnutrition situation in the area has worsened since 1995. The rate of wasting is exactly the same as the other two national surveys, which may indicate that the situation might not differ from the national picture, if the survey was done including both rural and urban centres.

A cross sectional study conducted in Zigaboto, Guragie zone in 1996 indicated the level of malnutrition to be very high among children 6-59 months (13). The study was conducted on 231 children and the overall prevalence of stunting, underweight and wasting were 46.7%, 44.2% and 13%, respectively. In this study it was found that, there was a high prevalence of stunting in children of illiterate mothers (52.2%) compared to children of literate mothers (22.2%). Maternal educational status was implicated to be a determining factor for achieving a better nutritional status.

A recent study conducted in five zones of southern Ethiopia estimated the level of child malnutrition and identified the factors associated with chronic malnutrition among children in the region (14). The findings of this study indicated 45% of the children to be stunted and 42% underweight and 12% wasted. The level of wasting is extremely high compared to the mean wasting level for the national surveys conducted so far. This may be due to the acute food shortage observed in the area as a result of failure of short rains in 1999. In this study, household economic status and women's education were the two socio-economic factors that determined nutritional status. From the demographic variables assessed, age, preceding birth interval and number of under-five children were found to be associated with stunting.

With respect to PEM data on adolescents, much has not been done in this country. A study conducted in rural Ethiopia indicated that wasting was less common among adolescents, only 7% during post harvest season (15).

Studies done on adult malnutrition in Ethiopia had indicated that there is a high prevalence of underweight. The condition is assessed by specifying the different degrees of underweight expressed as the Body Mass Index ($BMI = \text{weight (kg)}/\text{height (m}^2\text{)}$). Three grades of chronic energy deficiency were specified, marginal or grade one ($BMI\ 17.0-18.4$), moderate or grade two ($BMI\ 16.0-16.9$) and severe or grade three ($BMI < 16.0$).

Studies on maternal nutritional status are also scarce. In a study conducted on 226 rural women, 16% of them were found to have second to third degree of Chronic Energy Deficiency (CED)(16). This rate is a relatively high prevalence of moderate to severe energy deficiency in non-pregnant women. 35% of the non-pregnant women studied in southwestern part of the country had their mean BMI less than 18.5kg/m^2 and 20% of them had their height less than 150cm (17). The mean weight in this study group

was 46.9 kg, which falls below the NCHS 10th centile for Afro-American females. In another study conducted among adults, grade three CED affected 2.4% men and 4.7% women. Moderate CED affected 36% men and 43% women (15).

The concern about investigating the nutritional status of the elderly has started recently with the establishment of an NGO office in Ethiopia, named HelpAge International. Since then many NGOs have done studies on the elderly in some pocket areas especially to target them in emergency food distribution situations.

All studies done on the elderly in pocket areas in Ethiopia were done between January and December 2000 and had demonstrated that malnutrition exists among the elderly in Ethiopia (18-21). This was mainly during the 1999-2000 drought situation when the nutritional situation of the whole community was compromised. Therefore, there is a need to do other studies under normal situations. Nutritional survey done on the elderly (aged 55 and above), in Borena zone-Oromia region by Goal have shown that a high percentage (77.3%) of the elderly measured using Mid Upper Arm Circumference (MUAC) were malnourished. Among these 46.8% of them were severely malnourished (18). A study done on the nutritional status of the elderly in Zeway, central Ethiopia have reported a 30.5% prevalence rate of malnutrition (19). A similar study done by HelpAge International in Dire and Yabello districts, in Borena zone, reported a severe malnutrition rate of 53% among the elderly (20). CARE had also conducted a nutritional assessment of the elderly in Dire, Teltele and Yabello zone and found a severe malnutrition rate (BMI < 16kg/m²) of 41.8%(21).

2. Micronutrient deficiencies

Vitamin A deficiency

Vitamin A is an essential micronutrient for the normal functioning of the visual system, growth and development, maintenance of epithelial cellular integrity, immune function, and reproduction. Clinical deficiency of vitamin A is defined by the presence of progressive eye disease in the form of night blindness, Bitot's spots, corneal xerosis and/or ulcerations and xerophthalmia related corneal scars. Subclinical deficiency of VA for pre-school children is defined as the prevalence of serum retinol values < 0.70 mol/L minus the prevalence of clinical VAD.

Around the world, approximately 15 million children under 5 years of age have some degree of vitamin A deficiency (VAD). A large number of these children will become blind as a consequence and many will die. Others will be unable to fight infection and will therefore be at higher risk for complications of diarrhoeal disease or measles.

