# FACTORS RELATED TO VITAMIN A SUPPLEMENTATION COVERAGE TO PRESCHOOL CHILDREN IN GUCHA DISTRICT, WESTERN KENYA

**BY**

**MOMANYI SUSAN MORAA**

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Community Nutrition and Development

School of Public Health and Community Development

**MASENO UNIVERSITY**

## ABSTRACT

Nutritional deficiencies account for 3 million child deaths annually in less-developed countries. Deficiencies of vitamin A are responsible for 0.6 million deaths and 9% of global childhood Disability-Adjusted Life Years (DALYs). Vitamin A supplementation will help achieve one of the millennium development goals of reducing mortality among children by two thirds by 2015.Vitamin A will reduce mortality because it boosts the immune system. However, vitamin A supplementation coverage is low in many parts of the world for example in India (37.6%), Mozambique (46%) and Kenya (33%). Gucha district is a malaria endemic region yet there is evidence that vitamin A supplementation reduces all cause mortality among children living in such regions. The main objective of this study was to identify factors related to vitamin A supplementation coverage to preschool children in Gucha District. A cross-sectional survey design was used and the study population consisted of 4840 caregivers from 4840 households, 85 health workers, 5 members of the district health management team and 3 key informants (divisional heads) giving a total population of 4933. Using multi-stage cluster sampling, 3 divisions were randomly selected out of the 5 divisions in Gucha District. Subsequently, 1 location was randomly selected from each of the 3 divisions. Finally, 1 sub-location was randomly selected from each of the 3 locations. After this, simple random sampling was used to select 334 households out of the total 4840 households with caregivers with a preschool child. Since there were 85 health workers in Gucha district, 25 health workers were included in the study to give a 30% representative sample. All the 5 members of the district health management team and 3 key informants were also included in the study giving a total sample of 367 respondents. An interview schedule on caregivers, questionnaires on health workers and a focus group discussion with the district health management team and the key informants were used to collect data. Chi square test and odds ratio were used for analysis to establish the relationship and strength respectively, between the dependent variable (vitamin A supplementation coverage) and the independent variables (household factors). The relationship was statistically significant when the p-value obtained was less than 0.05. Data from health workers and the district health management team were thematically analyzed using narrative approach. The study showed that the level of vitamin A supplementation coverage was low (41.2%). There was a statistically significant relationship between vitamin A supplementation coverage and the age of preschool children (p=0.000), education level of caregivers (p=0.008), and distance covered by caregivers to health facilities (p=0.009). Out of 25 health workers, 24(96%) knew the importance of vitamin A supplements, 12(48%) are trained on vitamin A supplementation, 3(12%) recorded in tally sheets after giving vitamin A supplements and 6(24%) explained to caregivers the reason for giving vitamin A supplements. The roles of the District Health Management Team on vitamin A supplementation are planning, training, supervision and awareness creation. The age of the preschool child, distance covered by caregivers to health facilities, education level of caregivers, poor documentation by health workers and reduced number of times of supervision by the district health management team are related to the low vitamin A supplementation coverage in Gucha District. The Ministry of Health should increase the number of health facilities, employ more staff, train more staff on supplementation and emphasize on the importance of documentation to its staff. This study will be important in improving child health nutrition and safeguarding human power development.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background Information

Vitamin A deficiency (VAD) is one of the three major micronutrient deficiencies in the world (Jiang et al., 2008). It is a major public health problem that causes high childhood morbidity and mortality. Latest estimates indicate that nutritional deficiencies account for 3 million child deaths each year in less-developed countries and deficiencies of vitamin A are responsible for 0.6 million deaths, and 9% of global childhood Disability-Adjusted Life Years (DALYs) (Andrew et al., 2008). One DALY is defined as the loss of one year of healthy life to disease (Muennig et al., 1999). Thus, reducing mortality among children by two thirds is one of the millennium development goals to be achieved by 2015. Consequences of VAD ranges from poor vision, compromised immune function, retarded growth and defective iron metabolism (Fiedler et al., 2000). Inadequate dietary intake of vitamin A is the major cause of VAD but increased requirements during infections and malabsorption due to the absence of fat in the diet aggravate it.

The highest VAD prevalence worldwide is found in parts of Africa and clinical indications in parts of Asia and Africa (Milagres et al., 2007). These children suffer from increased infections which has a financial implication on a country's national budget in relation to the health sector. In addition to that, they become less productive in future and hinder development because of their reduced work capacity. In Africa and in Kenya 32% and 40.6% of all preschool children respectively, are vitamin A deficient (UNICEF, 2004). As part of the global call to action, the

UN Special Session on Children in 2002 set as one of its goals the elimination of vitamin A deficiency and its consequences by the year 2010 (World Health Organization, 2003). Therefore, giving vitamin A supplements to children aged 6-59 months is currently the major intervention to address the deficiency.

WHO recommends high vitamin A supplementation at vaccination contact after 6 months of age since the first dose is given at 6 months of age. This recommendation was informed by a study in Guinea –Bissau which established that vitamin A supplementation is more beneficial when given with measles vaccine and harmful when given with DTP (Christine et al., 2009). Currently, vitamin A supplementation program for preschool children is a global program, organized primarily by UNICEF with an objective of increasing vitamin A supplementation coverage to 70% (two doses). Routine immunization services, national immunization days for polio eradication, measles, and multi-antigen campaigns have been used safely and successfully to provide vitamin A to a wide age range of children at risk (World Health Organization, 2003). The Integration of vitamin A supplementation with routine immunization services has been WHO/UNICEF policy since 1994. This integration was introduced in Kenya in 2002 (Ministry of Health, 1999). This system improves adherence among receivers and helps create awareness to both service providers and caregivers since it uses an existing program. Studies from Bangladesh, Brazil, and Indonesia concluded that, nutritional education and periodic social marketing and other potential delivery channels, such as private healthcare practices, could contribute to an increased adherence of supplementation program (Pangaribuan et al., 2004).

Vitamin A supplementation coverage is the extent to which the supplements are being delivered to the targeted preschool children. Generally, vitamin A supplementation program coverage falls short of what is recommended. Only 75% of children in Sub-Saharan Africa and 46% of children

in South Asia receive at least one dose of vitamin A annually (UNICEF, 2004). India which has a high absolute number of children has a low coverage (37.6%) of Vitamin A supplementation (Sachdeva & Datta, 2009). In Mozambique, a survey showed that only 46% of children received a vitamin A supplement (Aguayo et al., 2005). According to KDHS (2003), 33% of preschool children received vitamin A supplements in Kenya. None of the above three countries achieved the target coverage of 70% due to many obstacles that include poor management and socio-cultural characteristics. However in Kenya, recent experience shows that a high coverage can be obtained if distribution of vitamin A supplements is done through immunization campaigns or maternal child health days (*Malezi bora weeks*) (Kabaka et al., 2009).

Successful supplement distribution could depend on factors external to the distributor like recipient characteristics as well as personal attributes like literacy (Katz et al., 2002). A study in India highlights the importance of female education and indicates that vitamin A supplementation needs to be improved in children living in deprived areas like urban slums (Dole et al., 2009). Moreover, opportunities to administer vitamin A were underutilized in South Africa and the main problems identified by health staff were lack of vitamin A capsules, inadequate training of health staff and difficulties in implementing the Program (Hendricks et al., 2007). The age of the child, sex, birth order, residence, mother's education, age and wealth quintile influence the consumption of vitamin A supplements by preschool children in Kenya (Kenya Demographic and Health Survey, 2003).

Effective social information, communication, and mobilization like involvement of policy makers, decision makers, and opinion leaders in rallying the population around vitamin A supplementation is crucial in improving coverage (Aguayo, 2003).This could ensure that all children between 6-59months are given vitamin A supplements. Health facility attendance for

preventive services tends to drastically decline for older children, making it difficult to achieve adequate coverage of preschool children (Mora & Bonilla, 2002).The service providers also need to have knowledge on the importance of vitamin A supplements in order to improve coverage. Training, supervision and management are critical for vitamin A Programs. Therefore, vitamin A supplementation should be increased rather than abandoned (Humphrey & Rice, 2000).

## 1.2 Statement of the Problem

Studies indicate that vitamin A supplementation in children reduces mortality risk by 23% to 30% and attenuation in the severity of measles, malaria, and diarrhea (Oliveira & Rondo, 2007). Despite the introduction of vitamin A supplementation program in Kenya in 2002, vitamin A deficiency remains a public health problem in Kenya. A study done in Kenya reveals that 46.9% of preschool children are vitamin A deficient and it is most prevalent in Kwale, Mombasa, Kitui, Baringo, Kisumu, Kisii, Bungoma, Garissa and Mandera (Ngare, Muttunga, & Njonge, 2002).

