VITAMIN A DEFICIENCY AND ITS DIETARY ASSOCIATIONS: THE CASE OF PRE-SCHOOL CHILDREN IN ARSSI REGION, ETHIOPIA.

A thesis submitted in partial fulfilment of the requirements for the degree of master of science in Applied Human Nutrition.

BY

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

To my parents for their invaluable encouragement

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Definitions

Xerophthalmia: The general term applied to all the ocular manifestations of impaired vitamin A metabolism, from night blindness through complete corneal destruction.

Ophthalmology: The branch of medical science which deals with the diseases and refractive errors of the eye.

Night blindness: Inability to see properly in the dark or in dim light due to early stage of vitamin A deficiency

Conjunctival xerosis: The earliest structural change in xerophthalmia with one or more patches of dry, non wettable conjunctiva.

Corneal xerosis: Xerosis of the cornea resulted from vitamin A deficiency. The corneal surface has a rough, fine "pebby" appearance and lacks lustre. At the later stage the cornea may become hazy with a bluish,, milky appearance present in the lower central part.

Corneal ulcer: Ulceration of the cornea due to hypovitaminosis A. It involves the partial or whole loss of substance of the corneal thickness, with only mild signs of inflammation or of a reaction.

Corneal scar: Headed sequelae of prior corneal disease related to vitamin A deficiency includes capacities or scars of varying density weakening and outpouching of the remaining corneal layer.

Colostrum: First formed breast milk. It provides sufficient food energy, protein, fat, vitamins and minerals for the needs of the infant. It has antimicrobial action that protects against infection.

Bitot's spots: A white foamy like substance appeared on the eyes due to vitamin A deficiency.

Keratomalacia: A Greek word meaning weakening of the cornea. It may lead to complete blindness of the eye.

Teff : (Eragrosis abyssinica) A tiny grain related to millet from which the staple food in Ethiopia, 'Injera' is made which is indigenous to Ethiopia.

Household: All the people who live together and operate as a unit, including such members as unrelated

servants, lodgers etc.

Household size: The total number of people living in a household during the study period.

Family: A group of people who live together under one roof and who are related by blood, adoption or marriage.

Dependency ratio: The proportion of dependents who are below fifteen and above sixty five years of age in the study households.

Villagization: A government policy designed to bring farmers together in villages who had been settled in scattered houses.

Vitamin A: (Retinol) A fat soluble vitamin found in liver, particularly fish liver, poultry, meat and dairy products, which is essential for the healthy eyes and skin.

ß-carotene: A red carotenoid pigment found in plants. Can be converted to retinol (vitamin A) in the body.

Abbreviation

ENI .... Ethiopian Nutrition Institute.

IVACG .... International Vitamin A Consultative Group.

CSA .... Central Statistical Authority.

IDRC .... International Development Research Centre of Canada.

FAO .... Food and Agricultural Organization.

WHO .... World Health Organization.

USAID .... Agency for International Development of the United States of America.

ACC/SCN ....Administrative Committee on Coordination - Sub Committee on Nutrition.

IFNP .... Integrated Food and Nutrition Programme.

ANP .... Applied Nutrition Programme.

GTZ .... German Technical Cooperation.

PEM .... Protein Energy Malnutrition.

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Abstract

Vitamin A deficiency and xerophthalmia is a well identified public health problem among pre-school children in the southern part of rural Ethiopia, Arssi region. This has been associated with the low frequency of consumption of vitamin A rich foods and a variety of interfering food habits and beliefs.

A cross sectional study was carried out in two rural villages of Arssi region in Southern Ethiopia in the period between January - March 1993. The objective of this study was to determine the severity of vitamin A deficiency and its dietary associations among pre-school children. For the purpose of this study, two clusters of villages in a rural setting were randomly selected. The total number of households included in the study was 130, of which 54 households were from village Hate tulu and 66 households from village Andode. A total of 229 children under five years of age were examined and clinical diagnosis conducted. A questionnaire on food frequency, breastfeeding and weaning and food habits and beliefs was administered in all the households.

Out of 229 children examined, 33 had at least one recognizable sign of vitamin A deficiency giving an overall vitamin A deficiency and xerophthalmia prevalence 14.4 percent.

The prevalence of night blindness and Bitot's spots was reported to be 11.4% and 0.9% respectively. Corneal xerosis, corneal ulceration and corneal scars were reported to be 0.9%, 0.43% and 0.43% respectively. These figures are above WHO's criteria which shows evidence for a public health problem. Most of these cases were in the age group of 48-60 months. More boys 61% were affected as compared to girls 39%.

The number of households that consumed locally available vitamin A rich foods at least 3 times a week is below 75% which, according to IVACG's criteria, suggests inadequate intake. This low frequency of consumption of vitamin A rich foods was also significantly associated ($p<0.0001$) with the occurrence of xerophthalmia.

A shorter period of breastfeeding was highly associated ($p<0.01$) with the deficiency state in the children. The weaning period and type of weaning food given contributes to vitamin A intake. However, most of the younger children in the study area, were not encouraged to eat dark green leafy vegetables nor animal products. Furthermore, the majority of the mothers weaned their children late. The data suggests that the age when foods were introduced has a significant association ($p<0.0001$) with xerophthalmia.

The overall results of this investigation suggest that signs and symptoms of vitamin A deficiency among the preschool children in the study area could be explained by their dietary intake. It is recommended that to combat the blinding effects of xerophthalmia in the area, measures such as grassroot level nutrition education supported by demonstrations and the strengthening of the district health care system should be among the strategies adopted.

of major dietary deficiencies, specially, in infants and children (Gebre-Medhin et al, 1975). For example, in spite of the high potential to produce a wide variety of fruits and vegetables containing ß-carotene, these foods are not commonly consumed. Vitamin A deficiency, is therefore one of the major nutritional problems in Ethiopia, as it is in the many parts of third world countries (Wolde-Gebriel et al, 1991).

1.2 Justification of research problem

Sommer (1982), pointed out that today, blinding xerophthalmia due to vitamin A deficiency, is believed to be largely limited to developing countries, especially those in Africa, Asia and the western Pacific. It is highly prevalent among the young children in these countries. Recent data, indicates that at least 5 million children in Asia develop xerophthalmia every year, 250,000 of whom go blind.

At the second session of the United Nations Committee on Food Aid policies and programs held in Rome, November 1976, WHO presented a tentative list of 74 countries and territories where vitamin A deficiency is considered to be a public health problem, and Ethiopia was one of these countries (Bauernfeind, 1980; IVACG, 1978).

Furthermore, in a dietary survey undertaken in 1971, less than forty per cent of the children in Sidamo regions

(southern Ethiopia), and all of those examined in Tigrai and Gondar regions (Northern Ethiopia), had an intake of less than forty percent of the vitamin A requirement. Dietary adequacy with respect to vitamin A during the hungry-harvest seasons among children over three years of age and adults in Arssi (Southern Ethiopia) was found to be below 80 percent (Hofvander and Eksmyr, 1971; Selinus et al, 1971).

As mentioned earlier, since Ethiopia is one of the countries where vitamin A deficiency is considered a public health problem, and as the results of some dietary studies in the country pointing out the inadequacy of vitamin A consumption, this study was proposed to find out wether there is an association between the prevalence of xerophthalmia and dietary intake.

1.3 Purpose of the study

Even though vitamin A dietary assessment has been carried out indirectly along with general nutritional surveys in some parts of Ethiopia, little is known about the problem, particularly in the rural settings. Based on the available information, and considering the extent of the problem, an in depth study was proposed to cover the ethnic groups of Southern Ethiopia. The main objective of the study was to investigate the dietary practices of pre-school children in relation to vitamin A deficiency.

1.4 Expected benefits from the study

The results of this investigation will enable health planners and policy makers at regional and national levels to improve the vitamin A status of the vulnerable groups and in general the health situation of the population.

1.5 Study objectives

1. To determine the interrelationships between local foods consumed using food composition tables, dietary habits and vitamin A deficiency.

Sub-objectives

1.1 To determine the nutritional quality of foods that are locally consumed with respect to vitamin A content.

1.2 To identify cultural beliefs and food habits that adversely affect vitamin A intake.

1.3 To examine the severity of vitamin A deficiency by determining the prevalence of the various stages of xerophthalmia namely.

a) Night blindness

b) Conjunctival xerosis

c) Bitot's spots

d) Corneal xerosis

e) Corneal ulceration, and

f) Corneal scars.

2. To determine the availability of vitamin A containing foods.

3. To determine the reasons for non consumption of vitamin A containing foods.

1.6 Study hypothesis

1. There is a relationship between consumption of vitamin A rich foods and the occurrence and severity of vitamin A deficiency.

2. Utilized natural sources of vitamin A exist in areas where vitamin A deficiency is highly prevalent.

CHAPTER TWO

LITERATURE REVIEW

Vitamin A deficiency is one of the most important public health problems prevailing in developing countries and is one of the major nutritional problems in Ethiopia. Despite the fact that Ethiopia has been referred to as the "bread basket" of Africa and in spite of its great potential in agriculture, due to a multitude of factors closely linked to the previous politico-economic and social systems, it has remained a subsistence producer. Natural calamities such as drought, flood and man-made disasters like war, have worsened the situation to make the country a net importer of grains (Ministry of Agriculture, 1985; ENI, 1985).

Vitamin A deficiency and its most serious manifestation, Keratomalacia, have probably occurred in badly fed communities throughout human history. The condition was well known to Hippocrates who described the use of liver in its treatment (Ebrahim, 1983). Throughout the nineteen century a number of papers on xerophthalmia were published from different parts of the world, including during the Irish potato famine in 1848 and during the First World War in Denmark which helped to

associate deficiency of vitamin A with xerophthalmia (Ebrahim, 1983).

Sommer (1982) noted that Vitamin A deficiency is a systemic disease affecting epithelial structures of human beings, the eye being the dramatic example. Keratinizing of the respiratory and intestinal epithelia is thought to be responsible for the pulmonary and gastrointestinal symptoms found in children who are severely affected. The clinical expression of xerophthalmia, which means "dry eye", results from gradual depletion of vitamin A stores. Its manifestation varies according to severity resulting in night blindness, conjunctival xerosis and Bitot's spots, corneal xerosis, corneal ulceration/keratomalacia, and corneal scars.

Mudambi and Rajagopal (1991) stated that the deficiency may result from dietary lack of vitamin A, the provitamin A, or poor absorption of the two. The deficiency results in growth failure and affects vision and the skin. The earliest symptom is impaired ability to see normally in dim light which is known as night blindness. The next symptom is usually dryness of the lining of eye lids and eye ball (conjunctiva). A later and more severe stage of deficiency is xerosis (dryness) of the cornea. The cornea becomes dry and loses its transparency (xerophthalmia). In the early stages, treatment with vitamin A will restore full vision.

It is children under the age of five years and females in the reproductive age groups who are at most nutritional disadvantage physiologically and culturally. Pregnant and lactating women require higher food intake as do children for their rapid growth and development. Yet in many communities, pregnant women are deprived of certain important nutrients due to taboos and beliefs. Similarly, children are also restricted in consuming certain foods. In addition children are considered as having no economic return and as a result given little importance.

In general, dietary inadequacy due to absolute poverty, lack of knowledge, infections, sociocultural factors and high population growth rates coupled with poor agricultural production are some of the principal underlying factors which contribute to the prevalence of vitamin A deficiency and indeed, malnutrition as a whole (Yemane, 1987; Martin et al, 1991).

2.1 Overview of Vitamin A metabolism

Vitamin A or retinol is a fat-soluble substance found in liver, particularly fish liver, and in poultry, meat and dairy products. Carotenes, which are potential precursors of plant origin, are present in green leafy vegetables, red palm oil, yellow fruits and others and can be converted to retinol in the wall of the gut (Wolde-Gebriel, 1992; Sommer, 1982).

However, carotenes are biologically less active than retinol, and their dietary sources are less efficiently processed and absorbed from the gut. One must therefore ingest up to six times as much pro-vitamin A ß-carotenes (by weight) as retinol for a similar effect.

Some 50-90% of ingested retinol is absorbed in the small intestine and transported, to the liver, where it is stored primarily as retinol palmitate. When needed it is released into the blood stream in combination with retinol-binding protein. The retinol is then removed from the serum and utilized by epithelial cells throughout the body. When intake remains low for prolonged periods of time the liver stores become depleted, serum retinol level drop, epithelial function is impaired, and xerophthalmia appears (Sommer, (1982).

" Xerophthalmia is the general term applied to all the ocular manifestations of impaired vitamin A metabolism, from night blindness through complete corneal destruction (keratomalacia). It is among the oldest recorded afflictions of mankind, having been recognized by both ancient Egyptians and the Greeks. As recently as the late nineteenth and early twentieth centuries numerous cases still occurred among malnourished individuals in such widely scattered parts of the globe as Brazil, China, England, Japan, Denmark and Russia" (Sommer, 1982).

Physiologically, vitamin A is required for synthesizing the pigment rhodopsin, also known as visual purple, in the retina of the eye. Rhodopsin is needed for proper excitation of rod photoreceptors which are responsible for vision under low levels of illumination. Impaired dark adaptation, or night blindness, occuras when vitamin A has been sufficiently depleted from rods to impair functions, and currently represents the earliest ocular manifestation of vitamin A deficiency (West and Sommer, 1993).