In Ethiopia, numerous studies have shown that vitamin A deficiency is a major public health problem (22-37). A study done by Postmus between 1957-58 in which he clinically examined 7,000 pre-school and school age children found out that 9% of the girls and 2.2% of the boys had Bitot's spots while approximately half of them had conjunctival xerosis (22). A Nation-wide study conducted by Zewdie and workers also reported that VAD is a problem of public health significance (23). In this study it was found that bitot's spot was 1.0% in all children, with the highest prevalence in the pastoral (1.6%) and cropping (1.1%) agro-ecozones than in the zones characterised by cash crops (0.4%) and "Enset" zone (0.0%). One case of corneal xerosis and two cases of corneal scars were also seen. Other consecutive studies have also shown that vitamin A deficiency is a serious problem in this country (Table 2). Another study conducted in Oromiya region found that 9% of the children under five years of age had

night blindness (9 fold of the WHO cut-off point), 14% had Bitot's spots (28 fold of the WHO cut-off point) and 0.6% had corneal xerosis (60 fold of the WHO cut-off point)(24,25). A study conducted between 1994-1995 in Jimma welfare home revealed that 36.5% of the children under sixteen years of age had clinical signs of xerophthalmia (26).

It is well recognised that vitamin A deficiency is a public health problem in Ethiopia. Therefore, Ethiopia supports and has adopted policies supporting regular vitamin A supplementation of children (27). This policy calls for children aged 6-12 months and over to receive 2 doses of vitamin A, once every four to six months. In Ethiopia now, vitamin A supplementation has been integrated into ongoing routine child immunisation programmes. It has been reported on the third report of the world nutrition situation, in December 1997, that the prevalence of clinical signs of VAD calculated from multiple surveys had decreased by -32.3% within ten years. The trend is that it has decreased by -0.32 percentage points within these ten years. This may be attributable in part to the supplementation programme. Even though the prevalence has shown a decreasing trend it can not be satisfactory. A recent impact evaluation study conducted in Tigray and Harari administrative regions in Woreda Integrated

Basic Service (WIBS) and EPI-plus woredas revealed that the post intervention prevalence rate is still higher than the WHO cut off point (28).

Although the Global and National target focuses on interventions for children 6-59 months, recent studies indicate that a substantial number of school age children (11.4%) are also suffering from vitamin A deficiency (29). Therefore, the supplementation programme should encompass those school children with identified problems of early signs of xerophthalmia. The other option is educating the students on consumption of vitamin A rich foods through different educational media.

Iron Deficiency Anaemia

Iron Deficiency Anaemia (IDA) is the most common nutritional deficiency in many developing countries. It is a major public health problem with adverse consequences especially for women of reproductive age and for young children. IDA in infants and children is associated with impaired physical and cognitive development. In adults, IDA is associated with weakness and fatigue, which reduce capacity for physical work and productivity. In pregnant women, it contributes to maternal morbidity, mortality and low birth-weight.

Iron deficiency occurs when an insufficient amount of iron is absorbed from the diet to meet the body's requirements. This may result from inadequate iron intake, reduced bioavailability of dietary iron, increased need for iron (e.g. during growth or pregnancy) or chronic blood loss. In Sub-Saharan Africa bioavailability of dietary iron was the most important determinant of anaemia. Intestinal parasites, helminths, especially hookworm infections cause intestinal blood loss and are one of the major causes of iron deficiency anaemia. Other causes include malaria and congenital haemolytic diseases such as thalassaemia.

WHO had set epidemiological criteria of haemoglobin levels indicative of anaemia, to define severe iron deficiency anaemia (>40%) as severe, (10-39%) as moderate and (<10%) as mild within populations (38).

In Ethiopia, there is a lack of information on the nation wide magnitude and distribution of anaemia. The aetiology of anaemia in Ethiopia is not well established, even though, it was reported to be one of the top ten diseases in most of the health Institutions. Few studies done in the area of IDA are limited in their capacity to be representative of the whole country and resulted in different conclusions. Earlier studies done have shown that iron deficiency anaemia is not a major problem in Ethiopia (39,40) some had attributed the situation to consumption of "teff" a cereal, which has a high iron content mainly due to contamination with the soil. Study of 14,740 school children by Zewdie and colleagues, which assessed Serum Haemoglobin (HB) and Hematocrit (HCT) values in 996 children found the prevalence of clinical anaemia to be 18.6%. This study concluded that the anaemia found was not nutritional in origin but resulted due to parasitic infestations and malaria (41). In a study done in northwestern Ethiopia by Zein Ahmed Zein, the prevalence rate of anaemia was 40.5%. In this study the higher infection rate was given as a possible explanation for the high prevalence of IDA (42). Haematological investigation carried out in Addis Ababa on pre-school children and school age showed a prevalence of 5 and 8% respectively (42). No between sex differences were observed as prevalence of IDA in these children were 7 and 8% in males and females respectively. Clinical anaemia was found to affect 15% of the mothers and 3-5% of children under five in the study conducted on mother child pairs in Oromiya region (24).