Gucha district is one of the areas in Kisii where malaria is endemic and morbidity due to malaria may be associated with vitamin A deficiency. The integration of vitamin A supplementation program and immunization was aimed at improving coverage, but this is not the case in Gucha district that boasts of a very high immunization coverage of 96% and low one dose vitamin A supplementation coverage of 74% (Ministry of Health, 2008).Despite the low coverage, an evaluation of the vitamin A supplementation program in this district has never been done since its inception in 2002.

Considering the low vitamin A coverage and the public health importance of vitamin A in averting childhood morbidity and mortality, this study aims at determining both household and health facility related determinants of vitamin A supplementation program in Gucha district. In

Indonesia lack of access to other public health interventions and demographic factors contributed to the rate of malnutrition in children missed by the vitamin A capsule program (Berger et al., 2007). The results of this study will inform the process of identifying a sustainable strategy to improve on the vitamin A supplementation coverage to preschool children in the district.

## 1.3 Objectives of the study

### 1.3.1 Main Objective

The main objective of this study was:

To identify factors related to vitamin A supplementation coverage to preschool children in Gucha District, Western Kenya.

### 1.3.2 Specific Objectives

The specific objectives of this study were:

1. To establish the level of vitamin A supplementation coverage to preschool children.
2. To find out the household factors related to vitamin A supplementation coverage to preschool children.
3. To find out the service provider factors related to vitamin A supplementation coverage to preschool children.
4. To assess the role of the district health management team and key informants on vitamin A supplementation.

## 1.4 Research Questions

The following research questions guided the conduct of the study:

1. What is the coverage of vitamin A supplementation to preschool children?
2. Which household factors are related to vitamin A supplementation coverage to preschool children?
   a) What is the relationship between the age of the preschool child and vitamin A supplementation coverage?
   b) What is the relationship between the education level of caregivers and vitamin A supplementation coverage?
   c) What is the relationship between the distance covered by caregivers to health facility and vitamin A supplementation coverage?
   d) What is the relationship between the type of house caregivers live in and vitamin A supplementation coverage?
3. Which service provider factors are related to vitamin A supplementation coverage to preschool children?
4. What is the role of the district health management team and key informants in vitamin A supplementation?

## 1.5 Hypotheses

The study was based on the following null hypotheses:

1. There is no significant relationship between the education level of caregivers and vitamin A supplementation coverage.

2. There is no significant relationship between the distance covered by caregivers to the health facility and vitamin A supplementation coverage.
3. There is no significant relationship between type of shelter and vitamin A supplementation coverage.

### 1.6 Assumptions of the study

The study carried out was based on the following assumptions:

1. The population of caregivers is homogeneous since all caregivers reside in the same district.
2. All facilities in Gucha district offer vitamin A supplements to preschool children.

### 1.7 Significance of the study

Findings from this study may be used in formulating a long-term strategy of improving vitamin A coverage in Gucha District. Results from this study may also be used by Ministry of Health in policy formulation to cover other districts with similar problems. Gucha is one of the districts that UNICEF is working very closely with the Ministry of Health on the implementation of vitamin A supplementation program. The findings of this study are therefore likely to be useful to UNICEF when faced with similar challenges in other districts where they support similar programs. Therefore these findings will be important in child health nutrition and the government in safeguarding human power development.

### 1.8 Limitations of the study

The study was carried out based on the following limitations:

1. Only caregivers with a preschool child residing in Gucha District were included in the study.
2. Only health workers working in the Maternal and Child Health (MCH) clinics/departments were included in the study.

### 1.9 Conceptual Framework

Figure 1 illustrates the conceptual framework and selected indicators that were used to guide collection of study data. Vitamin A supplementation is influenced by both the service providers' factors and household factors. The household factors are age of the child, sex, birth order, age of the mother, social cultural characteristics, wealth quintile, education level, parity, health facility attendance, distance, economic activities, knowledge of vitamin A supplements, attitude towards supplementation and their practice. The service provider factors related to vitamin A supplementation coverage are training, supervision, management, age of health worker, sex of health worker, number of staff, health workers knowledge on vitamin A supplementation and their attitude towards supplementation.

Lack of funds will hinder the availability of supplements in terms of its delivery to all the health facilities and therefore it will not be consumed. Consequently, all these service provider factors and household factors will influence the consumption of these supplements. The coverage of the vitamin A supplements for the entire region will hence be low resulting to VAD and even death as indicated in Figure 1.1. For example lack of knowledge among the caregivers on vitamin A supplements influences its utilization/consumption. In addition to that coverage will be low resulting to vitamin A deficiency.

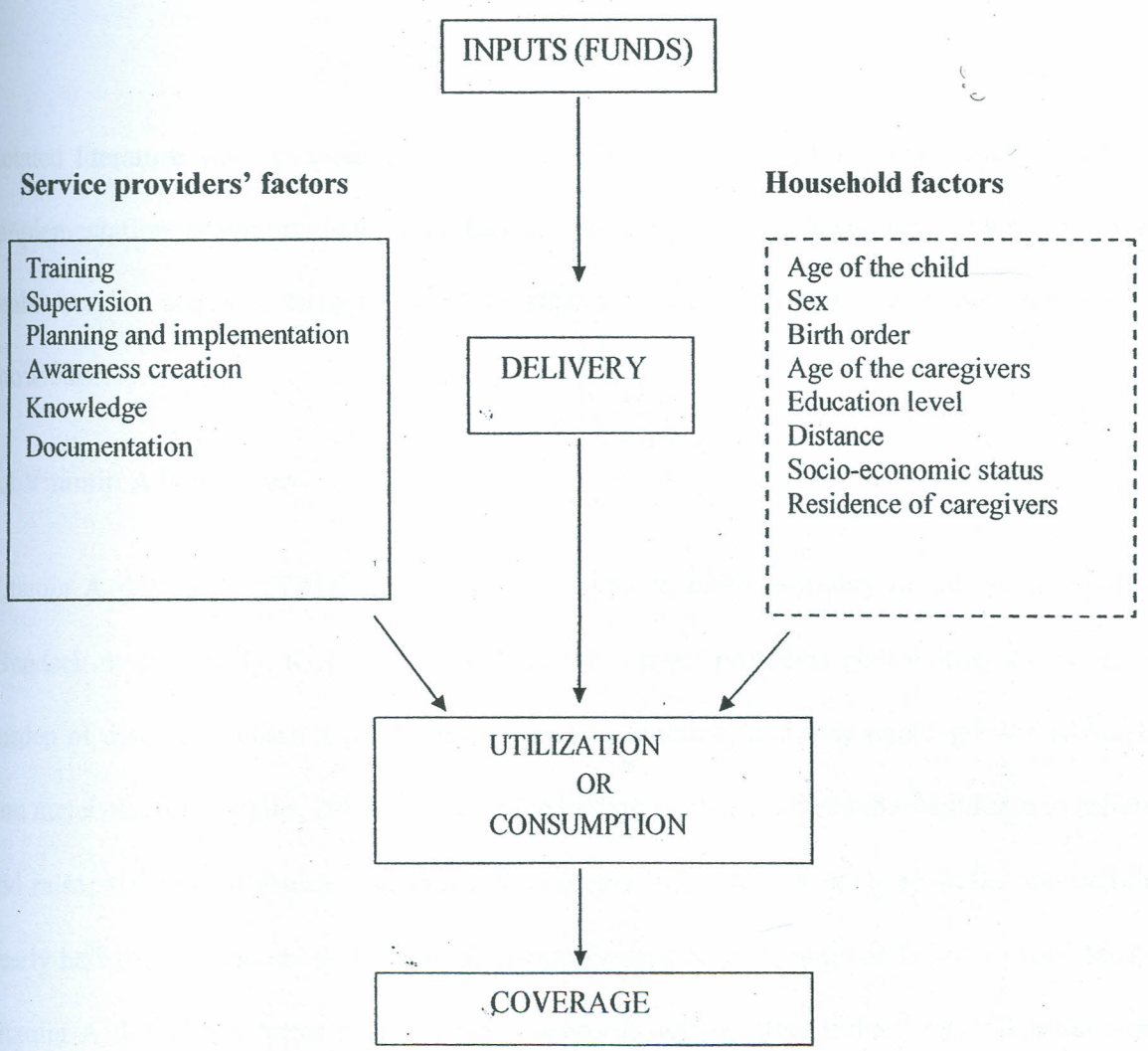


**Figure 1.1: Conceptual framework on factors influencing vitamin A supplementation**

# CHAPTER TWO

# LITERATURE REVIEW

Related literature was reviewed under the following topics; vitamin A deficiency, vitamin A supplementation programs, household factors related to vitamin A supplementation coverage, health service provider factors related to vitamin A supplementation coverage and gaps in knowledge.