Vitamin A is required for the maintenance of epithelial tissue, that is, cells found in the outer layer of the skin as well as lining of gastrointestinal, respiratory and urogenital tracts. Vitamin A deficiency results in a transformation of epithelial cells from soft, moist tissue to cells which are hard (Brewster and Naito,1980; Alfin-Slater and Kritchevsky, 1980). This is why infections such as the gastroenteritis complex of disorders, urinary infections, respiratory infections including tuberculosis and pertussis, dysentery, giardiasis, ascaris, measles, diarrhoea are frequently associated with xerophthalmia because of vitamin A's physiological function of maintaining the integrity of the epithelium layers (Ebrahim, 1987; MacLaren et al, 1981).

The intake of vitamin A above that which an individual can metabolize, either in a single excessively high intake or very high intake for prolonged period, causes very high retinol

blood level resulting in nausea, headaches, irritability, and abnormal responses of the blood, skin, hair and bone. A rapid recovery usually results when excessive intakes are discontinued. Hypervitaminosis A, then, is the result of abuse of this essential nutrient (Bauernfeind, (1980).

2.2 Factors associated with vitamin A status

"Xerophthalmia results from an insufficient supply of vitamin A to the eye. The cause of such a deficiency can be quite complex, and depends upon the type and amount of vitamin and provitamin (primarily ß-carotene) ingested, the absorptive, transport, and storage capacities of the individual, and his metabolic needs" (Sommer, 1982). Sommer also explained that unrelated disease states can dramatically alter each of these factors and, in turn, the individual's vitamin A status. For example, gastroenteritis will change the types and amounts of food offered to a child and his appetite, while the shortened transit time will decrease absorption of whatever amount of vitamin A that is ingested. If he is already protein-deficient, transport and storage may be decreased and the fever will increase his metabolic needs. The cause and contribution of each of these factors may vary from one community to another, resulting in different epidemiological patterns in respect of age, sex, season, magnitude, and relative proportion of cases with and without corneal involvement. In general, however, xerophthalmia is

predominantly a disease of young children from depressed rural communities with peak prevalence in the third and fourth years of life.

It has been pointed out Ebrahim (1983), that in the search for a specific dietary cause of xerophthalmia, it is often forgotten that vitamin A deficiency is a social disease affecting the poorest sections of the community who are forced to live on a monotonous diet and suffer recurrent illnesses. Socio-economic development in many countries has resulted in a fall in the incidence of xerophthalmia and the condition is now rare in countries like Hongkong, Singapore and Taiwan, and the Middle East where it used to be common. Ebrahim also suggested that the primary cause of low body stores of vitamin A is dietary deficiency caused by a monotonous diet. Dietary surveys in several rural communities in South East Asia show that the average daily intake of vitamin A in children is 70 µg compared to the required 300 µg. Such low intakes condition a community to xerophthalmia, and acute deficiency of vitamin A then occurs amongst the section of the community who suffer a high prevalence of precipitating factors like infective illness, lack of personal hygiene and poor environmental conditions. Thus, even though the disease presents itself as an acute deficiency of vitamin A, this deficiency occurs on a background of a host of other factors.

Seasonal variations in prevalence rates have been reported from many countries (Ebrahim, 1983). These variations are not always explained by changes in intake. There is evidence that this may also be related to seasonal variations in growth or in the seasonal incidence of intercurrent illnesses. Sumati and Rajagopal (1991), identified that in most countries where xerophthalmia is endemic there is a summer peak in incidence rates following diarrhoeal illnesses and a winter peak coinciding with respiratory infections.

2.3 Vitamin A status in developing countries and Ethiopia.

With respect to vitamin A deficiency the world may be divided into three regions:

1. Technologically developed countries where there is no xerophthalmia problem but where some hypovitaminosis A may exist;
2. Some rice-dependent countries of Asia where hypovitaminosis A is a problem of public health significance;
3. the rest of the world including Africa, Latin America, and the Middle East where the problem is not extensive but is intermittently intensive and highly sensitive to changing social and economic conditions.

Various nutrition surveys in several islands of the

Philippines have shown low intakes of vitamin A, low serum vitamin A levels in children and adults, and some clinical evidence of xerophthalmia (WHO/USAID, 1976). The same publication pointed out that an investigation of 1715 children in 12 different locations in Cebu had shown that 17% had serum vitamin A levels below 10 µg/100 ml. Altogether, 67% of the children had wrinkling of the conjunctiva and many had some conjunctival thickening and xerosis conjunctivae, while a few had xerosis of cornea. A statistically significant relationship was found between low serum vitamin A levels and low intakes of both vitamin A and protein.

A national nutrition survey carried out on Ecuadorian children aged 0-59 months of age Wilma, (1991), showed a prevalence rate of 14 percent. When the population was divided into urban and rural residents, a higher prevalence was observed among rural children (16.4 percent vs 11.9 percent, respectively). WHO/USAID (1976) noted that reports from Sri Lanka suggest that keratomalacia is reappearing in the clinics and wards of the large centres of population after having virtually disappeared some time ago. Similarly, there is no evidence to indicate that the situation in India has improved generally. The economically poorer of the rice-eating states in Southern India are still the most severely affected by xerophthalmia.

Individual reports from Bangladesh refer to a massive problem of xerophthalmia, with a large number of keratomalacia cases reported from Dacca and other urban centres. Initial examination of 21300 children for a prevention programme showed 1% of night blindness, 31.89% of conjunctival xerosis, and 0.18% of corneal scars (WHO/USAID, 1976). In 1989, night blindness was found to be prevalent in 1.78% of Bangladesh children aged 6-59 months. Based on recent findings in the same area on the relationship between vitamin A deficiency and child mortality, vitamin A deficiency is thought to be an even greater problem now than it was 25 years ago (Mahboob et al, 1991).

Mahboob et al (1991) also stated the consumption of dark green leafy vegetables the main source of vitamin A in Bangladesh, is less than 25% of the recommended 200 grams per day. In addition, mothers observe, to various extents, a complex set of post-partum and lactation food taboos that restrict their vitamin A intake.

Binka et al (1991) reported that traditionally, Africa south of Sahara has not been considered to have a serious xerophthalmia problem. Red palm oil which is rich in betacarotene is assumed to protect those who consume it in the western part of the continent. The drier northern parts of countries such as Nigeria and Ghana are, however, very

susceptible to vitamin A deficiency. Two separate, but linked cross-sectional surveys in the Upper East Region of Ghana have been carried out in 1989 and 1990 respectively. In the first result, 0.962% of the children had night blindness 0.013% had Bitot's spots, 0.013 had unilateral corneal ulcers and 0.045% had corneal scars of which 0.019% were bilateral. In the second study, 2.29% of the children had night blindness, 0.085% had Bitot's spots and 0.169% had corneal scars which shows that severity of the deficiency state differs in different locations (Binka et al, 1991). According to WHO/USAID (1976) the arid and semi-arid areas of the Sahel are probably always seasonally short of vitamin A sources, but little information is available. Recent data from Burkina Faso shows that there is considerable seasonal night blindness and some xerophthalmia.

In the past 20 years, reports of xerophthalmia have come from parts of Africa where it was not previously known to be common. These places include Johannesburg (South Africa), Zimbabwe, and the Luapula valley of Zambia where it is believed to be associated with measles (WHO/USAID, 1976). Other reports of xerophthalmia on similar publication have come from East Africa, Malawi, Nigeria and Zambia. This paper also reported that emergency assessments in Sudan and Ethiopia identified other key programmatic concerns (such as the prevalence and definition of target groups).

In Africa, most cases of blindness in young children are attributed to measles, however, it is very likely that measles precipitates acute, severe xerophthalmia among children whose vitamin A and protein status are marginal (Binka et al, 1991).

Wolde-Gebriel et al (1991) have reported that vitamin A deficiency is one of the major nutritional problems in Ethiopia. According to this study the limited consumption of green leafy vegetables and pro vitamin A rich foods are possibly attributed to a number of factors like lack of appreciation of their nutritional value, avoidance because of beliefs, non-availability in the market and limited purchasing power if it is there. In Ethiopia, there are terms in the major languages for night blindness: "dafant" in Amharic, "gahmi" in Tigrigna and "bebereti" in oromegana. These imply that vitamin A deficiency has been a wall recognized problem in the country.

Anecdotal accounts in hospital and survey reports since 1959 have indicated vitamin A deficiency to be a major health problem in Ethiopia. The 1979 Ethiopian Nutrition Institute (ENI) vitamin A deficiency national prevalence assessment study indicated a 16.0% prevalence of vitamin A deficiency with relatively higher prevalence in the cropping zones of the country (5.6%) (ENI,1989). The study conducted in the four ecological zones of Ethiopia (pastoral, involving animal

husbandry; cropping involving cereals and pulses; cash crop, involving coffee and khat (Khat edulis. a green leafy herb chewed as a stimulant); and ensete (Ensete ventricosum. false banana)) with a sample size of 6636 children aged from 6 months to 6 years were selected for the signs of xerophthalmia. Bitot's spots were seen in 1.0% of all children, with a higher prevalence in the pastoral (1.6%) and cropping (1.1%), cash crops (0.4%) and "ensete" (false banana) (0.0%). One case of corneal xerosis and 2 cases of corneal scar were also seen (Wolde-Gebriel et al,1991).

In another study, 721 children in the six schools for the blind in Ethiopia were studied in 1988-1989 (Wolde-Gebriel et al, 1992 (b)). Histories were taken to ascertain the predisposing factors and ophthalmological examinations and records were used to determine the causes of blindness. Ninety five percent of those examined had bilateral blindness, 12% did not know how they had become blind and, of those who provided information on how they became blind, 21% knew that they were born blind, 30% implicated measles as being responsible, and 13% implicated "mitch" which is an Amharic term used to describe a very wide range of non-specific and vague illnesses of which measles probably constitute a significant proportion.

The Hate tulu and Andode sub districts of Arssi region

attracted the attention of the current study as a possible vitamin A deficient area because of the apparent lack of locally grown vitamin A rich foods. In addition, a number of studies carried out in the surrounding areas have given evidence suggesting that vitamin A is a problem in the region (Yemane, 1987; Selinus et al, 1971; ENI, 1989). As Sole et al (1987) described, these villages are part of a vast plain lying at an altitude of 2400 mt where monocrop cultivation (cereals) has been practised during the past decade. The same report also indicated that some studies done in the region also suggested that vitamin A deficiency is hyperendemic even though this area is among the richest in the country and has not been affected by recent droughts in the country.

Since the dietary and health practices responsible for vitamin A deficiency are often shared by other members of the community, xerophthalmia cases tend to cluster within specific families and neighbourhoods. Children living in the immediate vicinity of an active case of xerophthalmia are more likely to be deficient in vitamin A, and at higher risk of xerophthalmia, than children of the same age, sex and socio-economic status living in a different neighbourhood of the same village or town (Sommer, 1982; Hofander and Eksmyr, 1971).

2.4 Assessment of vitamin A status

Methods available at present for assessing vitamin A status are: clinical, biochemical, and dietary intake.

2.4.1 Clinical assessment

According to the WHO/AID meeting on vitamin A deficiency and xerophthalmia in 1974, a classification of ocular signs of xerophthalmia was adopted and later in 1980 modification was made by WHO and presented as below (Table 1) (Mac Laren et al, 1981).

Table 1: Classification of xerophthalmia

Ocular sign	Classification
Night blindness	XN
Conjunctival xerosis	X1A
Bitot's spots	X1B
Corneal xerosis	X2
Corneal ulceration/Keratomalacia < 1/3 corneal surface	X3A
Corneal ulceration/keratomalacia ≥ 1/3 corneal surface	X3B
Corneal scar	XS
Xerophthalmia Fundus	XF

Source: Sommer, A. (1982). Field guide to the detection and control of xerophthalmia. WHO, Geneve.

Based on severity of vitamin A deficiency xerophthalmia can be manifested in various clinical eye signs. Using clinical and biochemical parameters, a classification system with recommended minimum prevalence criteria has been developed by WHO to assist in determining the extent to which vitamin A deficiency and xerophthalmia may be considered of public health importance among children in a community. These range from .01% of the target population with corneal disease to 1% with night blindness. The prevalence rates may appear deceptively low due to the rare occurrence of corneal disease with its possible attendant high risk of mortality due to other factors. Xerophthalmic scars (xs) are evaluated separately from indicators of active disease since persons with XS may or may not have concurrent active Xerophthalmia.

2.4.2 Biochemical assessment

The process of vitamin A depletion of the body has been studied extensively in both animals and man under carefully controlled experimental conditions. Biochemical changes precede the clinical change and it is the hope of achieving early detection of vitamin A deficiency that this approach has been pursued. Serum retinol level of less than 10 µg/100 ml in more than 5.0% of the population indicates a public health problem.

2.4.3 Dietary assessment

The techniques available for the measurements of dietary intake of vitamin A are recognized to be imprecise; many factors are difficult to control, making the results obtainable by even the most conscientious workers approximation only. Household food consumption, however, cannot be relied upon to provide an indication of the intake of individual members of the household, and this is especially true for the young child. However, even though dietary intake surveys might be difficult to indicate the level of preformed vitamin A and carotenoids as the biochemical and clinical studies do, they can be used as supportive evidence to point out the inadequacy of certain important nutrients including vitamin A. One of the existing approaches that can help in assessing the inadequacy of vitamin A and β-carotene, is using a food frequency consumption checklist. This is done by listing down carotene rich foods and/or preformed vitamin A foods and recording the frequency of consumption of each item in the targeted household. After administering this evaluation questionnaire if the foods rich in vitamin A were not consumed by more than 75% of the households at least 3 times a week, this indicates that there is inadequacy of the nutrient in that community (Karl et al, 1969; WHO/USAID, 1976; West and Alfred, 1987; Arroyave et al, 1989).