In Ethiopia animal sources are low, i.e. the staple diet for adults and children is usually prepared from cereals and tubers supplemented with legumes, however, while the iron content of such staples is generally high, it has low bioavailability. (43). The low bioavailability of iron from diets of vegetable origin is due to the presence of inhibitors of iron absorption, which irreversibly bind iron in the intestinal lumen (44). The Ethiopian diet remains mainly based on cereals, which provides about 70% of energy intake (43). The existence and severity of nutritional anaemia need to be confirmed by conducting a survey controlling for all confounding variables, such as infection. **Iodine deficiency**

Iodine is an essential element that is a constituent of the thyroid hormones thyroxin (T_4) and triiodothyronine (T_3). These hormones are essential for normal growth and physical and mental development in animals and man. The most familiar iodine deficiency disorder (IDD) is goitre. However, its effects go beyond goitre to all the effects of iodine deficiency on growth and development. The consequences of IDD are many such as abortions, stillbirths, congenital anomalies, deaf mutism, psychomotor defects, impaired mental function, retarded physical development and goitre with its complications. Iodine Deficiency Disorders (IDD), the world's greatest single cause of preventable brain damage and mental retardation, are estimated to affect 30% of the world's population.

Studies have demonstrated that goitre is one of the nutritional problems of public health significance in Ethiopia (45-56). Subsequently one out of every 1,000 people is a cretin, and about 50,000 prenatal deaths are occurring annually due to iodine deficiency disorders. 26% of the total population have goitre and 62% of the population are at risk of IDD (46).

A number of previous studies on goitre have indicated that the disease prevails in many parts of the country in an endemic scale (Table 3). A stratified goitre survey conducted in Ethiopia (with the exception of Eritrea and Tigray) on 36,635 school children and 19,128 household members revealed that the prevalence was 30.6% and 18.7% respectively. It was also found that the prevalence is higher in high altitudes for both school children and household members (47).

A baseline survey of goiter prevalence conducted among five endemic regions (Shoa-Majetie; GamuGofa-Sawla; Shoa-Gohatsion; Bale-Adaba; Gojam-Bure) and four non-endemic regions (Harergie-Alemaya; Shoa-Mojo; Sidamo-Yabello; Arsi-Hurruta) from 1988 to 1991 revealed that both the endemic and non-endemic regions were found to have a higher goiter prevalence rate than previously reported. In this study it was found that the non-endemic sites were also found to be endemic due to exposure over time. A mean goiter prevalence rate of 21.80 ± 5.4 was found for both the endemic and non-endemic sites (48).

Another study conducted in three villages of GamuGofa, Southern Ethiopia, reported that the total goiter rate (TGR) in the study sites was 62% while visible goiter rate was 25%(49). In an intervention study conducted in Awassa, South Ethiopia to determine the response of the thyroid on introduction of varying doses of oral iodised oil 42% goiter reduction was observed after 13 months. Before the intervention TGR was 64.9% and 69.8% in 200mg and 400mg dose groups, respectively. Visible goiter rate reported were 28.1% and 28.3% for the same dose groups respectively (50). A recent study conducted in ten villages from four administrative regions (Shoa, Jimma, Arsi and Gamu-Gofa) indicates that the gross prevalence rate among school children was 53.3%. This prevalence rate was regarded as severe according to the classification of WHO/UNICEF/ICCIDD (51). The prevalence rate was higher in females (56.1%) than in males (50.1%)(52).

Zinc deficiency

Zinc is an essential constituent of metalloenzymes and plays a role in stabilising the structure of organic components and membranes. Zinc is involved in nucleic acid synthesis, carbohydrate metabolism, oxygen transport and protection against free radical damage. Zinc has an important role in the structure and function of membrane (56). Zinc is also essential for the immune defence system.

Severe zinc deficiency in man has been observed in inborn error of zinc metabolism, acrodermatitis entropathia (57) in-patients with Cohen's disease. Zinc deficiency is also implicated as the cause of dermatitis, diarrhoea, alopecia and neuropsychiatric manifestations. Failure to thrive, growth retardation, immune defects and delayed sexual maturation are also regarded as clinical manifestations of zinc deficiency.

It is now believed that zinc deficiency plays a major role in stunting. The prevalence of zinc deficiency is unknown, but mild and moderate forms are likely to be wide spread. A recent study conducted by Umeta et al., 2000, showed the presence of zinc deficiency in Ethiopia. In their intervention study, it was found that combating zinc deficiency can increase the growth rate of stunted children to that of non-stunted children in rural Ethiopia and calls for the need for zinc supplementation (58). Besides halting the stunting process in infant's, zinc supplementation would be essential for catch up growth, improving general health status, stimulating appetite and reducing morbidity due to several infantile diseases.