## 2.1 Vitamin A Deficiency

Vitamin A deficiency (VAD) is a major contributor to child mortality in sub-Saharan Africa (Bendech et al., 2007). It is among the "top ten" health problems contributing to the global burden of disease because it compromises immune function, and may retard growth and affect iron metabolism (Hopkins, 2004). It is also the leading cause of preventable blindness in children and raises the risk of disease and death from severe infections. A study in India revealed that nearly half the childhood blindness in the North Eastern Region states of India is avoidable and vitamin A deficiency forms an important component unlike other Indian states (Harsha et al., 2008). The main causes of vitamin A deficiency in the developing world are insufficient intake of vitamin A and poor bioavailability of provitamin A sources (vegetables and fruits). Furthermore, other contributing factors are the increased requirements for vitamin A at certain stages in the life cycle (early childhood, pregnancy, and lactation) and during infection.

Globally, it is estimated that 0.6 million child deaths each year are attributed to vitamin A deficiency (Andrew, et al, 2008). Sub clinical forms of VAD may not cause any symptoms, but

the risk of developing respiratory and diarrheal infections is increased, growth rate is decreased, and bone development is slowed (Thakore, 2003). Consequently, these adverse effects are often noted in infants and preschool children. Darlow and Graham (2005) found that preterm infants have low vitamin A status at birth and this has been associated with increased risk of developing chronic lung disease.

## 2.2 Vitamin A Supplementation Programs

The Millennium Development Goals, to be achieved by the year 2015, were endorsed in 1999 at a meeting of the leaders of all United Nations member countries (Bloem, Kiess, & Moench, 2003). One of the millennium development goals is related to reducing mortality among children by two thirds. The World Health Organization recommends vitamin A supplementation (VAS) at vaccination contacts after 6 months of age to reduce mortality (Benn et al., 2009). Based on current knowledge about the effectiveness of vitamin A intervention in reducing childhood mortality, vitamin A programs can contribute substantially to reaching this millennium development goal of reducing childhood mortality. Semba et al. (2008) concluded that expanded coverage of the national vitamin A capsule program may help protect children from nutritional blindness and to help reach Millennium goals for reducing under-five child mortality in Ethiopia.

The national universal criteria set by UNICEF states that children 6-11 months should be given 100000IU dosage once during measles vaccination or any other contact. Children 12-59 months should be given 200000IU once every six months at an interval of 4-6 months during any MCH visits. Also, infants less than 6 months and not breastfed should be given 50000IU once at any contact. Disease targeted supplementation should be done when children are suffering from measles, acute diarrhea and severe protein energy malnutrition. A study in USA using a rat

model concluded that, early-life supplementation with vitamin A can prospectively benefit the primary and recall antibody responses to T-Cell Dependent Antigens (TD) administered at the young adult stage (Sankaranarayanan et al., 2007). Analysis of an outbreak of measles in Chandigarh, a slum in India, revealed that children who had not received Vitamin A supplements were most affected as compared to those who had received the supplements (Munesh, Vikas, & Swami, 2004).

Supplementation is the fastest way and the most widely used strategy to improve the vitamin A status of populations in which deficiency of this nutrient is endemic. Besides, universal periodic high-dose vitamin A capsule distribution is a cost-effective intervention to increase child survival in developing countries (Berger et al., 2007). In these programs, which are mainly aimed at young children, vitamin A is provided in capsule form and the three approaches, which are generally used, are universal distribution, targeted distribution to high-risk group and xerophthalmia treatment.

### 2.3 The Level of Vitamin A Supplementation Coverage

The effectiveness of supplementation programs depends on levels of coverage. For example, a coverage of 85% can result in a 90% reduction in the prevalence of xerophthalmia while a coverage of 25% is unlikely to have an impact on xerophthalmia (UNICEF, 2004). Efficient delivery strategies for health interventions are essential for high and sustainable coverage. In 1994, WHO/ UNICEF recommended integration of vitamin A supplementation program with immunization services and other related health interventions. This recommendation stems from the obvious reason that the Expanded Program of Immunization (EPI) is well established in most

developing countries where vitamin A deficiency is a public health problem. The integration of vitamin A supplementation program into routine and supplemental immunization services was meant to improve on efficiency, improve users satisfaction and convenience, and most important, to conveniently utilize the contact opportunities that immunization services offers. Moreover, routine immunization reach and coverage is often greater than other health interventions and is among the most equitably delivered health intervention. When supplemental immunization services for example Polio "mopping up" campaigns are focused on difficult to reach areas, vitamin A supplementation program is able to reach the vulnerable children that routine services do not reach.

Integration of vitamin A programs into immunization services has been practiced in many countries since 1994. In the initial years, countries successfully integrated VAS into the annual national immunization days (NIDs) activities which were designed to eliminate Polio. Vitamin A supplementation (VAS) program did therefore ride on the back of the Polio elimination initiative program. These efforts made many countries to achieve high coverage of VAS. However, with the announcement of the end of Polio NIDs in 2000, the support for vitamin A supplement dwindled and the coverage in many countries plummeted. For example, In Guinea the VAS coverage dropped from between 93 and 100% during the NIDs to 68% in the post NIDs period (Bendech et al., 2007). The search for alternative delivery strategies other than routine supplementation in fixed health facilities has yielded innovative strategies like the maternal and child health weeks in a number of African countries. Maternal and child weeks (commonly referred to as *Malezi Bora* Week in Kenya) are special days in the calendar of national health

activities during which all districts or their equivalents offer accelerated free child survival and maternal health services to their target populations.

The impact of this well intended integration has been a mixed fortune as confirmed by the coverage rates reported in the various countries. In most of the countries in Sub Saharan Africa, vitamin A supplementation coverage falls short of what is recommended(>70% for two doses). In 2001, 59 countries distributed vitamin A to preschool children and 13 of these countries achieved a coverage of 85% for only the first dose of vitamin A and at least 70% coverage for two doses unlike the 19 countries which distributed only one dose (Hopkins, 2004). It is important to note that the above coverage rates are based on administrative population figures which are not accurate and reliable in most developing countries compared to the figures found during surveys. One could therefore argue that the coverage is probably lower or uncommonly slightly higher than the reported rates.

A Demographic and Health Survey (DHS) in Nepal in 2006, revealed that vitamin A supplementation coverage among preschool children was 87.5% (Thapa, 2009). Nepal is one country that has managed to sustain this high coverage over a period of 15 years since the program was introduced. A critical analysis of the result of the DHS in Nepal identified children who continue to be missed by the program. The missed children (12.5%) disproportionally represented the poorest of the poor families, mothers with no formal education, and residents of rural areas and certain ecological and developmental sub regions. Further, Thapa (2009) argues that if program support ingredients and inputs are not interrupted, Nepal will be able to sustain the systematic improvement in coverage, improving service accessibility and reducing service inequity. A similar study (DHS) in Ethiopia revealed coverage of 46.8% (Semba et al., 2008). Contrary to the Nepal study, in Ethiopia, Semba et al. (2008) did not study programmatic factors

but only concentrated on the user's risk factors (caregivers education level) for not receiving vitamin A supplements. However, akin to the Nepal study, this study revealed that the level of education of the caregivers was strongly associated with the child receiving vitamin A supplements. In a nationally representative survey in Cambodia among 1547 preschool children, 42.8% received a vitamin A capsule within the last 6 months (Grover et al., 2008). Just like in the Ethiopia study, Grover et al. (2008) did not look into the programmatic factors influencing the vitamin A program. Maternal level of education was similarly associated with receiving vitamin A supplements.

In Africa, countries that have achieved a second round of vitamin A coverage greater than or equal to 70% are Burkina Faso 97%, Ghana 99%, Mauritania 89%, Niger 77% and Sierra-leonne 87% (UNICEF, 2005). In 2002, Korea, Mauritania, Niger and Tanzania achieved a second round of coverage greater than or equal to 70 % (UNICEF, 2004). However, the Kenya Demographic Health Survey, (2003) reported that only 33% of preschool children consumed vitamin A supplements in Kenya. Despite the fact that increased coverage of vitamin A supplementation would help to maximize the benefits for child survival (Berger et al., 2007).