2.5 Vitamin A status in relation to dietary intake

WHO (1979) pointed out that Xerophthalmia occurs in populations where the vitamin A intake is low. Communities where diets which contain no carotene, are the main staple and where little fruit, green leaves or animal products are consumed, often have a low vitamin A status. Chroenkiatkul et al (1985) pointed out that, protective foods with high ß-carotene content like amaranth, carrots, spinach and paw-paw are mostly not offered because of local traditions and beliefs that such foods give rise to diarrhoea in children or because of ignorance. A number of studies in different countries concluded that there is a significant relationship between the prevalence rate of xerophthalmia and the dietary intakes of foods rich in vitamin A (Ramana et al, 1991; Mahboob et al, 1991; Fasil et al, 1991; Wilma, 1991).

A strategy of growing dark green leafy vegetables perenniale requiring small space was tried in India by Saranya and Rao (1991). This was found to result in increased dark green leafy vegetables in family pots, but did not figure adequately in child feeds. Reasons for these findings were the current life styles, child care patterns, deep rooted beliefs of harmfulness of dark green leafy vegetables to young children and traditional method of feeding children.

In a survey of the dietary intake of Ethiopian mothers

in the third trimester of pregnancy Gebre-Medhin (1977) showed that non-privileged women had an intake considerably lower than the recommended level. This study also pointed out that liver concentration and content of vitamin A in Ethiopian foetuses were significantly lower compared to Swedish foetuses.

A study conducted in Ethiopian 10 privileged and 20 non-privileged woman selected from two institutions in Addis Ababa showed that with the exception of iron and thiamin, the non privileged consumed a diet that was, on the average, inadequate in all nutrients. For vitamin A, six of the mothers were found to have a level of intake below 80% and seven below 40% of the recommendation (Gebre-Medhin et al, 1975). Selinus et al (1971 (b)) and Wolde-Gebriel et al, (1991) also showed that ß-carotene was within the normal range in older children but low in those children below the age of two years in the areas where xerophthalmia was prevalent.

Pepping (1987) reviewed the food intake of 26 children in Tanzania of whom nine had Bitot's spots. The results showed that the intake of retinol and ß-carotene were low in all children with xerophthalmic children having the lowest intakes.

Breast feeding usually provides considerable protection

against the development of xerophthalmia unless the mother herself has a very low vitamin A status and her milk is deficient in the vitamin. Mother's milk can contain enough vitamin A to maintain adequate levels of vitamin A in the infant up to age six months. Studies have shown that xerophthalmic children are less likely to have been breast fed than healthy children. During World War I, Bloch noted that "xerophthalmia was never observed in children suckled by a mother capable of yielding sufficient milk" (WHO/USAID, 1976; West, 1991).

However, as mentioned above, the lactating woman herself can be vitamin A deficient, influencing the nutritional status of the infant. A dietary intake study of poor urban women during pregnancy and lactation in India concluded that vitamin A intake was one sixth the requirement for daily intake of the adult woman (WHO/USAID, 1976). In Asia and Africa, breast feeding itself is often delayed for one to four days following birth, with a prelacteal feeding of honey/sugar with water, the colostrum, rich in vitamin A as well as antibodies to protect the child, is considered harmful for the infant (Mahboob et al, 1991). It is the practice in many parts of Ethiopia that the diet is restricted during pregnancy in order to produce a smaller baby. In a sociological survey conducted by the Ethiopian Ministry of Health among 5 ethnic groups in southern Shoa and Arssi, it

was found that mothers were not allowed to consume foods white in colour, such as milk, cheese, eggs, etc. during the last trimester of pregnancy. In Minjar (central Ethiopia) and Guragie (south of Ethiopia) colostrum is not given to newborn babies because it is believed that the baby could not swallow it (Martin et al, 1991; Yemane, 1987).

As explained by Knutsson and Mellbin (1969) the duration of breast-feeding in rural communities in Africa, Latin America and Asia is usually considerably longer than in urbanized areas of the same regions. In the study conducted in Sidamo region (southern Ethiopia) on the duration of breast-feeding, it was reported that 32 percent of the children were breast-fed for 19 months or more, and 38 percent for 7 to 12 months, only two infants were breast-fed less than 7 months. However, the same study showed a quite different picture in Arssi region (southern Ethiopia). The duration of breast-feeding was 3 months or less for 15 percent of the children, 27 percent were given breast milk for 4 to 6 months and 47 percent for 7 to 12 months.

In studies from Asia and Africa, the most common reason given for discontinuing breast-feeding is another pregnancy. Once breast-feeding is stopped the child is in the critical period of weaning, when food intake can often be inadequate and inappropriate. The young child is also at high risk of

debilitating illness, such as diarrhoea, which requires additional vitamin A intake. The ill child requires additional vitamin A to fulfil the metabolic needs of the body. It is also the period when food intake is often suppressed, due both to lack of appetite and cultural practices (WHO/USAID, 1976; Eastman, 1987).

2.6 Vitamin A status in relation to sex

Mac Laren et al (1981) investigated whether there is evidence that males are more susceptible to xerophthalmia which is true for all ocular lesions at all ages. This study used records of 6,000 cases of xerophthalmia found that a male preponderance of 58% in the first 2 or 3 years of life rose steadily to between 80% and 90% by the age of 10 years. Similarly, Wolde-Gebriel et al (1992 (c)) found that among the 240 children examined for vitamin A deficiency in a village in Harare region of Ethiopia, 116 had at least one recognized sign of vitamin A deficiency. Among these children, 53.2% were boys and 43.1% girls.

In another study consisting of a total of 721 children in the six schools for the blind in Ethiopia (Asmara, Gimbi, Bako, Sebeta, Shashemenie and Wolaita) conducted in 1988-1989 showed that, there were more males (66%) than females (34%) and no girls were admitted to Bako school (Wolde-Gebriel et al , 1992 (b)). Further more, an earlier study on 6636 children

in 1991 in the country had also shown that conjunctival xerosis and Bitot's spots were twice as common in boys as in girls (Wolde-Gebriel et al, 1991).

A Vitamin A deficiency study conducted by Sole et al (1992) in southern Ethiopia in Arssi and Bale regions showed the prevalence of Bitot's spots is higher in males than females. The same study found the prevalence of children regularly eating vitamin A rich food was 2.1% higher in males than females.

2.7 Vitamin A status in relation to seasonal variation

The annual variation/ fluctuation in the dietary intakes of vitamin A and carotene, in plasma level of vitamin A, and of the occurrence of xerophthalmia are all well documented for various parts of the world. Xerophthalmia is associated with, among other things, particular seasons in which precipitating factors occur. Seasonal dry periods create shortage of fruits and vegetables while extended droughts may exacerbate signs of vitamin A deficiency (WHO/USAID, 1976).

According to an FAO/WHO (1987) report, vitamin A consumption at household and individual levels in Africa, vary widely according to geographical characteristics and to season. Almost all of the countries in the forest zone of West Africa derive the bulk of their vitamin A supply from

vegetable oils. The report also emphasised that in Senegal, the daily intakes range from around 300 µg RE per person in two northern villages to more than 2000 µg RE in the humid southern area, where red palm is a common element of the diet. In Cameroon, vegetable oils (mainly palm oil) are consumed daily by 90 percent of families in the urban area compared with 45 percent in rural regions. In the inland countries of west Africa there are considerable seasonal fluctuations; in one rural area family consumption increased from 109 µg RE per person per day in the dry season to 420 µgRE per person per day in the rainy season (FAO/WHO, 1987).

The results of the study conducted in southern Ethiopia, Arssi region, in 1989 explained that seasonality and drought are factors which contribute to vitamin A deficiency (Marina, 1991). But Demeke and Haile (1983) have pointed out that hypovitaminosis A occurs all year round, indicating that availability of foods rich in the vitamin is not the only factor relevant in the causation of the deficiency conditions. Its high occurrence in November and April, after the long and short rainy seasons, respectively, might be due to depletion of vitamin A from body reserves. The low occurrence in February and March, after dry, cold months, cannot be adequately explained although at Christian areas, these are largely fasting months.

Dietary studies in the Ethiopian rift valley carried out by Selinus et al (1971 (a)), indicated that the supplies of vitamin A were far below adequacy during hungry and harvest seasons, although there was a tendency toward improved values during harvest season.

2.8 Vitamin A status in relation to age

Age is unquestionably predominant among all of the factors that are associated with vitamin A status. Young children constitute the most vulnerable age group, in that the most severe eye lesions occur and the highest associated mortality rate are observed in this group. Reasons for the susceptibility of the young child are evident. Vitamin A requirements are closely related to the rate of growth; infectious diseases take a particularly high toll in early life; and other nutritional disorders, especially PEM, reach their peak incidence at about the same time and aggravate the deficiency of vitamin A. As children grow older, they forage more widely (providing a more varied, nutritionally balanced diet) and suffer fewer infections, therefore general nutritional status and vitamin A status improve; and the risk of blinding xerophthalmia declines (WHO/USAID, 1976; Sommer, 1982).

A review of outpatient records in Ethiopia showed that of the total number of xerophthalmic patients, 67% were under

3 years of age. It was suggested that it is not unrealistic to assume that most young children (0-2 years) are fed with breast milk which is deficient in vitamin A, accounting for the high prevalence of the deficiency in this age group. As age increases, children get their share of the family food which, because of its varied nature, is likely to contain appreciable amounts of the vitamin, and this together with the growing capacity of their body to store, reduces the likelihood of developing hypovitaminosis A (Demeke and Haile, 1982). As of WHO's (1979) publication the severest lesions and highest mortality are seen in the 1-5 years olds or in infants if milk feeding is unsatisfactory. Severe xerophthalmia is rare in school children and adults although Bitot's spots, night blindness and occasionally xerosis conjunctivae may occur.

The above studies have shown that vitamin A deficiency is a problem of public health significance in Ethiopia. The studies have also pointed out that there are various factors which aggravate the deficiency state. However, the question regarding dietary intake and the particular association with the deficiency state still needs to be assessed in order to suggest an effective means of alleviating the problem.

CHAPTER THREE

STUDY SITE AND METHODOLOGY

3.1 Background information

3.1.1 Country profile

Ethiopia covers an area of approximately 1.2 million square kilometres, with 75% of the land surface at more than 500 metres above sea level. Based on the 1984 census projections, the current population is estimated to be 52 million increasing at annual rate of 2.9%. The crude birth rate is 44.7 per 1000, crude death rate 19.8 per thousand and the infant mortality rate is 155 per thousand live births. Over 90 percent of the people live in rural areas with agriculture and animal husbandry being the main activity (Wolde-Geriel, 1992; Office of the Population and Housing Census Commission, 1988).

The principal health problems in Ethiopia are communicable diseases and nutritional deficiencies. Nutritional problems exist in the country as top threats to the general health of the population. Studies undertaken in the past show that about 4-10% of the population suffer from extreme malnutrition and 2.8% from severe protein deficiency. The problem is grave among children and it is estimated that 2% of the children aged 1-3 years suffer from