Dietary sources of zinc are protein rich foods including meat, fish and shellfish and whole grains. Root and tuber crops are low in their zinc content, while zinc in cereal staples is most often poorly bioavailable. Where diets are plant based and intakes of animal foods are low, the risk of inadequate intake of zinc is very high even when energy and protein intakes meet recommended levels (43). In these circumstances bioavailability rather than amount is the critical factor. In light of this fact, in most of the rural areas of Ethiopia consumption of animal sources is mostly limited to occasional public

Discussion

holidays, which indicated minimal intake. Thus one can expect a high prevalence of Zinc Deficiency in Ethiopia. It might also be the reason for the observed high prevalence of stunting in this country.

Breast-feeding and supplementation

Breast-feeding is an important component of the Ethiopian tradition and culture. Many previous studies conducted in Ethiopia have shown that breast-feeding is a common practice (59-60). In an earlier study conducted in 1976-1977 in collaboration with the WHO, it was found that 100% of the rural mothers were breast-feeding. In this study, it was found that 41.1%, 85.5% and 99% of the urban elite, urban poor and rural mothers respectively breast-fed their children until the end of the first year. In a nationwide rural nutrition survey in 1992, it was found that about 90% of the mothers were breast-feeding their children up to 2 years of age (5). The picture is more or less the same in the 1998 survey, which includes both rural and urban centres (6). The proportion of children who were being breastfed was higher in the Amhara region (95%), whereas lower rate was observed in Addis Ababa (70%).

In 1992 it was also reported that a very large proportion of infants are being exclusively breast fed far beyond the recommended age of six months, making it virtually impossible to meet their energy and protein requirements. The median age of introduction of complementary foods was 7.1 months. Recent studies done have shown an increasing trend in bottle feeding rising from 14 percent among children under four months of age to 20 percent among children 4-5 months (9). These findings have important implications for the health and growth of the infant and young children.

The optimal age of introduction of complementary food to breast-fed infants is a topic of considerable debate. For several decades, the WHO recommended that infants be given other foods beginning at 4-6 months. However, recently, WHO stated that infants should receive complementary foods starting from six months onwards because of the increased risk of morbidity due to introduction of complementary feeding between 4-6 months especially in developing countries (61). In developing countries early introduction of complementary foods is associated with an increased risk of diarrhoea due to poor sanitary conditions and lower quality of supplements.

Supplementary food offered to children are often cereal-based and are mainly deficient in protein and the bioavailability of minerals such as iron and zinc is low. These foods are bulky in nature and have a lower nutrient density. Therefore, they wouldn't fulfil nutritional requirement of the young child. In order to increase the nutrient density of such foods, frequency of feeding should be increased, but this has proved difficult as it causes digestion problems and the infant also can not tolerate the amount. Besides this, consumption of micronutrient rich foods is also very minimal. It has been demonstrated that feeding low quality diet with a lesser frequency (less than four times a day) is one of the risk factors contributing to malnutrition in urban slums of Addis Ababa (62). No study has attempted to quantify the adequacy of supplementary foods offered to children in Ethiopia. Therefore, more in-depth studies on the type and adequacy of supplementary foods in Ethiopia need to be conducted.

When discussing factors contributing for the high rate of malnutrition in Ethiopia it is appropriate to view them in terms of the conceptual framework of malnutrition developed by the UNICEF. The immediate causes of malnutrition are inadequate dietary intake and disease. An intake of 2100Kcal/person/day, has been recommended by the Ethiopian Medical Association as a minimum average calorie requirement per day for an average individual (ONCCP, 1987). However, the Disaster Preparedness and Prevention Commission allocates an intake of 1700 Calories/person/day (63). Compared to the average dietary energy intake set by the WHO; i.e. 2550Kcal. /p/d for males and a recommended intake of 1940Kcal/person/d for females, it is obvious that this intake level is inadequate for a person involved in strenuous activity (56). The food self-sufficiency ratio, as measured by the extent of food demand met by domestic production, has declined following the decreasing trend in food production in the early 1990's(63). Besides this, the dietary intake of young children is given less attention in our community in general. In the rural areas children are usually exclusively breast-fed far beyond the recommended age of six months and introduction of complementary foods is delayed (5). The duration of exclusive breast-feeding in some areas such as Tigray and North Gonder is as long as 12.1 months. This could also be one of the reasons for the observed high rate of stunting (59%) in the age group 6-11 months.

In addition to this, the high prevalence of acute upper respiratory infections and diarrhoea are responsible for the high rates of morbidity among under five children. These are at the upper strata of the top ten childhood diseases in Ethiopia (10). Inadequate access to health service facilities is one of the underlying causes of the high prevalence of diseases and morbidity. In Ethiopia, it has been estimated that only 33.3% of the population have access to safe drinking water and 16.9% have access to adequate sanitation. Immunisation rates for all the six antigens is far below the target levels (22.3%)(64). Illiteracy is also high, especially in rural areas.