A study in India using the 30 cluster sampling technique based on probability proportional size among 210 children reflects a low coverage (37.6%) of Vitamin A first dose supplements (Sachdeva & Datta, 2009). Analysis of the users risk factors for not receiving vitamin A supplements revealed that birth order, place of birth (health facility/home), and literacy of the mother were existing household determinants of vitamin A supplementation. Surprisingly and important to note is that the immunization status of the children did not influence vitamin A supplementation despite the fact that the two interventions/programs are integrated. Out of the children who had completed immunization, thirty (14%) children had not received vitamin A

supplements. This hints to missed opportunities in health facilities offering vitamin A supplements. To understand the reasons for the missed opportunities in health facilities the researcher should have carried out a missed opportunity survey that is advocated by the World Health Organization (WHO). Even if Sachdeva and Datta (2009) did not calculate the recommended vitamin A second dose coverage, one could suspect that it is much lower compared to the first dose supplement coverage further denying the children the health benefits of vitamin A. This study did not allow analysis of data from individual cluster, a known limitation of the 30 cluster coverage survey which is normally advocated by the WHO when assessing coverage of either vitamin A or immunization services. However, because this type of analysis is important for purposes of directing attention and support to facilities and areas that need it most, Lanata, Stroh, & Black, (1988) suggest that the Lots Quality Assurance Survey could have been used.

Vitamin A supplementation program can reduce resources spent on other health programs like malaria if integrated. An investigation of the cost and efficiency of vitamin A supplementation programs in Philippines, reveals that, maintaining a universal supplementation program provides a more acceptable public health policy which reduces direct Government expenditures on vitamin A programs by nearly 20% and reduces the number of children with vitamin A deficiency by 12% (Fiedler et al., 2000). Additionally, a study on analysis of costs per death averted in Ghana, Nepal and Zambia demonstrates that, vitamin A supplementation is highly cost effective relative to other primary health interventions and the authors suggested that vitamin A supplementation should receive priority consideration when allocating resources to primary health interventions (MOST & USAID, 2004).

In Pakistan vitamin A supplementation is used to save lives amongst preschool children (Bharmal & Omar, 2001). Routine vitamin A supplementation program in Kenya started in 2002 with the objective of promoting, strengthening and increasing routine vitamin A supplementation among preschool children to 90%. In-order to achieve this objective, health care personnel capacity and existing logistical services under the expanded program on immunization were strengthened to support vitamin A activities in their routine primary health care activities (Ministry of Health, 2003).

Process Indicators for monitoring and evaluating vitamin A programs are very essential for any program to succeed (Bloem et al., 2003). To increase and maintain high coverage rates, Indonesia uses an approach that informs providers on how to ensure a well-functioning distribution system, timely procurement of adequate capsules and health worker knowledge on vitamin A supplementation. These indicators have been used effectively to develop, refine and monitor the vitamin A supplementation program in Indonesia (Hellen Keller International, 2003). In addition to that, vitamin A supplementation coverage has been found to be the most basic process indicator for monitoring vitamin A supplementation programs. Information about access to health services is also used to monitor and support this program because the vitamin A supplementation program is linked with ongoing health care services. Therefore, comprehensive surveillance systems or multiple data collection systems are essential for monitoring the progress of the vitamin A supplementation programs.

Effective monitoring is of special importance to the success of vitamin A supplementation program because it increases coverage of those at highest risk. Issues important in establishing monitoring activities for vitamin A supplementation programs are supply management, recording

of doses received, sustaining supplement distribution and community awareness (World Health Organization, 2003). When monitoring provision/delivery, an adequate and timely flow of vitamin A supplements is fundamental to an effective program. Setting local targets for supplementation activities and assessing the quality of service (indirectly measured through supervision, training and awareness creation) are also important.

Ownership by consumers is a critical element of successful development programs. Therefore, it is essential that monitoring and evaluation be informative, transparent and increase awareness among consumers (Bloem et al., 2003). For instance, consumers should be able to demand an adequate quantity and quality of vitamin A capsules. Also the percentage of health workers who follow supplementation guidelines can be used to direct support and supervision of program staff.

When monitoring utilization, indicators of the use of supplements offered by health or community services provide a measure of distribution and potentially, demand for vitamin A supplements. Information on service use, disaggregated by target group and administrative or geographic area, can provide decision makers with crude estimates of program effectiveness, targeting effectiveness, and levels of community awareness and compliance (Aguayo, 2003). The sources of data for utilization are routine written and verbal reports by district, local medical officer and other health workers. Activity reports from NGOs and agencies distributing vitamin A supplements are also used. Comparing trends in the use of services with targets stipulated in local and national plan of action can help program managers identify health centers with low utilization rates. This may indicate distribution problems at the health center level, low quality of services resulting from inadequate staff training or supervision, or more general problems of

community awareness or confidence in the services providing vitamin A supplements. Data on use may also indicate too many missed opportunities for supplementation or supplement wastage.

### 2.4 Household Factors Related To Vitamin A Supplementation Coverage

Household factors related to vitamin A supplementation coverage are age of the child, sex of the child, birth order of the child, education level of caregivers, residence of caregivers, distance covered by caregivers to health facility and socio-economic status. A study among 289 children in India reported a low coverage (37.6%) of vitamin A supplementation and went further to analyze them with regard to selected variables like religion, gender, birth order, place of birth, immunization status and literacy of mother (Sachdeva & Datta, 2009). These analyses showed that majority (89.9%) were Hindu, males (55.7%), of birth order-one (48.1%), born in a health institution (57%) and received first dose of vitamin A supplementation. Thirty children though fully immunized for vaccine-preventable disease up to the age-of-one year had not received vitamin A-first dose supplement because of a missed opportunity and there was an association between receipt of vitamin A by the child and literacy status of mother (Sachdeva & Datta, 2009).

Socio economic status is a household factor that also affects vitamin A supplementation coverage among preschool children and wealth quintile can be used to segregate the population into poor/low status and rich/high status. An investigation in Philippines revealed that introducing a targeted vitamin A supplementation program to only the poorest municipalities (where the prevalence of VAD is the highest) could provide a more acceptable public health policy than in urban areas (Fiedler et al., 2000). Also in Nepal, the children missed by the

vitamin A supplementation program were found to disproportionately represent the poor families, mothers with no education, and residents of rural areas and certain ecological and development sub regions (Thapa, 2009).

Awareness creation is very important in vitamin A supplementation because people would understand why vitamin A supplements are consumed, when and where to get them. In Nepal awareness of the importance of vitamin A was higher in the vitamin A program districts than in non-program districts and clinical vitamin A deficiency was most prevalent among children who had not received vitamin A during the most recent vitamin A capsule distribution (Gorstein et al., 2003). Similarly, in Indonesia lack of access to other public health interventions and demographic factors contributed to the rate of malnutrition in children missed by the vitamin A capsule program (Berger et al., 2007).

Greater maternal formal education appears to be an important determinant for receipt of a vitamin A capsule by preschool children. This could be attributed by the fact that vitamin A supplementation messages are communicated in posters and in a language that requires formal education. A study in Philippines concluded that children whose mothers did not complete primary education and children living in poor households were less likely to receive vitamin A supplements (Choi, Bishai, & Hill, 2005). In a survey in Cambodia among 1547 preschool children there was no significant difference in paternal education, child age, fever within the last 2 weeks, stunting, underweight or wasting between children who did or did not receive a vitamin A capsule but maternal education was associated with child receiving a vitamin A capsule compared to no formal education (Grover et al., 2008). In Ethiopia maternal education and paternal education were associated with the child receiving a vitamin A capsule compared with no years of formal parental education (Semba et al., 2008).

Health facility attendance is very important in preschool children because they can get vitamin A supplements if missed during routine distribution or if the child is suffering from diarrhea, malaria and measles. In Indonesia a study was done among children in urban slums and it was revealed that, children who do not receive vitamin A supplements tend to be slightly more malnourished and ill, and are more likely to come from families with higher child mortality than children who receive vitamin A (Berger et al., 2008). In addition to that, children who are not reached by the vitamin A program are also less likely to be reached by the vaccination and other services emphasizing the need to identify and extend efforts to reach non- participants.