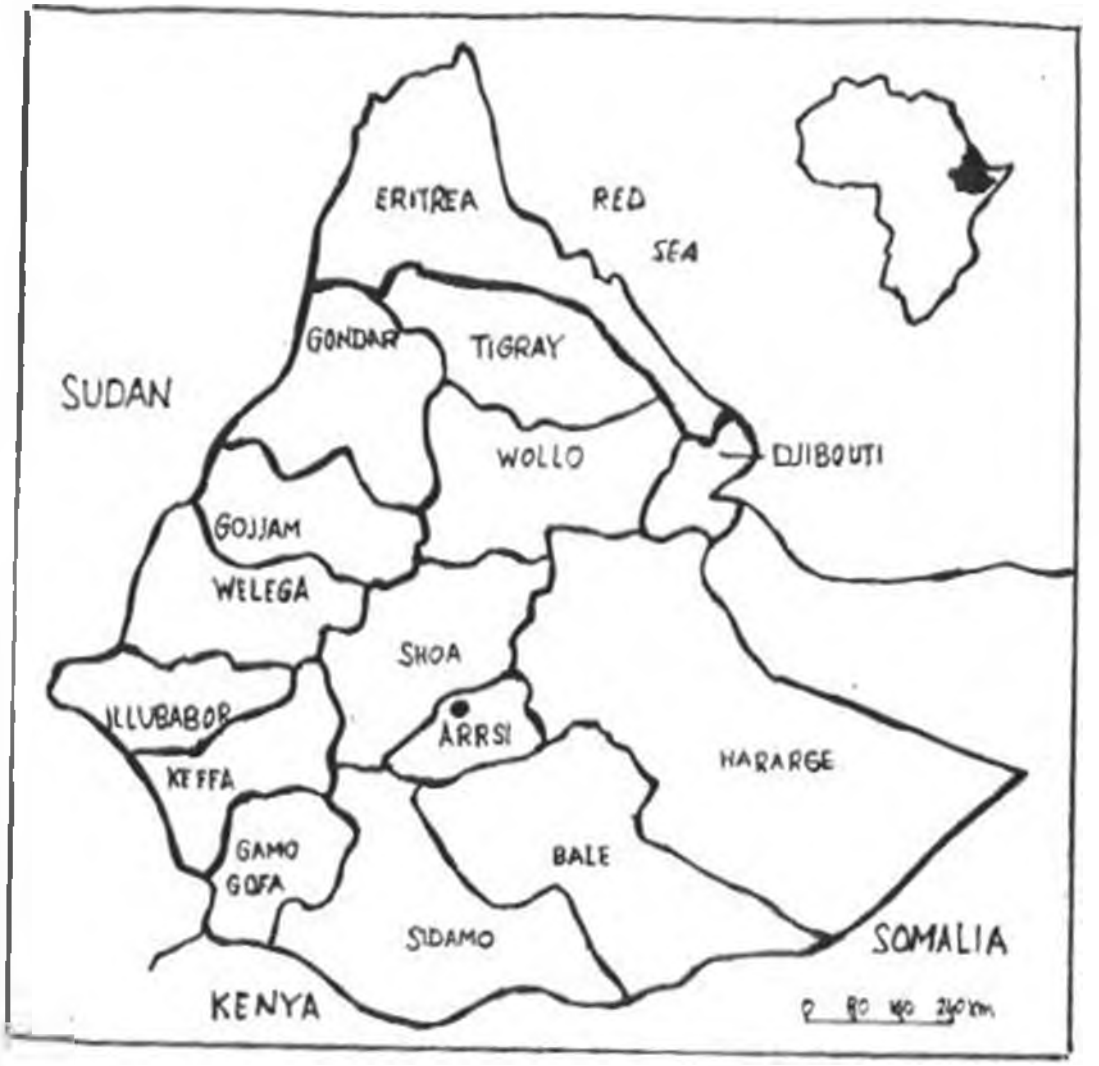
kwashiorkor, 4% from marasmus and that 40-60% of those children of the same age are underweight. Other nutritional problems include goitre, vitamin A deficiency and anaemia (ENI, 1985; Central Statistical Authority (CSA), 1992).

3.1.2 The study site

This study was conducted in Arssi region in southern Ethiopia (figure 1) and according to the 1984 population and housing census, this region has a population size of 1,662,790 of which 830,882 (50%) were males. The overwhelming majority (92%) of the population of Arssi live in the rural areas and only (8%) of the population of the region live in urban centres. The Arssi population is predominantly Oromo, about 18 percent of the population belongs to the Amahra ethnic group and the Gurage constitute about 1.3 percent. Over half (55.5%) of the Arssi population are muslims and about 44 percent are Orthodox Christians. As far as educational enrolment is concerned 50% of primary, 75% of lower secondary school and 87% of secondary school age population are still outside the purview of the school system of the region (Population and Housing Census, 1988).

The actual study area was Hitosa Woreda (sub-district) within a population of 91,286 people of which just over 50% are males (Office of the Population and Housing Commision,1988).

Figure 1 Map of Ethiopia showing administrative regions and study site.



● The study site

Two separate clusters of villages within the sub-district were selected for this particular study. Hatetulu, meaning hilly because it is located on a hilly area, and Andode, which gets its name by the kind of leaf available in the locality which is used as a soap for washing by the community. These villages are located 28 km north of Assela, the regional capital of Arssi.

In Hatetulu village there are 1214 people of which 592 (48.8%) are males and 622 (51.2%) are female. Similarly, in Andode there are 1228 people of which 596 (48.5%) are males and 632 (51.5%) are females (Office of the Population and Housing Census Commission, 1988). The actual study population consists of children under five years of age in the two study villages. All people are of the same ethnic group and they speak the same language (Oromogna). Both Muslims and orthodox Christians are represented among the population.

The altitude is around 2300 metres above sea level, with a climatic condition of Weinadega, which is a medium potential area. Major agricultural products include, wheat, barley, teff, millet, chick pea, lentils, broad beans and peas. Animal products and oilseeds such as niger seed and linseed are also produced. Apart from these, foods that are rich in vitamin A are also being produced as shown in Table 2. The main rainy season is between June and September and the

short rains come in December and January. According to the Central Statistical Authority (CSA), (1991), the 1990 monthly rainfall average in Arssi ranged from 24mm in January to 195mm in September.

The type of settlement in these two villages consists of well organized homesteads according to the villagization programme, with straight rows and partitions in between. The size of a homestead depends primarily on the type of family living there and secondly on the prosperity of the family. However, the average homestead consists of one to four huts having its own fence. The frame of the hut is constructed of wood and tightened with mud or cow dung. The roof is thatched and there are no windows in the hut nor any ventilation system. The floor consists of mud. Most often the huts consist of one large room with small partition for cooking, but in some the fire place is on the floor in the middle of the hut. Water is carried from the stream far from the villages taking about 2 to 3 hours. It is carried in clay pots by women on their backs. Donkeys are also used to transport water from the source.

Animal manure or wood gathered from the surrounding big trees (Acacia, Eucalyptus etc) which are growing wild or cultivated as a fence are used as fuel and the smoke has to force its way through the thatching of the roof.

Livestock comprises of goats, sheep, cows and donkeys. In most of the households the cattle are kept in the same hut overnight, while some villagers keep their livestock in separate fenced off areas situated in the compound. Since beds are found only in a limited households majority of the people have to sleep on the floor on animal skins. The household equipment consist of clay pots used for preparation of porridge and wot (sauce made up of pea, bean flour, meat etc). Gourds are used for storage of milk and butter.

Toasting of barley and baking of bread is done on a metal pan (mitad), and enjera (a leavened thin bread) is prepared on a clay mitad. For milling of grain at home, a stone grinder (Wofcho) is used. Diesel powered mills are also used and are available in the village market about 5 Kms away.

The illiteracy rate is high but a number of children are going to the local school nearby and have learned to read, but in most of the households neither husband nor wife could read or write. Even though the local language is Oromogna some of the villagers can understand the widely spoken language Amharic. All the heads of the households are farmers. No person in the research area could understand English.

Table 2: Locally available foods and their contributions to vitamin A.

Types of foods*	Contributions to vitamin A**
Maize (Zea mays)	good
Sorghum (Sorghum spp)	minor
Potato (Solanum tuberosum)	minor
Broad bean (Vieia faba)	minor
Peas (Pisum sitavum)	minor
Kidney bean (Phaseolus vulgaris)	minor
Lentil (Lens culinaris)	good
Kale seed (Brasica spp)	good
Carrot (Daucus carota)	good
Pepper sweet (Capsicum onnuum)	good
Tomato (Lycopersicon esculentum)	good
Orange (Citrus sinensis)	good
Papaya (Carica papaya)	good
Mango (Mangifera indica)	good
Banana (Musa sapientum)	good
Beef	good
Cow's milk	good
Butter	good
Chicken	good
Eggs	good

*Source: District agricultural office (Etaya,Arssi,1993).

**Source: Food composition table (CTA,ECSA,1987).

The hygiene is poor and washing is done infrequently. Fairly often, food such as milk is stored in uncovered containers which can easily be contaminated. Latrines are unknown in the area.

There is a small clinic in the village market but is poor in facilities and staffed by 6 health assistants who are employees of the Ministry of Health. A regional hospital is situated in the regional capital about 30 Kms south of the villages, otherwise the villagers have to travel 50 Kms north to reach a hospital in Nazareth town.

As stated above, the market place is located about 5 Kms north of the villages. A market is held twice a week Monday and Thursday. People from different directions gather during market days.

Among the food crops, barley and wheat dominate as cash crops and in the family diet. The crops are stored in large roofed baskets, which are tightened with mud and or cow dung. Vegetables and fruits are not grown in the area to an appreciable extent. Cattle are raised mainly for milk and milk products for sale for income generation rather than for meat. Cattle are slaughtered only on rare occasions and even then, rarely for consumption. Normally this would be for some important ritual reason. Sheep are regarded with a similar in

value to cattle and are rarely eaten except when slaughtered as a sacrifice. Even though eggs are found in some of the households, they are seldomly included in the family diet. They are used rather for sale to earn some money in order to buy items such as salt and kerosene from the market village. Most families have two large meals and one small meal per day. When the family is short of food, only two meals are served. The main meals are served in the middle of the day and sunset. The small meal is served in the morning or, when food is scarce, in the middle of the day. But for children it could be more, there is no definite time for them. At times of social events there is often a remarkable over consumption of food, especially by adult males. The tabooed foods in the communities include most wild animals such as wild pigs, birds and organ meat such as liver, heart, kidney, lung and spleen. There seems to be no special food habits during pregnancy. The most common food after delivery is a porridge (marka) made of barley and wheat and with a large supply of butter and sometimes, fresh milk. This kind of food is given as long as the mother stays inside the hut, usually 1 or 2 weeks. Fresh butter mixed with cow's milk is given by mouth to the new born baby to "grease the throat and stomach". Normally, breastfeeding continues for about 6 months sometimes going up to 1 years (informal discussions with local medical and agricultural staff plus with community leaders and personal observation).

3.2 Study Design

A cross-sectional study with descriptive and analytical components was undertaken in Arssi region, Chilalo Awraja (district), Hitosa Woreda (sub-district), in southern Ethiopia. The study was carried out in two rural villages, Hatetulu and Andode, that were brought together under the government programme of villagization implemented throughout the country.

The survey was conducted between January and March, 1991. Children under the age of five years comprised the study population. Data was collected by interview and by administering a pretested questionnaire on household consumption frequency, breastfeeding and weaning, and food habits and practices. A clinical examination was carried out for every child sampled. All families with children under five years of age in the villages of Hatetulu and Andode were included in the study.

Piloting was done around the area not very far from where the actual study took place. Nineteen households with children under five years of age were sampled from two villages during the pilot phase. After results and validity of the methods used were discussed with local advisors in Addis Ababa and with health officials in the study area minor changes on the structure of the questionnaire were made.

Before the actual study an enumerator was recruited among candidates who had completed high school and who had been serving as enumerators for the National vitamin A child survival project. A three day additional training was given on how to administer the questionnaires and how to approach the target respondents. The enumerator was fluent in the local language, Oromogna, which was spoken by the people interviewed.

The actual data collection was conducted in the period between January and March, 1993. Before the data collection started, the purpose of the study was communicated to the two villages by the office of National Vitamin A Child Survival Project through the area coordinating office located in Eteya Wereda (sub-district). Community leaders were briefed about the programme by the principal investigator, who was introduced by the vitamin A project field coordinator and supervisor. The community leaders were welcoming and tried to know about the objectives of the study. The day following the discussion, the leaders transmitted the study's objective throughout the households in the villages.

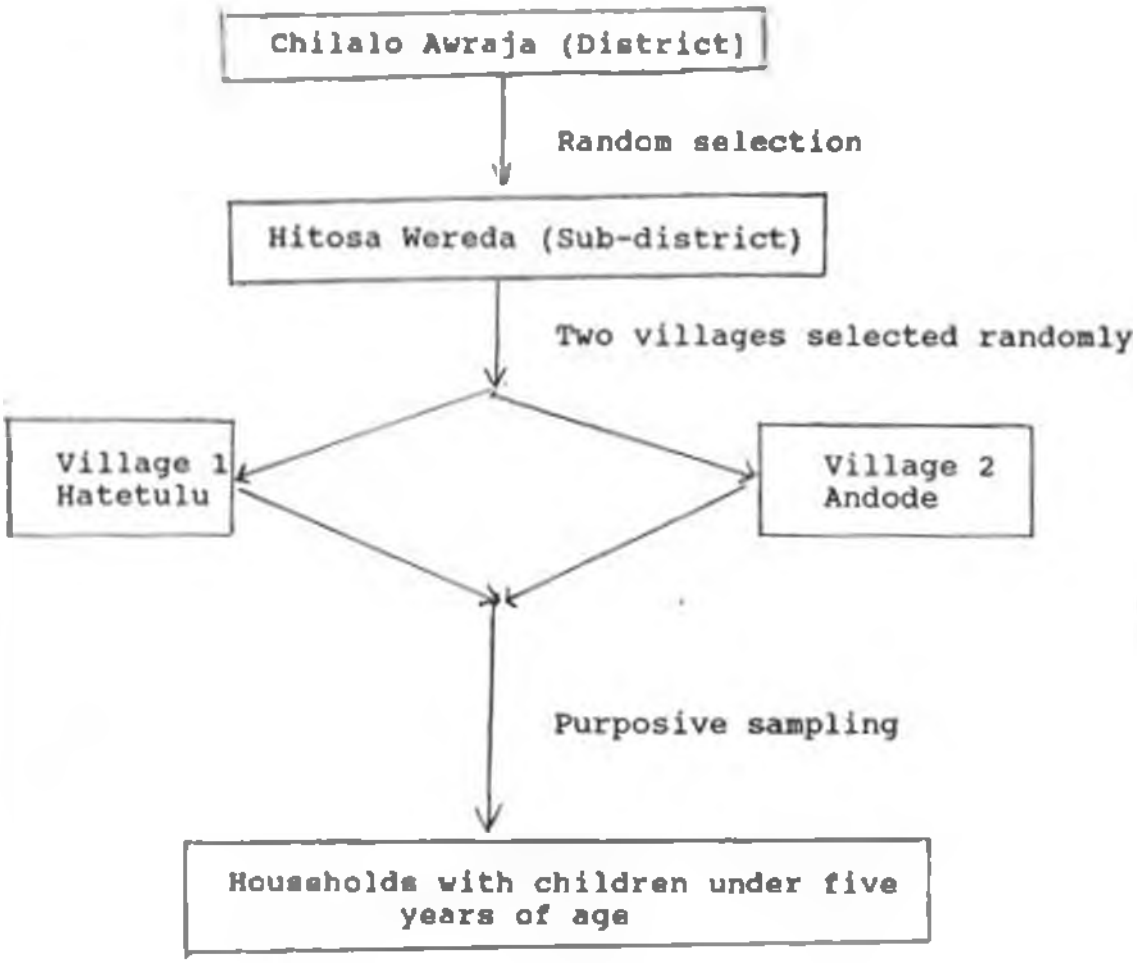
The enumerator, due to his last experience in the same villages, could easily identify the households selected. In most of the households mothers were the principal respondents to the questionnaires. Food frequency information was taken

for the whole household. The breast feeding and weaning questionnaire was directed towards the younger child in the household. Since food habits were almost uniform throughout the villages, 19 households were randomly selected for this part of the questionnaire. Apart from this, informal conversations were also undertaken on certain topics. Clinical examination was done by a medical doctor from the regional hospital who had a rich experience in ophthalmology. All the under five children in the sampled households were examined by going from house to house. Every questionnaire was checked for accuracy and completeness immediately following the interview.