The problems of malnutrition are the outcomes of the interaction of various underlying causes such as inadequate agricultural production, inadequate care and inadequate social services in areas of health education, water and sanitation. In 1998, total area cultivated, total production, and average yield per hectare have decreased by 15.15%, 23.67% and 10.05%, respectively, compared to the last cropping season, i.e. 1996/97. Compared with the rate of population growth 2.7%(64) and occurrence of recurrent drought, it is quite clear that this has little contributed in ensuring household food security. A number of studies confirmed that there is a severe food insecurity problem in Ethiopia. Over 40 percent of the estimated food-insecure people in Sub-Saharan Africa are found in Ethiopia, Nigeria and Zaire. In 1992 it was estimated that about 27 million people in Ethiopia were food insecure (65).

Care of the child by the mother and other members of the family are highly compromised by the fact that Ethiopian mothers have a relatively heavy workload. In the rural areas they work along with the men in the fields as well as take care of in-house activities. Therefore, they will have so little time left to provide adequate care for their children. Often infants and young children are looked after by older children who themselves need to be cared for. Inadequate dietary intake by the mother and prevalence of infections coupled with lack of pre-natal care during pregnancy contributes to the delivery of a low birth weight infant. This in turn, results in a malnourished child and hence, a stunted adult and forms a sort of a vicious circle of the problem.

Limited social services and inadequate infrastructure in the areas of health and education have contributed to lack of awareness about the causes of diseases and intake of balanced diet. Hence, a high prevalence of malnutrition. Inappropriate prioritisation of nutrition issues, low level of development of

the socio-economic structure, harmful cultural beliefs and practices and inadequate and inappropriate use of potential resources are the basic causes of the problem. Therefore, the problem of PEM is intertwined into array of causes and needs efforts and attention of various sectors to be eliminated.

Concerning the problem of vitamin A deficiency, supplementation of vitamin A to children is a short term strategy and can not be sustainable, therefore, there is a need to design and undertake a long term strategy to ensure total elimination of vitamin A deficiency from this country. Food-based approaches to increase quantity and quality of micronutrients in diets, particularly to improve vitamin A intake, which include strategies other than supplementation, such as horticultural promotion and fortification of processed foods have not yet be given due attention in Ethiopia. Nutrition education and communication is also believed to be one of the strategies supposed to bring about a sustainable means of eliminating micronutrient deficiencies, was also not addressed effectively so far. At present, NGOs are also making an effort to combat this problem but their efforts need to be integrated into the existing Government infrastructure as their coverage might be limited and their efforts need to be supported. Although supplementation is a means to immediately address the problem, it can not be sustainable. Other strategies that will result in a sustainable elimination of VAD and deficiency of other micronutrient malnutrition such as dietary diversification, food fortification and promotion of nutrition education and communication need to be addressed simultaneously in order to achieve set goals.

With regards to food fortification, the basic question is which foods to fortify in the Ethiopian context needs to be assessed. In Ethiopia there are different ethnic groups, which have different staple diets, and there is no one type of food that is consumed all over the country. In other countries processed foods offer to be the best vehicles for fortification. Therefore, a thorough study needs to be conducted on identifying the most common food consumed by the large proportion of the population before deciding on one specific food. Other means of addressing the problem by fortifying locally processed weaning foods at village level could also provide a good option. For this purpose capacity building of small-scale producers and community associations need to be strengthened.

The food diversification issue needs to be addressed by all concerned organisations such as the Ministry of Agriculture (MOA), Ministry of Health (MOH) and Ministry of Education (MOE) and others. Introduction and promotion of vegetable gardens among communities need to be encouraged and should be accompanied with Information, Education and Communication components (IEC).

Besides these, the promotion and protection of breastfeeding is a fundamental aspect of preventing vitamin A deficiency. Breast milk is virtually the only source of vitamin A in the first few months for many infants and often continues to be one of the most important sources through age two. Although vitamin A concentrations in human milk are dependent on the mother's vitamin A status, vitamin A deficiency is rare among breastfed infants, even in parts of the world where vitamin A deficiency is endemic. Promotion of exclusive breastfeeding for 4-6 months and continued breastfeeding with complementary foods thereafter should form part of any dietary intervention to improve vitamin A status. Efforts need to be made to stop the declining breast-feeding situation observed in some Urban centres in Ethiopia (66).

The Global goal of vitamin A control was to virtually eliminate VAD by the year 2000. This has proved difficult due to various problems and the goal is now set or postponed to the year 2005. It is true that some effort has been made towards the elimination of Vitamin A deficiency in Ethiopia, but there

remains a lot to be done to achieve the desired goal. To this effect a concerted effort from all concerned Government and Non- Government Institutions is needed.

Several strategies are implicated in controlling IDA, such as supplementation for vulnerable groups, dietary modification and control of parasitic diseases. Effective supplementation programmes require long term commitment. However, the effectiveness is constrained by gastrointestinal side effects of oral iron intake and difficulty of sustaining motivation. Effectiveness of fortification depends on a bioavailable iron source compatible with suitable food vehicles, that conforms with the existing regulations and a suitable vehicle (food) to fortify. In dietary diversification issues like increasing the intake of haem iron (from animals), increasing the intake of vitamin C to promote iron absorption and reducing the intake of iron absorption inhibitors (Coffee, tea, some cereals) need to be considered. Control of hookworm and malaria are also significant strategies to reduce iron deficiency anaemia.