Socio-cultural characteristics also influence the intake of vitamin A supplements in a community. A study among women in Ghana receiving vitamin A supplements highlighted potential barriers like the idea of 'doctor' medicines as curative, false expectations of the supplement, forgetting to take the supplement, losing the supplement, travelling, lack of motivation, perceived side-effects, concerns that the supplement is really family planning or will make delivery difficult, and concerns about taking the supplement with other 'doctor' or herbal medicine, or when pregnant or breast-feeding, or if childless (Hill et al., 2007). These factors could also apply to preschool children since their caregivers are mostly women. In Kenya the age of the child, sex, birth order, residence, mother's education, age and wealth quintile influence the consumption of vitamin A supplements by preschool children (Kenya Demographic and Health Survey, 2003).

Studies discussed above have identified the household factors related to vitamin A supplementation as age of the child, sex, birth order, age of the mother, social cultural

characteristics, wealth quintile, education level, parity, health facility attendance, distance covered by caregivers to health facility, economic activities, knowledge on vitamin A supplements, their practice and attitude towards supplementation.

### 2.5 Health Service Provider Factors Related To Vitamin A Supplementation Coverage

There are many health service provider factors related to vitamin A supplementation coverage. A cross-sectional random cluster survey conducted in Guinea in July 2003 showed the national coverage rate of 68% to be much lower than the official coverage rate of 93% and Middle Guinea, the region most affected by VAD, had the lowest coverage rate of (58%). It was suggested that in order to increase overall VAS coverage and reduce regional disparities, mass VAS be organized on a regional level, prioritizing rural regions (Bendech et al., 2007).

Lack of training amongst the health workers influences vitamin A supplementation coverage. Training emphasizes more on the importance of giving vitamin A supplements, dosages, documentation and informing the caregivers the importance of vitamin A to children. Adequate training and flexible delivery mechanisms enhances quality of service, utilization and hence important for high coverage. During vitamin A supplementation campaign in one state in India some children died. Ramachandran (2001) reported that health workers were not trained on the correct way of administering the dosage resulting to the deaths of the children. The benefits of vitamin A in reducing childhood mortality were not experienced among the Indian children probably because the dosage was little and the frequency of giving was less. Health workers who are not trained may not see the need of timely reordering and delivery of supplies to peripheral areas. They may also have poor practices in maintaining buffer stocks, inventory and stock

rotation. In Niger, training and supervision tools are developed at the central level and adapted at the district level to the specific needs and realities at the districts (Aguayo, 2003).

A cross-sectional study in Mali in 2006 by Ayoya et al. (2007) assessed the professionals' (health workers) knowledge on vitamin A and various aspects related to the supplementation strategy. The subjects were health agents who participated in the national nutrition weeks (campaigns) and administrative leaders. The results showed that at least 80% of the children received the supplement and knowledge about VAS was high among the administrative leaders and health professionals. The planning and implementation of activities at the district level in Mali were also found to be good in general. It was then concluded that National Nutrition Weeks (campaigns) provide a successful example of a periodic VAS strategy with high coverage among children aged 6-59 months in Mali.

Lack of supervision by the DHMT members in the district influences vitamin A supplementation coverage. Supervisors have to be trained to supervise, not just to administer vitamin A supplements. Supervision, ought to be seen as essentially providing on-the-job training and solving problems rather than as an inspection function. Therefore, it must be sensitive, consistent, flexible, and frequent (Aguayo, 2003). Both quantity of vitamin A supplements based on the target preschool children and quality of the vitamin A supplements based on the expiry dates have to be considered.

Supervision at the district or comparable levels of intermediate management also requires attention. It is the level from which operations research questions are posed for higher-level consideration. Supervision entails supply monitoring, which involves tracking quantities of supplements at both the district and provincial levels. Provincial staff collect information on the

number of capsules received and distributed and calculate the balance. To assess provision of supplies and services, supervisors check the availability and accessibility of vitamin A capsules. For example in Philippines, a modified form used at the municipal level monitors activities of rural midwives. It includes questions about supplies as well as midwives' practices when providing and administering the supplements (World Health Organization, 2003).

Although previous studies have examined the prevalence of vitamin A deficiency, the factors that may influence the use of supplements in preschool children have never been explored. Stella, Michael, and Peter (1997) conducted a study on Vitamin-Mineral supplement use among preschool children in the United States in1991 to examine the health services factors associated with supplement use. Data of 8285 mothers with preschool children interviewed for the 1991 Longitudinal Follow-up to the 1988 National Maternal and Infant Health Survey was used. Statistical techniques included bivariate and weighted multiple logistic regression analysis. The results showed that children who received any supplements tended to be receiving care from a private health care provider. Interestingly, from this study by Stella, Michael, and Peter (1997) the results showed that the source of the health care provider was not related to giving of supplements, suggesting that few differences exist in the advice on supplement use by private or public health care providers. However, it was concluded that children's use of supplements may be more of a parent-initiated health practice that is more influenced by sources other than pediatric health care providers.

Lack of proper management by the stakeholders and the team in charge of vitamin A supplementation like the DHMT members hinders supplementation. Management approaches have to take account both of the services to be delivered like administering vitamin A

supplements, their organization like the target preschool children and the socio-cultural characteristics of preschoolers targeted for vitamin A supplements. An essential tool of intermediate field management is a good monitoring system to provide early warning of performance problems in particular geographical or functional areas for example the use of tally sheets and child health cards after administering the supplement. This is essentially a level for planning, budgeting and administrative decisions based on interaction with the top project management and feedback from below, on issues related to vitamin A supplementation coverage among preschool children.

Childhood immunization program may provide infrastructure for delivering vitamin A supplements to infants in developing countries. A study of 27 villages in Bogor district, Indonesia on integration of vitamin A supplementation with the expanded program on immunization was done (Richard et al., 1999). A randomized, double –blind, placebo controlled clinical trial was conducted to determine the effect of giving vitamin A supplements simultaneously with trivalent oral polio virus vaccine (TOPV) on antibody responses to polio virus. Infants (n=467) received oral vitamin A supplement, 15mg retinol equivalent (RE), 7.5mg (RE) or placebo with TOPV at 6, 10 and 14 weeks of age. Antibody responses to polio virus neutralization assay was measured at enrolment and at 9 months of age. Seroconversion rate to polio virus 1, 2 and 3 ranged from 98 to 100% in the three treatment groups and there were no differences in mean antibody titers to poliovirus types 1, 2 and 3 among treatment groups. This study demonstrated that oral vitamin supplement does not affect antibody responses to poliovirus vaccine when integrated with the Expanded Program on Immunization. Therefore, vitamin A supplements can be given during polio campaigns to improve on the vitamin A supplementation

coverage or vitamin A supplements can be given together with polio during immunization without affecting the effectiveness of polio.

Under certain circumstances, vitamin A supplementation to infants has the potential to improve the antibody response to some vaccines, including tetanus and diphtheria toxoids and measles (Villamor & Fawzi, 2005). Consequently, linkage with immunization/integration may improve vitamin A supplementation coverage because of the opportunity health workers have to these children. An Intervention study of mass distribution of vitamin A to preschool children in Chandigarh, India, which achieved coverage of 99%, concluded that linking of vitamin A distribution with National Immunization Days improves coverage (Swami, 2002). To ensure high coverage of 85% to children where utilization of health services is high, they should be given vitamin A routinely during health contacts. Where utilization of health services is not high, vitamin A should be distributed during immunization campaigns. Routine supplementation should occur immediately before the season when incidence of diarrhea, measles and other infectious diseases is highest. In addition to that, Vitamin A should be given during sick child visits when needed (Hopkins, 2004). Tanzania's success in achieving over 80% vitamin A coverage for children 6-59 months is due to the strengthened supplementation through routine services and using innovative approaches, such as child health weeks, to assure coverage in difficult to reach populations (USAID, 2005).

In addition to that, program ownership promotes awareness through mobilization improving vitamin A supplementation coverage. In the Philippines, lack of a smooth transfer of program ownership to local government units, and lack of capability to manage the vitamin A

supplementation program, attributed to the low vitamin A supplementation coverage. Pedro (2002) reported that low public response due to inability of the program to provide supplies on time, lack of promotion and social mobilization, low awareness of mothers and the community, few volunteers, waning enthusiasm among health workers due to lack of support by local executives and inadequate knowledge about the benefits and importance of micronutrients led to the low vitamin A supplementation coverage.