3.2.1 Sampling procedures

A multistage sampling technique was used in selecting the study population as shown in Figure 2. To select the two villages taken as a sample community, random selection was used out of 166 villages within the National Vitamin A Child Survival Project. After selecting the two villages, households with children under five years of age were also randomly selected using the household number given by the vitamin A project.

Figure 2: Flow-chart showing the study design



3.2.2 Sample size determination

The determination of the sample size was calculated using the following formula.

$$n = \frac{z^2 (pq)}{(r)^2}$$

Where:

z = z value of the desired limit of confidence.
In this investigation z = 1.96 (95% confidence).

p = The given prevalence rate of vitamin A deficiency in relation to Xerophthalmia.
For this study p = 16%

q = 1 - p estimate of proportion of non vitamin A deficient children in the study area.
For this study q = 100 - 16 = 84%

r = The acceptable range, within which the calculated percentage or prevalence of vitamin A deficiency may differ from the true result.
In this study r = 5%

Since the proportion of vitamin A deficiency in children of study area was not known, the investigator estimated the extent of the problem in the area to be 16 percent based on the information obtained from the national study done in the country by the Ethiopian Nutrition Institute (ENI, 1989). As such, the sample size was calculated to be:

$$n = \frac{z^2 (pq)}{(r)^2}$$

$$= \frac{(1.96)^2 (0.16 \times 0.84)}{(0.05)^2}$$

$$= \frac{3.8416 \times 0.1344}{0.0025}$$

$$= 206$$

Since there were two district clusters of villages the sample size in each group was taken to be 113 and 116 in order to account for all < 5 Children in the village . Therefore, for this particular study the sample size was 229 children all under five years age (113 from village Hatetulu and 116 from the village Andode).

Households in the two villages Hatetulu and Andode totalled 288 and 290 respectively. A total of 130 households with children under five years of age were randomly selected and all these households were visited and the children examined for clinical manifestation. All under five children in a household were included in the study.

These two randomly selected villages were part of the sites of an on going national vitamin A child survival project in the Awraja (district); which covers 166 villages. All the households in the villages were numbered and these numbers

were used to select the sample households in the villages.

3.2.3 Study instruments

The questionnaire had five parts of which the first part dealt with demography, the second contained a food frequency check list, the third was a breast-feeding and weaning questionnaire with the fourth part dealing with food habit. The fifth part with clinical examination for xerophthalmia.

3.3 Consumption frequency of vitamin A rich foods

Before administering the questionnaire on food frequency, it was necessary to identify those food items that are rich in vitamin A content and those that were available in the locality through the local agricultural offices. The questionnaires were then exercised in all 130 sample households of the two villages. Mothers were considered as the respondents and asked how often a particular food item considered to contribute to vitamin A intake was consumed in the household. The frequency of consumption was classified into four different categories. The first category includes consumption at least three times a week. The second, "seldom", includes those eating less than two times a week, the third, "never", and the last, seasonal consumption corresponding to consumption during the wet seasons for vegetables and rare occasions for animal products. The criteria for inadequacy has been used as suggested by the

International Vitamin A Consultative Group (IVACG) (Arroyave et al, 1989).

3.4 Prevalence of vitamin A deficiency

Prevalence surveys determine the proportion of individuals in the sample with the particular attribute or abnormality at the time of examination. The assessment in the study area was carried out using clinical examinations of the different stages. House to house examination was conducted among all the sampled (n=229) children. Prevalence criteria are listed in Table 3, endorsed by the World Health Organization and the International Vitamin A Consultative Group (Arroyave, 1989). For night blindness, mothers of the children under five years of age were asked whether the child had maladaption to dim light or not. Conjunctival xerosis was identified by the drying of the conjunctiva, Bitot's spots by an extension of foamy or cheesy patches forming on the conjunctiva, corneal xerosis by a hazy or granular surface, a pebbly dryness apparent on the cornea, corneal ulceration, when the ulceration was observed in the corneal surface and corneal scar by observing a scarring associated with previous xerophthalmia condition (Eastman, 1987). All examinations were done by the experienced medical doctor who was familiar with the clinical manifestations of xerophthalmia.

Table 3 Prevalence criteria for determining the public health significance of xerophthalmia and vitamin A deficiency.

Night blindness (XN) in > 1%
Bitot's spots (X1B) in > 0.5%
Corneal xerosis / corneal ulceration / keratomalacia (X2/X3A/X3B) in > 0.01%
Corneal scar (XS) in > 0.05%

Source: Arroyave et al, (1989). Methodologies for monitoring and evaluating vitamin A deficiency intervention programs. IVACG, Washington D.C.

3.5 Breastfeeding and weaning practices

Information on breastfeeding and weaning practices in the study community was gathered through interviews and structured questionnaires from all the mothers in the sampled 130 households in the two villages. This task was performed by the investigator and a trained assistant who had been recruited from the study area.

3.6 Food habits and practices

Since the food habits and practices within the two sampled villages are more or less similar the investigation was carried out on a sub-sample of nineteen households using an

interview with mothers. Apart from this, additional information was obtained through informal discussions with the elders and leaders of the community. The interview was carried out by the investigator accompanied by the enumerator.

3.7 Study limitations

The study was restricted to Arssi region and to families with children under five years of age.

3.8 Data analysis

Computer data processing (entering data and analysis) was done using Dbase III, EpiInfo (version 5) and SPSS/pc programmes at the Unit of Applied Human Nutrition (ANP), University of Nairobi.

CHAPTER FOUR

RESULTS

There were a total of 838 people living in the 130 study households. Data generated from these households included demography, dietary intake information, breast feeding and weaning, food habits and practices, plus clinical examination. The population comprised 438 (52%) males and 400 (48%) females.

4.1 Demographic characteristics

Age and sex distribution of the study population is shown in Table 4. There were 229 children who were under five years of age of whom 113 were from the village of Hate tulu and 116 from the other village Andode. The mean age of the children under five years of age was 33 months. Mean mother's age and father's age was 31 and 40 years respectively. Percentage of the mothers and fathers who cannot read and write was 78% and 56% respectively. The young generation with the age below 15 years in the community were 517 (61.6%), the dependency ratio being 1:1.7 which is slightly higher than the dependency ratio of the region 1:1.5. The female to male ratio in the study was 1:1.1. The average household size for the two study villages was 6 persons. Again this was higher than the region's average household size which is 4.8 persons

(Office of the Population and Housing Census Commission, 1988).

Table 4: Distribution of the study population by age and sex

N = 838

Age in years	Sex		Total
	Male	Female	%
0-<5	125	104	27
5-<15	148	142	35
15-<45	135	142	33
45-<55	17	4	2.5
55+	13	8	2.5
Total	438	400	100

4.2 Consumption (frequency) of vitamin A rich foods.

As indicated in Table 5, some particular food items were consumed more frequently compared to others, while others were not consumed at all in some households. Other households also indicated that they consumed certain food items seasonally.

The frequency of consumption observed in almost all the foods was below the average cutoff point set by IVACG. IVACG recommends that a given vitamin A rich food should be eaten in

more than 75% of the households at least three times a week in a community. The leafy vegetables with rich ß-carotene were not eaten frequently, only 13.1% of the households consumed

Table 5: Proportion of households consuming vitamin A rich foods.

Types of food	Household Percentage frequency of consumption of vitamin A rich foods n=130			
	At least 3 x a wk	*Seldom	Never	*Seasonally consumed
a) Vegetables (leafy)				
- Dark green	13.1	40.0	2.3	44.6
- Dark yellow	.8	53.8	33.8	11.5
- other green vegetables	-	5.4	91.5	3.1
b) Cereals, legumes & tubers				
- maize	27.7	26.2	14.6	31.5
- sorghum	40.0	23.1	35.4	1.5
- peas	64.6	28.5	6.9	-
- lentil	11.5	60.0	27.7	0.8
- sweet potato	0.8	3.1	96.2	-
c) Fruits & juices				
- citrus fruits and juices	-	2.3	97.7	-
- other fruits	-	0.8	99.2	-
- tomatoes	0.8	26.2	71.5	1.5
d) Milk and milk products				
- milk	6.9	34.6	57.7	0.8
- yoghurt	5.4	31.5	62.3	0.8
- cheese	6.2	32.3	60.8	0.8
- butter	6.2	79.2	13.8	0.8
e) Meat & poultry				
- beef	0.8	73.8	25.4	-
- liver	-	14.6	85.4	-
- heart	-	9.2	90.8	-
- kidney	-	10.0	90.0	-
- poultry	-	26.9	72.3	0.8
- eggs	0.8	56.2	42.3	0.8
f) Nuts	1.5	13.1	84.6	0.8

* Seldom = Less than two times a week.
* Seasonally = During wet season for plants and rare occasions for animals and animal products

dark green vegetables frequently and only in 1 (.8%) household, was dark yellow vegetables eaten at least three times a week. Citrus fruits were not included in the diet

within this category. Apart from beans which were consumed in 82.3% of the households, the rest were taken in very few households. Consumption of milk and milk products showed a reduced intake as only 5.4% of the households adequately consumed yoghurt, and 6.9%, cows milk. Animal and animal products were even less frequently consumed, and none of the households consumed organ meats such as liver, heart, kidney and poultry as well.

It was observed that the consumption of most food items was seldom in most households with the average consumption ranging from 79.2% for butter to 0.8% of the households consuming fruits.

4.3 Prevalence of vitamin A Deficiency

Based on the criteria established by WHO in 1981 to indicate public health significance of xerophthalmia and vitamin A deficiency in under five years of age, the results from clinical examinations (Table 6) indicated that xerophthalmia is a major public health problem in the two villages, Hate tulu and Andode, of Arasi region.

The overall prevalence rate of xerophthalmia and vitamin A deficiency was 14.4 percent. From the total of 229 children, 33 had at least one recognized sign of vitamin A deficiency. Out of the 33 xerophthalmic cases, 21 (63.3%) of them were from the village Hatetulu and the remaining 12 (36.4%) were from the other village Andode.

Table 6: Distribution of children with clinical signs and symptoms of xerophthalmia by age group and sex

N = 229

Clinical signs	Sex	Age in months					Total	%
		<12	12<24	24<36	36<48	48<60		
Night Blindness	M	0	1	2	6	8	17	
	F	0	1	1	4	3	9	
(XN)	M + F	0	2	3	10	11	26	11.4
Conjunctival xerosis	M	0	0	0	0	0	0	
(X1A)	F	0	0	0	0	1	1	
	M + F	0	0	0	0	1	1	0.43
Bitot's spots	M	0	0	0	0	1	1	
(X1B)	F	0	0	0	0	1	1	
	M + F	0	0	0	0	2	2	0.9
Corneal Xerosis	M	0	0	0	1	1	2	
(X2)	F	0	0	0	0	0	0	
	M + F	0	0	0	1	1	2	0.9
Corneal ulceration	M	0	0	0	0	0	0	
(X3A)	F	0	0	0	1	0	1	
	M + F	0	0	0	1	0	1	0.43
Corneal scar	M	0	0	0	0	0	0	
(X5)	F	0	0	0	0	1	1	
	M + F	0	0	0	0	1	1	0.43
Total no. of	M	0	1	2	7	10	20	
xerophthalmic	F	0	1	1	5	6	13	14.4
cases	M + F	0	2	3	12	16	33	
Total examined	M	29	22	26	24	26	127	55.5
	F	20	21	22	22	17	102	45.5
	M + F	49	43	48	46	43	229	100

Night blindness (XN) was reported in 26 (11.4%) of the children. All the respondents said that they could not remember when the symptom first appeared. Conjunctival xerosis and Bitot's spots were seen in 0.43% and 0.9% respectively, corneal xerosis 0.9% corneal ulceration in 0.43% and corneal scars in 0.43%.