With regards to IDD, efforts were made by the former Ethiopian Nutrition Institute (ENI) and the Ministry of Industry in establishing salt iodination plants at Assab and Mitswa, in order to iodise all incoming salt in 1995. It was running effectively until the border dispute between Eritrea and Ethiopia. At present efforts are being made by the Ministry of Health to put in place mechanisms of control of importation of iodised salt and iodination of inland salt found in Afdera, Afder and Abiata found in Afar, Somali and Oromia regions respectively. Recently, UNICEF has assisted with the assessment of the Ethiopian salt Industry and three potential areas have been identified, north in the area of Mekele, Northeast at Lake Afdera and at Lake Dobi. For Mekele, a factory for the process of crushing, sieving, iodising and packaging of rock salt is being built (67).

Besides this, National and Regional micronutrient committees have been established to coordinate and follow-up the national programme. A national baseline survey on utilisation of iodised salt by the community was made. In this survey only 0.2% of the households were consuming iodised salt. To create awareness and involve concerned sectors in the forthcoming interventions, various seminars were held for responsible experts from all regional health bureaus and trainings were given to laboratory technicians (68). There is still a need to continue to strengthen control of importation of noniodised salt and build capacity to iodise inland salt.

Eventhough efforts had been made to eliminate IDD; they have been hampered by the conflict between Eritrea and Ethiopia. The distribution of iodised salt especially to the targeted high endemic areas was discontinued. Therefore, the prevalence of goitre found in recent studies was found to be higher than previously reported. This shows that there is an immediate need to undertake a sustainable solution to the problem. Iodination of inland salt started by private investors at Afdera is one step forward towards solving the problem and needs to be encouraged.

Prevalence of zinc deficiency in Ethiopia is not yet well established. Recently an intervention study on the effects of zinc supplementation on leaner growth had indicated that the problem exists. From the results of the pocket study conducted, it is obvious that there is a need to assess the prevalence of zinc in Ethiopia and take appropriate interventions to overcome the problem. Strategies to address iron deficiency by increasing intake of animal foods or decreasing the content of potatoes through fermentation will also improve zinc nutrition in deficient populations (43).

Conclusion

No one solution, by itself will be effective in eliminating PEM and other micronutrient deficiencies or malnutrition in general. A collective set of policies and related programme activities will be needed. Any comprehensive strategy for attacking the problem of child malnutrition must include actions to address both its basic and underlying causes. If national income is not improved the resources necessary for investing in health environments, women's education and status and food availability will not be available. Actions taken at both levels will ensure successful achievements of more direct nutrition interventions like breast-feeding, nutrition communications, food fortification and micronutrient supplementation

Death of children from malnutrition is technically preventable and it is not tolerable that concerted efforts by all concerned should be made to prevent it. Investments in health and education (particularly of women) can help to improve nutrition if investments reach the malnourished, are of good quality and are well distributed. Policies encouraging community-based programmes accelerate improvements.

Rapid reduction in malnutrition is possible, and is urgently needed; rapid reduction of malnutrition requires focused and systematic action in the areas of health, food security, child and maternal care. Access to education, healthcare and safe water, protection from illness and adequate micronutrient intake are key elements, together with some systems for community follow-up and support of the severely and moderately malnourished children. The main reason given for the deteriorating trends in Sub-Sahara Africa, which includes Ethiopia is "failure to develop"(7). Compounding, contributory factor is the rapid population growth at a faster rate (at nearly 4% per year). In the coming ten years the population of Ethiopia is expected to grow to around 83.5 million. Such uncontrolled population growth drastically undermines their social, physiological, mental and intellectual growth and development. It also provides fertile ground for the recruitment of the socially marginalised child with all that it implies. On these underlying problems are superimposed repeated and persistent droughts.

The highest prevalence of malnutrition in Ethiopia is an immediate national concern that will affect future generations if not addressed now. Several ministries, institutions and organisations in Ethiopia independently work either directly or indirectly with nutrition issues. Despite all the efforts being made to overcome the problem, malnutrition is on the increase. The multifaceted nature of the causes of malnutrition can effectively be alleviated by a multisectoral policy that harmonises the activities of those sectors involved in nutrition work. Development of food and nutrition policy in Ethiopia will be an important tool for bringing this harmony, both conceptually and practically with the ultimate goal of eliminating malnutrition in the country.