Sustainability also influences coverage in the sense that a program that is sustainable will have a high supplementation coverage unlike one that is not. Stakeholders interested in or already working to control VAD need to be organized to plan future directions and raise awareness in other stakeholders about the importance of controlling VAD. If the results of ongoing and planned trials involving antenatal micronutrient supplementation confirm the benefits of such interventions, the success and sustainability of programs may be enhanced through a better understanding of the characteristics of distributors and recipients (Aguayo, 2003). For sustainability training on the benefits and protocols for giving vitamin A should be included in pre-service and in-service training in the Ministry of Health programs. Demand for vitamin A should be raised and supported in the community and information dissemination about the benefits and safety of vitamin A should be emphasized. Lastly, community volunteers should be involved at distribution sites to ensure high coverage of vitamin A supplementation during campaigns. Therefore, the ministry of health and other stakeholders like UNICEF should ensure the issues mentioned are addressed to achieve a high coverage.

Lack of motivation like failure of caregivers demanding vitamin A supplements hinders vitamin A supplementation coverage. In a situation characterized by low technology and knowledge and high uncertainty about outcomes, the tasks of service providers often are not clearly defined or are intrinsically hard to measure and therefore not easily monitored. Furthermore, a lack of demand from the clients and their generally marginalized status act as disincentives to workers' concentration on services to them.

Health workers characteristics like age, sex, ethnicity, knowledge, attitude and education level influences vitamin A supplementation coverage. Recipients would interact most with those health workers of the same characteristics like age. Katz et al. (2002) reported that in Indonesia successful supplement distribution depended on factors external to the distributor (village, household, and recipient characteristics) as well as personal attributes (age and literacy). Illiterate distributors related better to women who were more like them, leading to increased compliance. A similar result was seen in a vitamin A supplementation program for preschool children in Indonesia, where village-based male distributors with less education had higher coverage rates.

Lastly, the amount of time spent distributing supplements and the number of staff supplementing has an effect on coverage. Few staff that work long hours will be inefficient in distribution due to fatigue. In Mali distributors with low coverage rates had an average of 13 more recipients and 4 more hours of work (Ayoya et al., 2007). Thus, work conditions (hours spent and number of recipients) were associated with low coverage.

Studies discussed above have identified the health service provider factors related to vitamin A supplementation as training, supervision, management, motivation, number of staff, knowledge, attitude and health workers characteristics like age and sex.

## 2.6: Existing gaps in knowledge

Studies on factors influencing vitamin A supplementation coverage to preschool children, concentrate more on service receivers (household factors) than the service providers. Both service provider's factors and service receiver's factors influence vitamin A supplementation coverage to preschool children. In addition to that, few countries keep data on vitamin A supplementation coverage and little is known about the level of coverage at district level. The study described in this thesis therefore identified both the household factors and the health service provider factors related to vitamin A supplementation coverage to preschool children in Gucha district and assessed the level of vitamin A supplementation coverage in Gucha district since it remains unknown.

# CHAPTER THREE

# METHODOLOGY

## 3.1 Area of Study

Gucha District is one of the 12 districts of Nyanza province in western Kenya. According to the District Development Plan, Gucha district, 2002-2008, the district has a population of 530,000 people with a population density of 795 persons per Km Square (Ministry of Planning - Gucha District , 2002). The fertility rate in Gucha District is 5.2. The district covers an area of 66.8 km square. The district is found on the Kenyan highlands west of the Rift valley. It shares common borders with Kisii Central District to the north, Migori District to the west, and Trans-Mara District to the south. It lies between latitudes 0 degrees 30' and 0 degrees 58' south and longitudes 34 42' and 35 05'. It is divided into 5 administrative divisions and 3 constituencies.

The District has a highland equatorial climate with an average annual rainfall of 1500ml suitable for agriculture; and is generally hilly with most areas above 1,800 m above sea level. Most parts of the district have red volcanic soils, which are deep and rich in organic matter. The predominant economic activity in the district is farming of tea, coffee, and sugarcane. Other economic activities include brick making, soapstone mining for carvings, and subsistence dairy farming. It is estimated that 57% of the district's population are absolutely poor, based on a poverty line of ksh 1,239 per adult equivalent. The staple foods include maize, bananas, traditional vegetables and kales.

Gucha District has 38 health facilities offering immunization services to preschool children. These facilities are randomly distributed in the five administrative divisions within the District.

They include one district hospital, two sub-district hospitals, five health centers, two private clinics and twenty seven dispensaries (Ministry of Health, 2008). Ogembo division and Sameta division have 9 facilities each while Nyamache division has 7 facilities. Kenyenya division and Nyacheki division have 8 facilities and 5 facilities respectively.

The integration of vitamin A supplementation at six months with the routine immunization Program was done in January 2002. This integration process was piloted at the District hospital and slowly spread to the peripheral health institutions. Vitamin A supplementation and immunization coverage for Gucha District for the year 2008 was 67% and 96% respectively (Ministry of Health, 2008).

### 3.2 Research Design

The study adopted a cross-sectional survey among the study population. This is a type of design where data is collected once and analyzed.

### 3.3 Study Population

The respondents involved in the study were 4840 caregivers in households within Gucha District who had a preschool child. In a case where there was more than one preschooler in a household, then simple random sampling was used to select only one preschool child. A preschool child in this case was eligible for vitamin A supplementation and this study was limited to 4840 households with caregivers in the entire District.

In addition to that, other respondents involved in the study were health workers in the health facilities in Gucha District. According to the Gucha District Health Plan (2009), there are 38 health facilities and a total of 85 health workers in the District. These facilities offer

immunization with at least one health worker per facility in the Maternal and Child Health clinic (MCH). The health workers targeted in these facilities are charged with the responsibility of giving vitamin A supplements to preschool children.

The District Health Management Team (DHMT) and the key informants in the district were also included in the study. There is one DHMT consisting of only five members namely; District Medical Officer of Health, District Nutrition Officer, District Public Health Nurse, District Medical Records Officer and the District Public Health Officer in Gucha District. This team is charged with the responsibility of conducting supervision and management of Vitamin A supplementation program within the District. They also train health workers on Vitamin A supplementation. There are also 5 divisional heads who are the key informants to caregivers in the district since they are responsible for mobilization and awareness creation. Therefore, the study population consisted of 4840 caregivers, 38 health workers, one DHMT team comprising 5 members and 5 key informants at the time when the study was conducted (June & July 2009).

### 3.4 Sample Size and Sampling Procedures

Multi-stage cluster sampling technique was used whereby three divisions out of the five divisions in Gucha district were randomly sampled and involved in the study. From each of the three divisions one location was randomly sampled giving a total of three locations. One sub-location from each of the three locations was then randomly selected. Simple random sampling technique was then used to select the households with an under-five child in these sub-locations which were included in the final sample. These sub-locations included Emenwa (1200 households), Boochi (2346 households) and Kenyerere (1294 households). The rationale of

selecting the sub-locations was to cut down on cost of travelling based on the limiting funds. A sample size of 334 caregivers was calculated using this formula (Mugenda & Mugenda, 2003).

$nf = n/(1+(n/N))$

Where $nf$=desired sample size (when population is <10000)

N= the estimate of the population size i.e number of households 4840

n= desired sample size (when population is >10000)

$n = Z^2pq/d^2$

z= standard deviate which is 1.96

p=proportion in the population with characteristics under study i.e vitamin A supplementation coverage in Gucha is 74%

q= 1-p

d= level of significance set is 0.05

$n = (1.96)^2 0.74 \times 0.26/ (0.05)^2$

$n = 296$

$nf = 296/(1+(296/4840))$

$nf = 279$

279+20% non response =334

The sample size was achieved by distributing caregivers proportionately among the three sub-locations using the following formula.

$Y = 334X/N$

Where Y= Number of households (caregivers) required in the sub-location in question

X=Total number of households (caregivers) in the sub-location in question

N=Total population of households (caregivers) who are in the three sub-locations

Based on the above formula, 82 caregivers were chosen in Emenwa Sub-location, 161 caregivers in Boochi and 90 in Kenyerere. Simple random sampling technique was used to select 334 (279+20% non-response) caregivers in households with a preschool child from the 4840 households.

These three divisions have a total of 25 facilities: Ogembo division (9 facilities), Nyamache division (7 facilities) and Sameta division (9 facilities).There is one health worker in each of these facilities who gives vitamin A supplements to preschool children giving a total of 25 health workers. These 25 health workers were included in the study to give a representative sample (30%) of the entire district since there are 85 health workers in Gucha district. Finally, there are 5 DHMT members in Gucha district and 3 divisional heads (key informants) for the three divisions selected who were also included in the study giving a total of 8 members.