4.4 Factors associated with vitamin A deficiency.

4.4.1 Food consumption patterns.

Certain vitamin A rich foods were consumed

seasonally in some of the families including most of green leafy vegetables and animal resources ranged from 0.8% of the households to 44.6%. The association of household consumption frequency of some of these foods (eggs, butter, citrus fruits, organ meat, dark green vegetables and dark yellow vegetables) with having the deficiency state was statistically significant ($p<0.0001$) as shown in Table 7.

Food habits and practices also have their own influence on the manifestation of the signs and symptoms of vitamin A deficiency. This particular study area as in other parts of the country, has its likes, dislikes and beliefs about food. As of the informal interview conducted, and from the results on the sub-sample households, some foods are not eaten mainly because of taboos and ignorance about the nutritional value, besides being unaccustomed to some foods of high protein and vitamins contents such as eggs, organ meat, citrus fruits,etc. When younger children are ill, they are restricted from eating certain foods such as meat and butter which are believed to aggravate the disease. When food is served 80% believed that priority should be given to the elders. Children get their share last or eat the leftovers. In 65% of the households the male head received the first choice of the food, followed by the oldest

Table 7: Distribution of xerophthalmia cases by the household frequency consumption of some vitamin A rich foods.

Type of food	freq/case	consumption: adequate*	seldom	never	seasonal	p-v	x^2
Dark green vegetable (eg.kale, spinach)	freq	17 (13)**	52(40)	3(2)	58(45)		
	case	2(6)	18(55)	0(0)	13(39)	P<0.0001	26
Dark yellow vegetables (eg.carrot, pumpkin)	freq	1(.8)	70(54)	44(34)	15(11)		
	case	0(0)	20(61)	6(18)	7(21)	P<0.0001	25
Citrus fruits	freq	0(0)	3(2)	127(98)	0(0)		
	case	0(0)	0(0)	33(100)	0(0)	P<0.0001	76
Eggs	freq	1(.8)	73(56)	55(42)	1(.8)		
	case	0(0)	20(61)	13(39)	0(0)	P<0.0001	36
Butter	freq	8(6)	103(79)	18(14)	1(.8)		
	case	2(6)	28(85)	3(9)	0(0)	P<0.0001	65
Organ meat	freq	0(0)	116(13)	14(88)	0(0)		
	case	0(0)	5(15)	28(85)	0)0)	P<0.0001	65

*Adequate= At least 3 times a week
**figures in parenthesis show percentages

children according to their ages and, lastly the mother.

In 76% of the households although foods rich in vitamin A such as eggs, chicken, milk, etc. were available in the households they were to be taken to the nearest market during market days for sale. Consumables for the

household (kerosene, salt, sugar and other items) were then purchased for the household. Among the parents, 13% believe that their children at the weaning age might get worms if they feed them with solid foods such as eggs, meat, fish, etc., they also believed that if a child is given solid food before he is able to walk, his faeces will be foul and the smell unbearable for the persons who clean the child.

During festivals, expenditure of much money leads to a disruption in the economy of the household which results in a shortage of food. It is a common practice in the study community to have large church feasts, such as Christmas, true cross, New Year, Easter, etc. in the Ethiopian orthodox church community, and during events like Arefa. moulid. idalfter in the muslim communities. Most of these are usually held during the harvest season. In spite of these expenses, a large proportion of the population (between 73.6% and 84.2%) including women and children are restricted from eating certain organ meats such as intestine, heart, lung, spleen, kidney, and liver.

4.4.2 Age and Sex

There were 20 (61%) male and 13 (39%) female xerophthalmic cases among the study population. Among the children with night blindness 65% were boys and 35% were girls. Children with conjunctival xerosis were only two, a boy and a girl. Similarly, there were two cases of

xerophthalmic cases among the study population. Among the children with night blindness 65% were boys and 35% were girls. Children with conjunctival xerosis were only two, a boy and a girl. Similarly, there were two cases of Bitot's spots, again, a boy and a girl. Only one case was observed with corneal xerosis (boy). For both corneal ulceration and corneal scars, only one case was seen in each and both were girls. There was a significant ($p<0.0001$) sex difference between the cases of xerophthalmia. As shown in Table 8 there was no xerophthalmic case under the age of 12 months, while 6% of

Table 8 Distribution of xerophthalmia cases by age group of children

n=229

	Age group					Total
	<12	12<24	24<36	36<48	48<60	
cases	0(0)*	2(6)	3(9)	12(36)	16(49)	33 (14.4)
non cases	49(25)	41(21)	45(23)	34(17)	27(13)	196 (85.6)

x^2 =37 d.f=4 ($p<0.0001$)

*Figures in parenthesis show percentages

the cases were in the age group 12-24 months, 9% in age 24-

4.4.3 Religion

As shown in Table 9, of the 33 cases, 27 (81.8%) were children from moslem households and the remaining 6 (18.2%) from households of Ethiopian orthodox church followers.

4.4.4 Breastfeeding and weaning practices

During the study, 83 (63.8%) of the mothers in the selected households were breastfeeding their children. Among these, 75 started giving their breast to the baby immediately after birth while the remaining 8 mothers started one to three days later.

Those mothers (47) who had stopped breastfeeding before the study team arrived in the village gave different reasons for stopping. Among these mothers 6.9% said it was due to another pregnancy, 3.1% due to the birth of the next child, 0.8% due to their illness and the rest (24.6%) stopped because the child was too old. Of these mothers, 5.4% of them stopped breastfeeding abruptly while 28.5% of them in the course of time over a month. The frequency of breastfeeding situation and having one of the signs and

Table 9: Percentage distribution of xerophthalmic cases in relation to religion practised

Clinical signs	Religion		Total
	Moslem	Christian	
Night blindness (XN)	22 (66.6)*	4 (12.1)	26 (78.7)
Conjunctival xerosis (XIA)	1 (3.0)	- (0.0)	1 (3.0)
Bitot's spots (XIB)	1 (3.0)	1 (3.0)	2 (6.0)
Corneal xerosis (X2)	2 (6.0)	- (0.0)	2 (6.0)
Corneal ulcer	1 (3.0)	- (0.0)	1 (3.0)
Corneal scar (XS)	- (0.0)	1 (3.0)	1 (3.0)
Total	27 (81.8)	6 (18.2)	33 (100)

* Figures in parenthesis show percentages

symptoms of xerophthalmia was significant ($p<0.01$) (Table 10).

Of all the mothers interviewed, 83.1% fed the first breast milk "colostrum" to their babies. But 16.9% said that they did not gave colostrum to their babies. The reasons given by the mothers varies, 2.3% of them had no reason, 13.8% said that it was not good for the general health of the child, and 0.8% said that it was due to their illness.

Table 10: Distribution of xerophthalmia cases by the frequency of breastfeeding situation

N=229

	Breast feeding	Stopped breastfeeding	Total
Freq	83(64)	47(36)*	130(100)
Case	19(58)	14(42)	33(100)

x^2=8.6 d.f=2 (p<0.01)

* Figures in parenthesis show percentages

Concerning the duration of exclusive breastfeeding, the results suggest that the mothers had different opinions (see Table 11). Of all the mothers 22% believed that children should be exclusively breastfed until 4 months, 46% for between 4-6 months while 32% said it could be done over 6 months. On the other hand, concerning the period over which breastfeeding could be continued along with weaning foods, 89% suggested one year and above while the rest said it should be limited to below one year as shown in Table 11.

As for the type of weaning food and age given, 10% of the mothers gave cows milk at the age between 4 to 6 months, and 24% when the child is above 6 months of age. In addition, 23% of the respondents also gave porridge made

Table 11: The duration of exclusive breastfeeding and introduction of weaning foods.

N=229

Feeding period	Type of feeding	
	Breast milk only	Breast milk with weaning
< 4 months	28(22)*	2(2)
4<6 months	60(46)	5(4)
6<12 months	42(32)	8(6)
Above 12 months	-	115(89)

*Figures in parenthesis show percentages

from wheat or barley when the child's age was above 6 months. As shown in Table 12, 28% of the mothers gave green leafy vegetables when the child was 6 months old, 9% gave banana, and 2% gave carrot. The association between the age when solid and liquid foods were introduced and xerophthalmia is strongly significant as shown in Tables 13 and 14.

A number of the mothers 34.6% gave butter by mouth to the newly born baby. while 16% of these said that this was to remove bad things from the child's stomach, while 3.8% used it until the child knows how to suck the breast properly.

Table 12: Type of foods and drinks first given to children other than breast milk and age started in months

Types of foods and drinks given	Age started in months		
	2-4	4<6	Above 6
Cow's milk	-	14(10)	34(24)*
Fruit juices	-	-	1(.7)
Porridge	-	2(1)	32(23)
Bananas	-	3(2)	13(9)
Carrot	-	-	3(2)
Green vegetables	-	-	39(28)

*Figures in parenthesis show percentages.

Abstention from eating or from eating certain foods is done for fixed periods of time. For example, fasting is imposed on the members of the Ethiopian orthodox church while the moslems fast (day time only) during Ramadan. Vulnerable groups like children under the age of 7 year are exempted, and up to about 15 years of age youngsters fast only half the day or merely part of Ramadan. Elders also pointed out that some of the mothers were restricted from consuming white foods like milk, cheese, eggs, etc., during their pregnancy period in order to produce a small baby so that it doesn't create a problem during delivery.

Table 13: Distribution of xerophthalmia cases by the age when solid foods were introduced

N= 229

	4<6 months	>6 months	Not started
No. of children	7(5)	59(45)*	64(49)
Cases	0(0)	19(58)	14(42)

x2=61 d.f=2 (p<0.0001)

*Figures in parenthesis show percentages

Table 14: Distribution of xerophthalmia cases by the age when liquid foods were introduced

N=229

	4<6 months	>6 months	Not started
No.of children	22(17)*	45(35)	63(48)
Cases	1(3)	28(85)	4(12)

x^2=33 d.f=2 (p<0.0001)

*Figures in parenthesis show percentages

CHAPTER FIVE

DISCUSSION

5.1 Prevalence of vitamin A deficiency

Results of the clinical study show that the levels of xerophthalmia exceed the cut-off points set by WHO as criteria for a public health problem. According to these criteria, the results of this investigation showed that vitamin A deficiency is a public health problem in the study area. Out of the total 229 children, 33 had the signs and symptoms of vitamin A deficiency. The overall prevalence rate of xerophthalmia was 14.4 percent. Even though the result is slightly lower than the national survey result of the Ethiopian Nutrition Institute which reported 16 percent, the severity is still at a high level (ENI, 1989).

Night blindness was reported in 11.4% as compared to WHO cut-off point of 1%. Of these children 65% of them were boys and 35% girls showing that boys are more vulnerable than the girls. This is in agreement with a previous study done by Demeke et al, (1982). Prevalence of Bitot's spots showed in the study was 0.9% compared to the cut-off point set by WHO, 0.5%. This result corresponds to other results done in some of the seven provinces of Shoa region (Wolde-Gebriel et al, 1991). However,it is lower when compared to reports obtained from the same region by Sole et al, (1987). Altogether with the results of conjunctival xerosis (0.43%), corneal xerosis (0.9%) corneal ulcer (0.43%)

and corneal scar (0.01%), these results confirm that vitamin A deficiency is indeed a public health problem in the study area. In addition, and in agreement with a previous study (Sole et al, 1987), this study has shown that severity varies from place to place within the region. There were 63.6% cases in the village of Hate tulu and 36.4% cases in the other village, Andode. This variation could be due to the religious difference, there being more moslems in Hatetulu compared to Andode. The religion difference may enamats from differences in food consumption patterns, and household size. This is in agreement with Knutsson (1964) who also suggested that significant health differences may occur between traditional societies more due to their socio-cultural context.

Furthermore, the results show an age group trend also in agreement with an earlier study carried out in Ethiopia (Wolde-Gebreil et al, 1991). The prevalence is low at early ages and high among the ages of 48-60 months. This shows that the risk of manifestation of the diseases becomes greater as the child's age increases.

5.2 Consumption (frequency) of vitamin A rich foods in relation to vitamin A deficiency.

The consumption of vitamin A rich foods has been shown to be below the average minimum percentage of the families as set by the International Vitamin A Consultative Group (IVACG). IVACG states that consumption is normal when more than 75% of the households consume vitamin A rich foods at least 3 times a week.

In the current study, the results show that those vegetables high in vitamin A content were not eaten or their consumption is very low. The vegetables include dark green vegetables, dark yellow vegetables and other vegetables consumed in 0.0% to 13.1% of the households. An earlier study in the same region also reported that green vegetables were consumed only once in a week, and carrots in an even more irregular way (Sole et al., 1987). The frequency of consumption of milk, yoghurt, cheese and butter was similarly very low 6.9%, 5.4%, 6.2% and 6.2% of the households, respectively. Even though the consumption of cereals, legumes and tubers was higher than the other foods, their adequacy was still in question. The percentage of the households consuming these varied from 0.8% for sweet potato to 82.3% for peas. Peas were the only food staff that exceeded the set level.

Reported results on the frequency of the consumption of meat, poultry and nuts was also a point to be given attention. Most offal which are supposed to be nutritive were discarded due to food habits and taboos practised by some of the villagers. The percentage consumption in these groups ranged from 0.0% to 0.8% of the households surveyed, suggesting a very low percentage of households consuming vitamin A from these sources. A Previous study in the same area had also reported similar results (Demeke et al., 1982).