Recommendations

Ethiopia is one of the countries, known for its history of famine and drought, in which case, nutrition is always identified with the food sector. Due to this, efforts made to overcome the problem of malnutrition in this country mainly focus on food related objectives (Self-sufficiency, increased production, more efficient distribution, or food security at national, regional and household level). The fact that the surplus producing regions of the country had the highest levels of stunting than the food deficit areas, implies that there is more to be done other than ensuring household food security. The authors recommend that focus should also be made in the following areas: -

- Political action to eliminate poverty and deprivation to reduce inequalities within a country,

- Executing targeted policies in Agriculture, health, and Infrastructure development should be given due consideration,
- Promoting PHC as one of the strategies of ensuring proper nutrition,
- Recognising the special role of women and the necessity of community participation in decision making as well as actual activities,
- There should be access to resources by the malnourished,
- Promotion of the education and status women in the community. Mothers level of education was a dominant factor in whether or not a child becomes malnourished,
- Improvement of water supply and sanitation. Many studies had documented the impact of improving water supply and disposal of excreta on reducing diarrhoeal morbidity.
- Development and implementation of food and nutrition policy in the country.

Tables

Table 1: Percentage change in prevalence of PEM from 1983-1992 by region.

Regions	Under weight 1983	Under weight 1992	Percentage Change	Stunting 1983	Stunting 1992	Percentage Change	Wasting 1983	Wasting 1992	Percentage Change
All regions	37.3	46.9	+9.6	59.8	64	+4.2	8.1	7.7	-0.4
Arsi	25.5	41.1	+15.6	56.7	62.7	+6	3.5	4.6	+1.1
Bale	23.0	29.2	+6.2	50.7	55	+4.3	4.5	4.4	-0.1
Gomogoffa	35.6	43.5	+7.9	66.3	55	-11.3	5.8	6.5	+0.7
Gojam	47.2	53.2	+6	64.7	70.7	+6	8.4	10.1	+1.7
Gondar	50.5	57.8	+7.3	74.1	70.8	-3.3	7.3	8.9	+1.6
Illubabour	36.5	49.6	+13.1	51.3	61.6	+10.3	11.3	10.2	-1.1
Keffa	40.0	48	+8	60.8	66.6	+5.8	8.1	7.2	-0.9
Shewa	33.8	39.3	+5.5	59.8	61.7	+1.9	7.6	5.6	-2.0
Sidamo	35.8	52.8	+17	62.1	64.9	+2.8	5.9	9.9	+4.0
Wello	43.5	51.6	+8.1	52.6	59.2	+6.6	10.7	10.8	+0.1
Wellela	45.3	48.9	+3.6	67.5	64	-3.5	10.1	6.2	-3.9

Source: CSA, National Rural Nutrition Survey; core module 1983 & 1992.

Table 2: Reported prevalence of vitamin A deficiency by various studies in Ethiopia.

Authors	Survey reported		Group studied	Age	Total	Level of Xerophthalmia year No.					
						NB	XIB	CX	CS	KM	
						XN	X2	X3A	X3B		
Postmus			1957/58 Pre-school and school age children		7,000				2.2-9%		
Bernt Lindtjorn	1981	Out-patients	55		5.4%	0.2%	0.2%				
		Zewdie W/G et al.,	1980/81 Pre-school children		6m-6y	1.0%		1	2	case cases	
Teshome Demeke et al.,			out-patients at Ethio-Swedish P.C & Menilik II hospital	under 18y	1982	188,737	6.3%		19.3%		
	1991	All children		NS		Zewdie W/G et al.,			240	69%	16%
Zewdie W/G et al.,	1991	School children	NS	14,740				0.91%			
		Yonas Taffes et al.,	1993 pre-school children		678	7.8%	3.4%				
		Tsegaye Demisse	1996 pre-school children		6m-7y	4123		1.2%	0.2%		
Jemal Haidar et al.,	1996	Pre-school children	6m-6y	5,253	0.9%	1.5%	0.4%	0.4%			

WV - Ethiopia 1997 pre-school children NS 1246 4.0% 6.4% 3.5% 4%

WV - Ethiopia 1977 school age children NS 3003 11.4% 7.5% 1.7% 0.4%

NB: The WHO cut-off: Night blindness - 1% Biot't spot - 0.5% Corneal xerosis - .01% Corneal Scaring - .05%

Table 3: Prevalence of Iodine deficiency reported by various studies in Ethiopia

Author	Year	Study area	No. examined	Prevalence rate	
ICNND	1959	11 areas	-	4.3%	
US.AID	1965	Tigris province	Wollo 314	20% M, 42%F	Popov 1967
					Wollo 22,793
Yngve Hofvander	1970				7.5%(Grade 3)
					10-28% (Grade 1)
Addis Ababa, Ijaji & Bako		353		8.5% AA	
		613		26.9% Ijaji	Zewdie
		149		53% Backo	W/Gebreil
					1980/81
Representative of the whole country		36,635 School children & 19,158 households		30.6% school children, 18.7% households	
Hana N/Tibeb		Sidamo, Shoa, Gojam, Arsi, Gamo-Goffa			1.93%-58.89% in Uban and 1.16%-73.55% in Rural
12,703 households			1987-1988		
		and Harage Regions			
	1994-1995				
Cherinet Abuye and Kelbessa Urga	1988-1991	Shoa, Bale, Gojam, Gamu-Gofa, Arsi, Sidamo and Harerghie	327 - from endemic regions, 276 - from nonendemic regions		21.80±5.40 (mean for both groups)
		Gamu Gofa	1162 households		
	1994-1996				