### 3.5 Ethical Consideration

The researcher obtained a letter of introduction from Maseno University and research permit from the Ministry of Education Science and Technology. The District Medical Officer of Health of Gucha District and the Divisional heads were informed and briefed on the objectives,

procedures and the requirements of the research. The researcher sought verbal consent of the respondents and briefed them on the research procedures and assured them of confidentiality.

### 3.6 Research Instruments

The following research instruments were employed in the study:

#### 3.6.1 Interview schedule

This was the main instrument that was used to collect data from caregivers and it was filled by the researcher. It was used to collect information on the socio-demographic and economic characteristics of the caregivers and preschool children, their knowledge on vitamin A, and their source of information on vitamin A.

#### 3.6.2 Questionnaire

This was the main instrument used to collect information from the health workers and it was filled by the healthworkers. The questionnaire was used to collect information on the health workers demographic characteristics, assess their knowledge of vitamin A supplementation including documentation, and their level of training on vitamin A supplementation.

The questionnaire was used to collect information from the health workers on their knowledge on vitamin A supplementation, training on vitamin A supplementation, documentation of vitamin A supplements, duties performed, staff available, age range of children visiting the facility for vitamin A supplements, and supply of vitamin A supplements.

#### 3.6.3 Focus Group Discussion

This method was used to collect information from the District Health Management Team. A focus group discussion was conducted using an interview guide to better understand the roles

played by the different members of the District Health Management Team and how their roles complement each other. Particularly, their roles on training, supervision, management, mobilization and awareness creation of vitamin A supplementation program were explored. This instrument was also used to capture suggestions from the District Management Team Members. The key informant interviews were used to gather information from the key informants in this case the chiefs and village elders on their role in vitamin A supplementation, especially on awareness creation, and on how best the program could be improved.

### 3.7 Pre-testing of the Instruments

The research instruments were pre-tested in Gucha district before the onset of fieldwork on 10% of the sample to improve on the research instruments. This was done on 30 caregivers, 3 health workers and 1former DHMT member. This was to help check if all the questions were understood clearly and if they covered the problem under investigation. This only included subjects(caregivers, health workers and DHMT member) who did not participate in the main research. Pre testing helped the researcher assess the clarity of the instruments and also the rate of response. The instruments were then revised depending on the type of response by restructuring the questions well. Out of the 30 caregivers, 6 did not respond giving a non response rate of 20% which was added to the sample size before onset of field work.

### 3.8 Data Collection

Using the interview schedule, caregivers were asked questions and the researcher captured their responses in the spaces provided in the interview schedule. It was a face to face interview. The researcher was able to explain in detail any question that a caregiver did not understand. A self administered questionnaire was handed over to the health workers. The researcher was at hand to

explain any question the health workers did not understand. Upon completion of the questionnaire the health worker handed over the filled questionnaire to the researcher.

To understand the roles played by the different members of the District Health Management Team and how their different actions complemented each other, a focus group discussion was held in the office of the District Medical Officer. As the researcher facilitated the discussion using an interview guide, an assistant was writing down the responses. The researcher's role in the meeting was to ask open ended questions which provoked discussion among the focus group discussants. Where a subject area was not addressed exhaustively, the researcher asked probing questions to elicit further responses. After the focus group discussion, in-depth discussions were planned and conducted with two members (DMOH who is the chairperson and DNO who is in charge of nutrition activities) of the District Health Management Team on sensitive matters that came up in the focus group discussion but could not be discussed in a group.

### 3.9 Measurement of Variables

The dependent variable was vitamin A supplementation coverage which was measured using the formula below.

$$\frac{\text{Actual number of pre-school children who received VAS in May}}{\text{Targeted preschool children for VAS in May}} \times 100$$

It was measured for purposes of determining whether the coverage is low (<70%) or high (>70%) according to WHO standards. The interview schedule was used to gather this information from the caregivers who were asked whether their children had received a vitamin A supplement within the last 6 months prior to the study. Secondary data from the records officer

for the District was also used to give the reported coverage for vitamin A supplementation in this district in order to compare the coverage that is reported and the actual one.

The independent variables were also measured as follows. The education level of caregivers was categorized into; no education, primary, secondary and tertiary. The distance to the nearest health facility was measured by the number of kilometers to the nearest health facility. The socioeconomic status was measured by the type of house the caregiver lived in or for those living in a rented house the amount paid for the rent was used to categorize the caregivers into; low or high economic status. The residence of caregivers was either urban or rural.

Health workers recorded on the questionnaire the importance of vitamin A supplements, dosages and frequency of giving vitamin A supplements in order to measure their knowledge. They were either trained on job on vitamin A supplementation or not. Documentation of vitamin A supplements was done in both the child health cards and the tally sheets, either of them or none. Awareness creation by the health workers was measured by whether the health worker explained to the caregiver the reason for giving the child vitamin A supplements or did not explain. Supervision of vitamin A supplementation program by the DHMT was measured by the number of times (weekly, monthly, semi-annually, annually or at any time) they visited each facility and the availability (number) of vitamin A supplements in relation to target population at a particular time(month) for the entire district.

### 3.10 Data Analysis

Data analysis was done quantitatively and qualitatively to address the research questions. Statistical Package of Social Sciences (SPSS) for windows version 15.0 was used to generate descriptive and inferential statistics. The categorical dependent and independent variables were

coded and entered in Excel and finally imported to SPSS. Logistic regression was used in analysis because the dependent variable was binary or dichotomous (low or high coverage) and the independent variables were categorical (age of child, gender of the child, birth order of the child, education level of caregiver, distance covered by caregiver to the nearest health facility, residential location and type of house caregiver lives in). The goal of logistic regression was to describe the relationship between the dichotomous dependent variable or outcome variable and a set of independent predictor or explanatory variables. Logistic regression produced both the chi square and the odds ratio associated with each predictor value or variable. Chi square test is a likelihood ratio test in a logistic regression model which was used to test both the significance of individual independent variables. Odds ratio test gave the relative amount by which the odds (probability) of the outcome (coverage) increase by more than one or decrease by less than one when the value of the predictor variable was increased by 1.0 unit. The relationship was considered to be statistically significant when the p-value obtained was less than 0.05. These were presented using tables and cross tabulations.

Qualitative data from health workers, district health management team and key informants were thematically analyzed using narrative approach.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

The aim of this study was to find out factors related to vitamin A supplementation coverage to preschool children in Gucha district. Findings are summarized from a more general perspective to definite by data analysis, interpretation and presentation. Analysis and interpretation of data are specific to the relationships between the dependent variable (actual vitamin A supplementation coverage) and the independent variables (age, gender, birth order, residence, type of house, education level of caregivers, and distance to health facility). In order to achieve this, the level of statistical significance was set at 0.05 and p-value less than 0.05 is significant.

## 4.1 Response rate

Data was collected from 308 caregivers, 25 health workers, 5 members of the district health management team and 3 key informants in Gucha district for a period of two months. The questionnaires to caregivers were self administered and information on factors related to vitamin A supplementation coverage to preschool children had 92.2% response rate. On the other hand, all the 25 health workers and 5 district health management team members and key informants participated in the study.

## 4.2 Description of respondents by variables

A total of 308 caregivers of preschool children were included in the study. Among the preschool children, 161(52.3%) were female and 223(72.4%) were aged between 12 months and 59 months. Majority of these preschool children (65.6%) were either first or second in the birth order in their respective families. Among the care givers, a clear majority were females

accounting for 97% of the respondents in the study. Their ages ranged between 14 and 41 years with most (75.6%) of them aged between 18 and 34 years. A total of 287 caregivers (over 90%) had received formal education with 39.3% of them attaining primary level of education. Out of 308 caregivers, a total of 275(89.3%) covered a distance of less than 5 kilometers to access the nearest health facility.

Based on the study's contextual definition of socio-economic status and the type of area of residence of the caregivers, more than half of the caregivers (57.8%) were of low socio-economic status and 75% lived in rural parts of the district as shown in Table 4.1.