The staple food in the area studied is basically a porridge, bread and injera (a thin leafy bread) made of teff,

wheat or barley. Apart from these, vegetables were also produced seasonally. However, though vitamin A rich foods are available in the study area, the purchase of these food items depends on the availability of money in the households and the knowledge they acquire in relation to their use.

In summary, the study population apart from falling below the IVACG's cut-off point on the proportion of households consuming vitamin A rich foods, the statistical analysis carried out for the association between the consumption of some selected vitamin A rich foods and cases of the deficiency state showed a significant ($p<0.0001$) relationship. A previous nationwide study also suggested that not consuming vitamin A rich foods is among the contributory factors (Wolde-Gebriel et al., 1991). Therefore, the result suggests that the first hypothesis in this study which stated that, "there is a relationship between consumption of vitamin A rich foods and the occurrence and severity of vitamin A deficiency" is acceptable. Secondly, even though the consumption frequencies of vitamin A rich foods in the households is lower than the IVACG cut-off point, the study shows that these food items are available in the study area. Wolde-Gebriel et al., (1991) in a national xerophthalmia study in Ethiopia also reported that foods potentially rich in vitamin A are not consumed in these areas. Therefore, the second hypothesis which states that " utilized natural sources of vitamin A exist in areas where vitamin A deficiency is highly prevalent" is also acceptable.

5.3 Breastfeeding and weaning practices in relation to vitamin A deficiency.

It is known that poor breast feeding habits and weaning practices can also increase the prevalence of vitamin A deficiency. The duration of breastfeeding was reported to be similar to that reported in other areas of the country. Among the mothers, 85% breastfed for more than one year and this is higher compared to other previous studies which reported the proportion to be between 57% and 64% mothers (Knutsson and Tore, 1969; Selinus et al., 1971 (b)).

However, the association seemingly contradictory between some breastfed children and the existence of xerophthalmia might be explained as being due to the inadequate intake of vitamin A rich foods by the lactating and pregnant mothers. This could possibly result in breastmilk that has a low vitamin A content. In support of this, Demeke et al., (1982) postulated that most of the young children fed with breastmilk which is deficient in vitamin A, account for high prevalence of the deficiency condition. Sole et al., (1987) also stated that there were no cases of xerophthalmia recorded in children who were breastfed for up to 2 years even in villages with high prevalence. A proportion of the mothers (32.3%) reported that they continued giving only breastmilk until the child was more than 6 months old which leads to late weaning that may lead to inadequacy of vitamin A intake. Furthermore, newly born babies were also fed with butter by mouth (34.6%) for a few days in order to open up its throat, to remove any thing bad in the stomach and other

related reasons. However, the butter given in such situation is usually dirty and it may cause diarrhoea, vomiting, indigestion and prevent the child from taking breast milk, which possibly interferes with vitamin A metabolism (ENI, 1987). Accordingly it is advisable instead to use the butter in the weaning food of the child like porridge which will help in the absorption of the fat soluble vitamins.

Nearly 17% of the mothers did not feed their children with "colostrum", which is 2-6 times rich in vitamin A than breastmilk. The reasons for this were many and varied from household to household. Most mothers thought that it was not good for the child's health so they simply preferred to discard it. Apart from this, most of the mothers (63.8%) tended to breastfeed their children only whenever the child was crying.

The largest group of mothers, 87%, reported that they started weaning after 6 months of age with food stuff of different kinds as shown in Table 12. Vitamin A study in Arssi region, Ethiopia, has also reported the mean weaning age to be 6.6 months which is late as far as the child's requirement is concerned (Sole et al., 1987). Even though some of the mothers reported starting weaning before the age of 4 months, majority of their children as reported above are at a risk of late weaning. Therefore, from the results of this study and other related studies mentioned earlier it is understood that breastfeeding and timely weaning children with vitamin A rich foods are important in combating xerophthalmia in the study area.

5.4 Food habits and practices in relation to vitamin A deficiency.

The results obtained from the informal interview and from the sub-sample households, showed that many traditional factors could contribute towards aggravating the deficiency state. This is in agreement with a report in Ethiopia (Yemane, 1987) stating that socio-cultural patterns could be considered as contributory factors for malnutrition. These practices include sudden withdrawal of the breast during weaning (which results in a physiological trauma that in turn leads to poor appetite and vomiting), late introduction of weaning and others.

During food serving, it was reported that priority is given to elders and male heads in the household and the next may be the children according to their ages while the last to take a share is the mother who may be feeding a small child or lactating or pregnant. The food is therefore, offered to the family in the reverse order to that dictated by nutrient needs. It was also reported that most households preferred to sell their vitamin A rich foods such as eggs, chicken, milk, etc. A few also believed that their babies get worms if they feed them with solid foods. Muslim villagers were greater in number and some practised polygamy which contributes to a larger average family size, which may have contributed to maldistribution of available vitamin A rich foods. This figure is higher when compared to the regional average household size set before 4.8 persons (Office of the Population and Housing Census Commission, 1988).

Most members of the community in the study area reported that they never consumed some parts of animal flesh like liver, kidney and heart, which is quite unfortunate when one considers the nutritional value of these foods (in terms of vitamin A) and their low cost (Clive E, et al., 1987). Fasting also falls into a category of food taboo. The main difference from ordinary taboo is its temporary nature. In many conservative households, pregnant and lactating mothers are not exempted from fasting. For that matter the mother and new born baby will be exposed to low vitamin A intakes during the fasting periods. Informal discussions also suggested that foods white in colour and those supposed to increase the vitamin A intake were restricted in that pregnant mothers did not eat them.

During harvest time in the area, there are special feasts where remarkable overconsumption of food is practised especially by adult males. This might create a shortage of food for the rest of the period resulting in inadequacy of certain important nutrients like vitamin A. The informal interview also showed that fasting rules in the orthodox church are of two kinds, one governs the time for the consumption of food while the others governs the type. During a fasting day, this must not take place until after the sun has passed its noon position. The second fasting rule concerns the diet allowed, which must not contain any food of animal origin with the exception of fish, Meat, egg, milk and butter are the major groups in this list of restrictions. Generally, the periods of fasting vary from individual to individual. For common people, the total number

of fasting days probably amounts to 110-150 days a year, while others such as priests, monks and people connected with the church can reach 220 days. During the fasting period there is simply no non fasting food in the market, and even if meat or eggs could occasionally be found, the fasting mother does not like to touch them, let alone prepare such food. The consequence of illegally breaking the fasting rules is believed to be serious and the measures taken could be harsh. Excommunication can occur and this is much feared as it prevents burial in the church yard, which in its turn has the direct implication of the loss of the soul.

5.5 Summary

In summary, the study has showed that major dietary deficiencies exist, with respect to intake of vitamin A and that the situation is made worse by the various food habits practised in the area. The overall results suggest that the existing situation of blinding xerophthalmia in both villages is severe. Therefore, special attention has to be given to this problem giving particular attention to mothers, and children under the age of five years, in the area.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

This study has investigated the associations between the signs and symptoms of vitamin A deficiency in under fives in relation to the dietary intake in Arssi region of southern Ethiopia. The results indicate that vitamin A deficiency is a public health problem. The household frequency consumption of vitamin A rich foods in the study area is below the cut-off point (75% consuming at least 3x a week) recommended by IVACG confirming the inadequacy of vitamin A intake in the area. Further analysis shows that there is strong association between the frequency of feeding vitamin A rich foods and xerophthalmia.

Breastfeeding and weaning practices also appeared to be contributory factors to the high prevalence of xerophthalmia in the children. The significance of the association of xerophthalmia with the duration of breastfeeding and weaning was strong. Although not tested statistically, evidence from informal interview suggested that the prevalence of vitamin A deficiency is also aggravated by the food habits, beliefs and taboos of the study community. These include practises such as not giving colostrum to the new born child, late weaning, avoiding organ meat, etc.

The results strongly suggest that the public health

problem of xerophthalmia which existed in the area could be due to the insufficient consumption of vitamin A rich foods in association with the existing food habits and beliefs of the study areas. This study, in conjunction with other previous prevalence surveys, indicate that inadequate dietary intake along with different food habits and practices are responsible for high prevalence.

6.2 RECOMMENDATIONS

1. The available evidence suggests that vitamin A deficiency is a public health problem in spite of the fact that there are many vitamin A rich foods in the study area. It is therefore recommended that education programs be formulated to teach people to increase their dietary intake of vitamin A rich foods. Nutrition and health education of mothers is a fundamental long-range approach towards solving the problem of an inadequate intake of the vitamin and critical evaluation of the food practices of the community. These education programmes could be implemented by community workers such as community health agents, agricultural extension agents, community development workers and also through religious leaders, etc.

2. Vitamin A supplementation is an effective short-term solution in increasing the intake of vitamin A. Although this is an expensive intervention method, it would be the most effective way of combating the effects of the vitamin deficiency. The best supplementation program could be delivered through the health network and community channels. Capsules of large doses

of vitamin A should be availed and periodically given to children below the age of five years. Oral administration of 110 mg retinol (66 mg of the acetate, i.e. 200,000 IU) and half this dose for children below 12 months of age, every 4-6 months will protect the vast majority of recipients from blinding xerophthalmia. The vitamin can be given as a capsule or concentrated liquid.

3. Local weaning foods should be developed from locally available vitamin A rich foods as one other possible ways of preventing the development of vitamin A deficiency.

4. A health facility in the area should be strengthened and nutrition surveillance system has to be implemented.

5. Since other factors apart from dietary intake of vitamin A could possibly interfere with the deficiency state, further studies should be carried out in the area in order to determine the exact nature of the problem. Apart from this, it is also important to make dietary surveys during different periods of the year to identify the seasonal differences in the intake of foods rich in vitamin A and precursors.

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appedix A

Plate 1 The research site

Plate 2 Explaining the objectives of the study

Appendix B

Plate 3 Adminstering food frequency quetionnaire

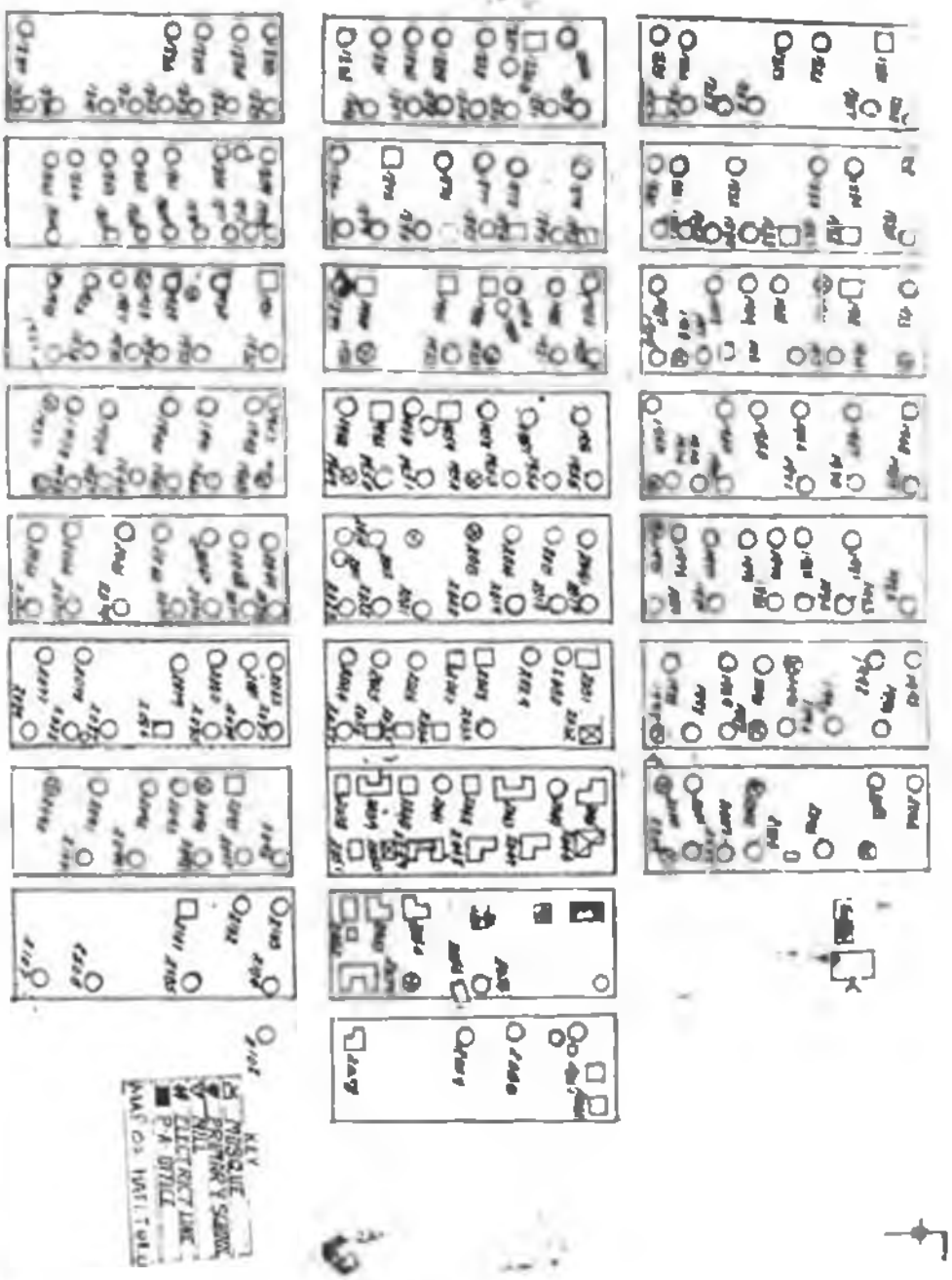
Plate 4 Collecting food habit information