Cherinet Abuye, et al.		Awassa, 110 children		TGR - 62%
Cherinet Abuye and Kelbessa Urga	1993- 1994	Shoa, Jimma, Arsi and Gamu-Gofa	2,485 elementary school children	visible goiter - 25%
				64.9% and 69.8%
				128.1% and 28.3%
				Cherinet Abuye, et al.
				TGR - 53.3%

Figures

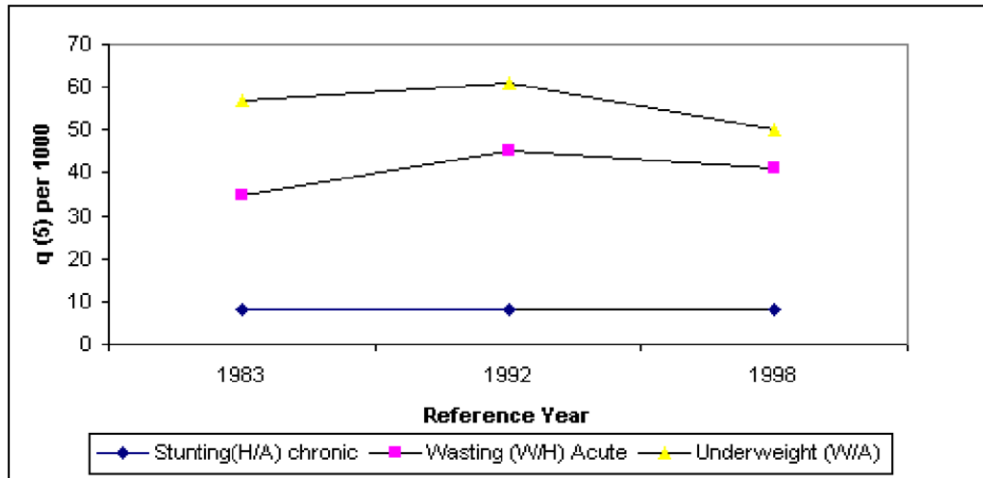


Figure 1: Percentage prevalence of PEM in children under-five years of age (0-59 months) in Ethiopia (1983-1998) using a cut-off level of -2SD.

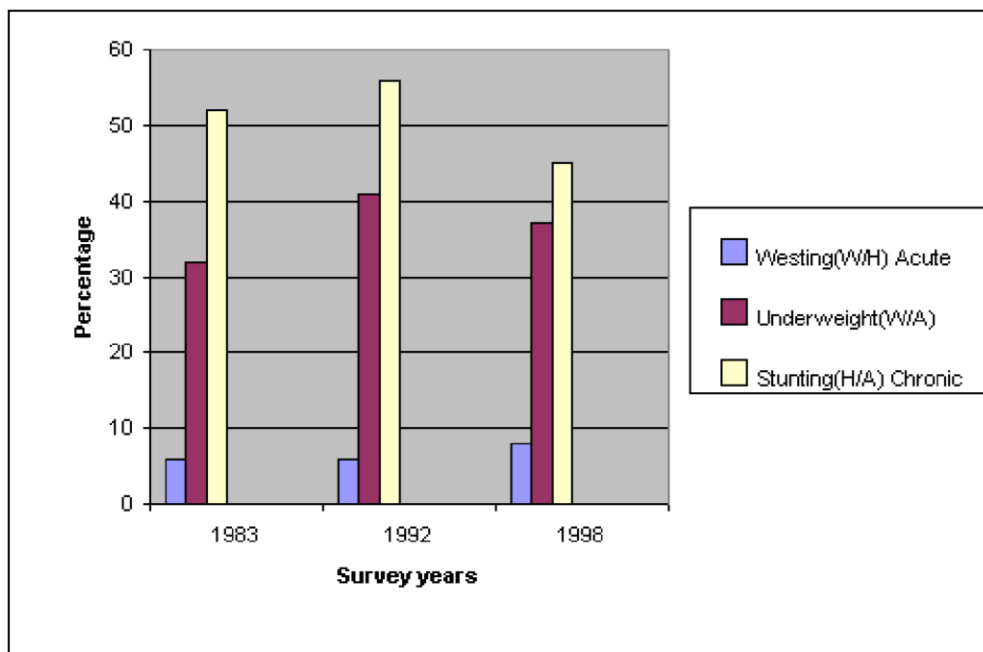


Figure 2: Trends in prevalence of malnutrition (1983-1998)

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