Appendix C

Plate 5 Conducting clinical examination

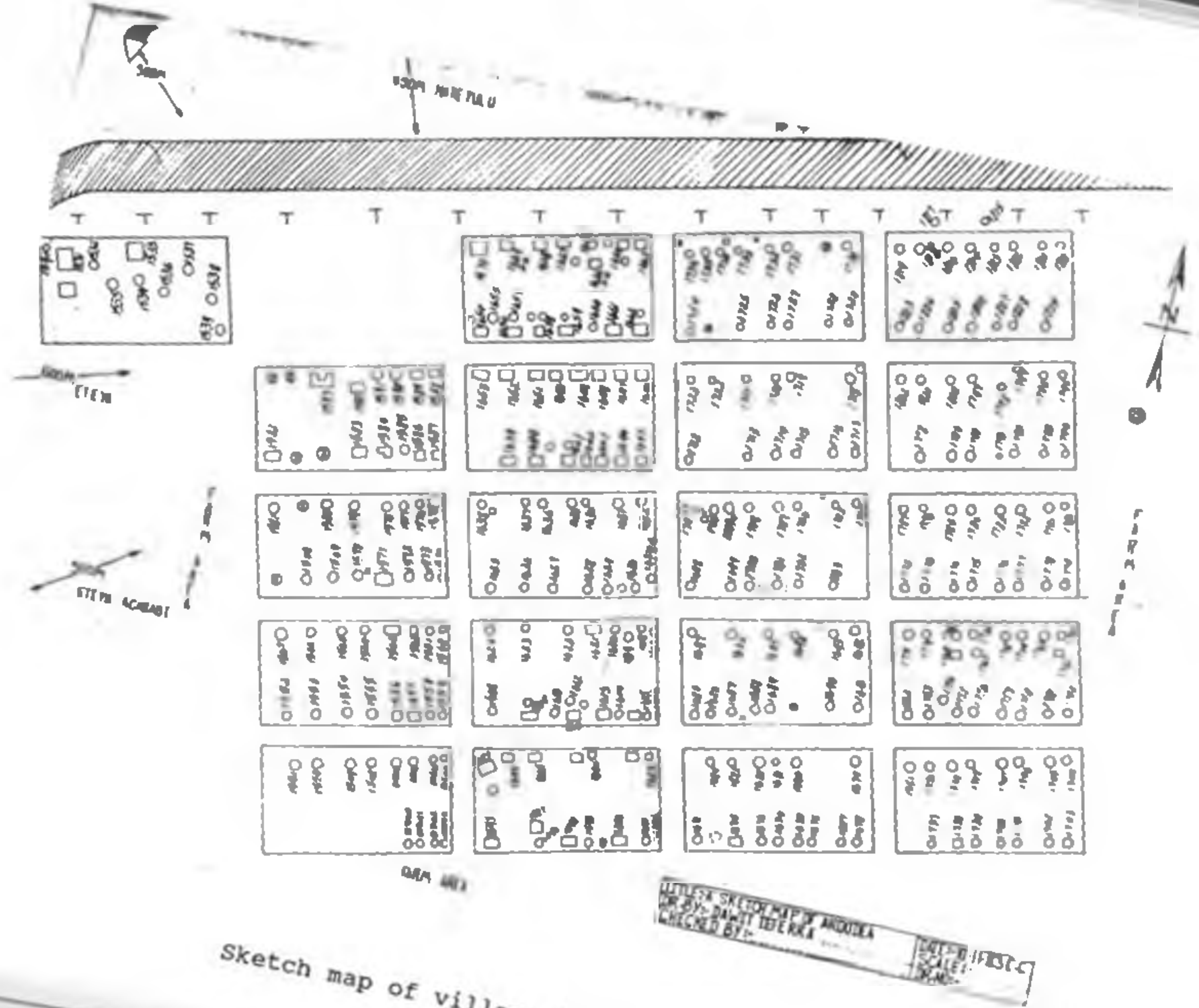
Plate 6 The head of the household, the mother and children during clinical examination

Appendix D



Sketch map of village Hatetulu

Appendix E



Sketch map of village Andode

Appendix F

DEMOGRAPHY QUESTIONNAIRE

Form No. 1 Page 1 of 1

1. Region_____District_____Village_____
2. Cluster: ABCDEF HH No_____Date_____
3. Name of Head of the Household_____
4. Ethnic group_____
5. Name of interviewer_____
6. Name of the respondents_____

SerNo	Name	Age	Sex	Rel toH/h	Edu	Relig
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						

Sex

1. Male
2. Female

Rel. to H.H

1. Head
2. wife
3. son
4. daughter
5. grand mother
6. grand father
7. brother
8. sister
9. Others

Level of Education

1. Cannot read/write
2. Can read/write
3. grade 1 to < grade 6
4. > 6 to < 12 grade
5. Above 12 grade

Religion

1. Orthodox
2. Catholic
3. Muslim
4. Others

Questionnaire on identification of local foods rich in Vitamin A

Form No. 2-a Page 1 of 1

1. Region _____ District _____ Village _____
2. Date _____
3. Name of interviewer _____
4. Name of respondent _____

1, Identification and list of all plants, animals and animal products rich in vitamin A(libraries,museums,etc.)

Cereals	Roots &tubers	Legumes	Vegetables	Fruits	Meat & Animal products

2 Identify and list locally available ones (agricultural offices)

3. Which ones of the above mentioned items are the H/H familiar with list? (H/h)

_____
_____
_____
_____
_____
_____

4. Which ones of the above do they currently use as child food? (H/h)

_____
_____
_____

Food Frequency Check list for larger samples

Form 2-b Page 1 of 1

1. Region _____ District _____ Village _____

2. Cluster ABCDEF - H.H.No. _____ Date _____
(circle)

3. Name of interviewer _____

4. Name of respondent _____

Below is a list of foods. Please tell me how many servings of these foods you give to your child each week, which foods you give seldom (less than six times per year), and which foods you never give.

Vitamin A containing foods	No of servings at least 3x a week	Seldom	Never	Seasonal
1. Dark green vegetables (spinach)				
Dark yellow vegetables (carrot)				
Other green vegetables (lettuce)				
Other vegetables (cabbages)				
2. Maize				
Beans				
Sorghum				
Peas				
Lentil				
Potato				
Sweet potato				
Other grains				
3. Citrus fruit or juices				
Other fruits				
Tomatoes				
4. Milk				
Yoghurt				
Cheese				
Butter				
5. Beef mutton				
Liver				
Heart				
Kidney				
Poultry				
Eggs				
Nuts				

6. Other foods not listed _____

Cluster: A B C D E F (circle) Household No_____ Name of HHH_____

Breast feeding and weaning survey

Form No. 4 Page 1 of 3

Date of Survey:_____: ____: ____: Name ofnterviewer_____

Name of respondent:_____

Part 2: Breast feeding and weaning information.
Question to be answered by the mother of thechild under 5 years of age.

Name of the subject:_____Sex: M F Age(Mos)_____

1. Are you still breast feeding your child: Y/N. :____:
If no, go to question 3.

2. If yes, when did you start breast feeding?

1. Immediately after birth

2. One to three days after birth

3. later.specify:_____

3. Why did you stop breast feeding? :_____:

1. Pregnancy

2. Birth of next-in-line child

3. Illness of mother/child

4. insufficient breast milk

5. child too old

6. other, specify:_____

4. How did you stop breast feeding?

1. From one day to the other :_____:

2. Over one week

3. Over a period of two or more weeks

4. Over more than a month.

Cluster: A B C D E F (circle) Household No._____ Date_____

Form No. 4 Breast feeding and weaning survey continued. Page 2 of 3

5. Did you feed colostrum to your baby? Y/N:

   1. If yes why? :_____:

   _____
   _____

   2. If No, why not?

   _____
   _____

6. For how long will babies feed breast milk only?

   1.< four months

   2.< six months > four months :_____:

   3. other specify :_____:

7. For how long should mothers breast feed their babies?

   1. 4 months

   2. 6 months :_____:

   3. 1 year

   4. above 1 year.

8. When do mothers breast feed their babies?

   1. Whenever babies cry

   2. Any time mothers find it convenient

   3. According to mothers time schedule

   4. Other/specify:_____

Cluster: A B C D E F Household No._____ Date_____
(circle)

Form No. 4 Breast feeding and weaning survey continued.

9. Are you giving to your child any food or drink other than breast milk? Y/N. :_____:

If yes, what, and what age did you start?

Liquid foods	Age (mos)
Cows milk	:_____:
fruit juices	:_____:
porridge	:_____:
others/specify	:_____:
_____	:_____:
_____	:_____:
_____	:_____:
_____	:_____:
Solid foods	
Bananas	:_____
Potatoes	_____:
Carrot	:_____:
Green vegetables	:_____:
Others/specify	:_____:
_____	:_____:
_____	:_____:
_____	:_____:
_____	:_____:

Comments:_____

10. What do you give by mouth to a new born baby for the first time.

Type of food	how long	Reasons

Cluster : A B C D E Household No._____ Name of HHH:_____

(circle)

Food habits and dietary practices survey

Form No. 5 Page 1 of 5

Date of Survey:_____: _____:____Name ofinterviewer:_____

Part 3 Food habits and dietary practices information. Questions to be answered by the mother of the child under five of age.

Name of subject:_____Sex MF Age (mos)_____

1. List diets that are consumed only during social events listed in the table below:

Social events	Type of diets		Duration	Types of people to whom the ceremony is organized	Reasons
	Food	drink			
Birth of child					
Circumcision					
Baptization					
Wedding					
Funeral					
New year					
True cross					
Christmas					
Easter					
Areia					
Moulid					
Others					

Cluster: A B C D E F (circle) Household No. _____ Date_____

Form No. 5 Food habits and dietary practices survey continued. Page 2 of 5

2. List down those diets that are restricted during social events listed in the table below:_____

Social events	Type of diets restricted	People affected	Duration of restriction	Reason for restriction
Birth of child	Food			
	Drink			
Circumsicion	Food			
	Drink			
Wedding	Food			
	Drink			
Funeral	FOOd			
	Drink			
Fasting	Food			
Drink				
Others				

Cluster: A B C D E F Household No._____ Name of HHH_____
(circle)

Form No. 5 Food habits and dietary practices survey
continued. Page 3 of 5

3. List down events when meat is consumed by the ethnic group.

Event	Type of animal killed	Prepared for		
		Men	Women	Children

4. In regard to culture, religion and beliefs of this ethnic groups, is there a non-edible part of flesh of animal killed.

Type of animal killed	Part of flesh avoided (non-edible part)	People who are restricted	Reason for restrictions

Cluster: A B C D E F (circle) Household No. _____ Date_____

Form No. 5 Food habits and dietary practices survey continued. Page 4 of 5

5. List down the priorities given during meal services within the family.

Who gets the priority

1st_____

2nd_____

3rd_____

4th_____

6. When a respective man or honourable guest comes to a family, a special dish like chicken wot, mutton, porridge etc is to be served. How do the children in the family get their share?

1. From common dish
2. Individual dish
3. Get no share at all

7. Methods used to store and preserve cooked food for longer period of time.

Type of Food	Storage or preserving material used	Storage or preserving material made of	Method of storage or presevation	Duration

Cluster: A B C D E F (circle) Household No. _____ Date_____

Form No. 5 Food habits and dietary practises survey continued. Page 5 of 5

8. ist down food and drink that are allowed and are not allowed for children in association with the following diseases.

Type of disease	Food & drink not allowed	Duration	Reason	Food & drinks allowed	Duration	Reason
Diarrhoea						
Fever						
Vomiting						
Measles						
Whooping cough						
Intestinal parasite						

9. Do you consume wild roots, tubers and fruits?
Y/N :_____:

If yes, list the local names:-

_____

_____

_____

_____

Cluster: A B C D E F (circle) Household_____ Name of HHH_____

Clinical manifestation survey
(Vitamin A deficiency)

Form No. 6 Page 1 of 2

Date of survey _____ _____ _____Name of interviewer_____

Name of respondent:_____

Part 4 Vitamin A deficiency status survey (child)
Conducting clinical examination and asking questions to the mother

Name of subject:_____Sex MF age (mos)_____

1. Clinical manifestation of the child

1 Conjuctival xerosis
2 Bitot's spots
3 Corneal xerosis
4 Corneal ulceration
5 Corneal scars
6 Normal

Question to be answered by the mother

2. Do you observe signs and symptoms of night blindness in your child.

Yes/No

If yes, how and at what age?

_____

_____

_____

Cluster: A B C D E F (circle) Household No._____ Date_____

Form No. 6. Clinical manifestation survey continued

3. Explain the cause of the disease?

_____

_____

_____

4. How do you control or prevent the problem?

1. home treatment
2. Traditional healer
3. Consult community health worker
4. Health centre
5. hospital
6. Did nothing
7. Other/specify

5. Mention if there is any traditional treatment?

_____

_____

_____

6. How long does it take to reach health service

1. less than 15 min.
2. > than 15 min < 1 hr.
3. An hour to two hrs.
4. More than two hours.