**Table 4.1: Description of respondents by variables**

| Variable | Category | Frequency (n=308) | Percentage of total sample |
|---|---|---|---|
| **Age** | 12-59 months | 223 | 72.4 |
| | 6-11months | 85 | 27.6 |
| **Gender** | Female | 161 | 52.3 |
| | Male | 147 | 47.7 |
| **Birth order** | 1st-2nd | 202 | 65.6 |
| | 3rd-4th | 86 | 27.9 |
| | 5th+ | 20 | 6.5 |
| **Residence** | Rural | 231 | 75.0 |
| | Urban | 77 | 25.0 |
| **Caregivers education level** | None | 21 | 6.8 |
| | Primary | 121 | 39.3 |
| | Secondary | 112 | 36.3 |
| | Tertiary | 54 | 17.5 |
| **Distance to health facility** | 1-2km | 145 | 47.1 |
| | 3-4km | 130 | 42.2 |
| | 5km+ | 33 | 10.7 |
| **Live in a permanent house** | No | 178 | 57.8 |
| | Yes | 130 | 42.2 |

### 4.3 Level of vitamin A supplementation coverage to preschool children in Gucha District

Vitamin A supplementation coverage is the ratio of the actual number of preschool children given vitamin A supplements against the targeted expressed in percentage for a given period of time. The preschool children who received vitamin A supplements during the study period (May 2009) were 127(41.2%) while those who did not receive were 181(58.8%). Therefore the overall level of vitamin A supplementation coverage to preschool children in Gucha district is 41.2% which is low. However, it is important to note that, this overall coverage masks the underlying differences in coverage based on factors studied. Coverage based on the factors studied is as shown in table 4.2.

**Table 4.2: Level of vitamin A supplementation coverage to preschool children**

| Variable | Category | Received Vitamin A supplements | | |
|---|---|---|---|---|
| | | Yes | No | Coverage (%) |
| **Age** | 12-59 Months | 53 | 170 | 23.8 |
| | 6-11 Months | 74 | 11 | 87.1 |
| **Gender** | Female | 63 | 98 | 39.1 |
| | Male | 64 | 83 | 43.5 |
| **Birth order** | 1st-2nd | 83 | 119 | 41.1 |
| | 3rd-4th | 36 | 50 | 41.9 |
| | 5th+ | 8 | 12 | 40.0 |
| **Residence** | Rural | 95 | 136 | 41.1 |
| | Urban | 32 | 45 | 41.6 |
| **Caregivers education level** | None | 2 | 19 | 9.5 |
| | Primary | 53 | 68 | 43.8 |
| | Secondary | 50 | 62 | 44.6 |
| | Tertiary | 22 | 32 | 40.7 |
| **Distance to health facility** | 1-2km | 64 | 81 | 44.1 |
| | 3-4km | 56 | 74 | 43.1 |
| | 5km+ | 7 | 26 | 21.2 |
| **Live in a permanent house** | No | 76 | 102 | 42.7 |
| | Yes | 51 | 79 | 39.2 |

Out of the 223 preschool children aged between 12-59 months, 53 children received vitamin A supplements and an actual coverage of 23.8% while among the 85 preschool children aged

between 6-11months, 74 children received vitamin A supplements and an actual coverage of 87.1%. Out of 161 female preschool children studied, 63 received vitamin A supplements representing an actual coverage of 39.1% while among the 147 male children, 64 children received vitamin A supplements representing an actual coverage of 43.5%.

Among 202 preschool children who were either first or second in the birth order in their families, 41.1% received vitamin A supplements. In the category, third to fourth birth order, 41.9% received the supplements and among those in the fifth birth order and above, 40% received vitamin A supplements. Out of 202 preschool children residing in the rural areas, 41.1% received vitamin A supplements while 41.6% received vitamin A supplements among the 77 preschool children residing in the urban areas.

The education level of caregivers was divided into none, primary, secondary and tertiary. 9.5% of preschool children of caregivers with no education received vitamin A supplements while 43.8% of preschool children of caregivers with primary education received vitamin A supplements. Similarly, 44.6% of preschool children of caregivers with secondary education received vitamin A supplements, and 40.7% of preschool children of caregivers with tertiary education received vitamin A supplements.

Out of 145 preschool children of caregivers covering a distance of 1-2 kilometers, 44.1% received vitamin A supplements. Similarly, 43.1% of preschool children of caregivers residing 3-4 kilometers away from the nearest health facility received vitamin A supplements. On the other hand, 21.2% of preschool children of caregivers residing 5 kilometers and above from the nearest health facility received vitamin A supplements. Out of the 130 preschool children residing in a

permanent house, 39.2% received vitamin A supplements. On the other hand, 42.7% of the 178 preschool children who did not live in a permanent house, received vitamin A supplements.

Vitamin A supplementation coverage can be used to measure the progress or success over time in a targeted nation, or it can be used to compare coverage rates among regions (Bloem et al., 2003). This coverage shows the actual number of preschool children who received the vitamin A supplement against those who were targeted for supplementation. This study has shown that the level of vitamin A supplementation coverage among preschool children in Gucha District is low. This is in spite of the program being in existence for the last seven years in this district. The medical records indicated that coverage among preschool children was 67%. This is 1.6 times higher than what was found by this study. This result is similar to a survey done in Guinea that showed the administrative coverage of vitamin A supplementation among preschool children to be 1.4 times higher than what the survey showed (Bendech et al., 2007).

The disparity between the administrative coverage and the result from the two studies could be explained in two ways: It is possible that many children who are outside the 6-59 months target age group receive vitamin A supplements during routine supplementation, resulting in an overestimation of the proportion of the 6-59 months old children who received vitamin A supplements reported in secondary data. This situation is also aggravated by the lack of current data regarding households since the one used in Gucha district is for the census conducted in 1999. In Guinea it was revealed that the difference in the coverage (reported and studied) is either by underestimation of the children who received vitamin A supplements in the study,

and/or an overestimation of the target population during mass distribution campaigns (Bendech et al., 2007).

Vitamin A supplementation program was integrated to the existing immunization program with an aim of reaching these children with vitamin A supplements. Since 1999 in Niger, the combination of National Immunization Days and National Micronutrient Days has ensured that over 80% of children 6 to 59 months of age receive two vitamin A doses annually (Aguayo et al., 2005). Vitamin A supplementation program targets preschool children between the ages 6-59 months while immunization targets those between 0-11 months. Therefore, the immunization coverage in Gucha district is high compared to the supplementation coverage despite the integration. Notably, supplementation was high among 6-11 month old children than those above 12-59 months. This is attributed to the fact that immunization is considered very important and once children are through with it they do not visit the health facility again to benefit from other services like vitamin A supplementation and growth monitoring which continues up to 59 months old children. These results were different in a study conducted in Indonesia in 1999-2002, where supplementation coverage rates for the target group of 6-11 months old children was uniformly low (26-55%) (Hellen Keller International, 2003).

This low coverage subsequently has an impact on child health nutrition and preschool children in Gucha district are not an exception. Malaria is endemic in this district as well as morbidity and mortality due to malaria among preschool children. Malaria morbidity attributable to VAD worldwide is 20% and more than 90% of them occur in Africa (Laura, Stephanie, & Robert, 2004). Additionally, diarrhea and other childhood illnesses like measles can be reduced or averted if vitamin A supplementation coverage is high among preschool children. Several

interventions trials have confirmed that vitamin A distribution to high risk populations can reduce early childhood mortality by as much as 20-30% (West et al., 2001).

Increased coverage of vitamin A supplementation would help to maximize the benefits for child survival (Berger et al., 2007). A recent national survey in Tanzania reported that mortality in children younger than 5 years dropped by 24% because of increased coverage of key child-survival interventions, such as vitamin A supplementation (Masanja et al., 2008). Many countries have not achieved a high coverage for vitamin A supplements yet this has been WHO/UNICEF mission since 1987. In Mozambique, the last VAS coverage survey showed that only 46% of children received a vitamin A supplement in the 6 months preceding the survey (Aguayo et al., 2005). Nevertheless, some countries like Nepal achieved a high coverage of vitamin A supplementation that was 85% among preschool children during a 4-month distribution survey (Bishai et al., 2005). The possible reasons for the low coverage of vitamin A supplementation among preschool children in Gucha district are explained in the following sub sections.

### 4.4 Factors related to vitamin A supplementation coverage to preschool children in Gucha District

Among the variables investigated were age of the child, gender of the child, birth order, residence, education level of the care givers, distance covered by the caregivers to the health facility, and the economic status of the caregivers. In order to identify the factors related to vitamin A supplementation coverage to preschool children in Gucha District, these variables were cross tabulated for any relationship with the actual vitamin A supplementation coverage. Chi-square statistic was used to show this relationship and results with a p-value of less than 0.05 were considered significant as shown in table 4.3.

**Table 4.3: Relationship between household factors and vitamin A supplementation coverage**

| Variable | Category | Frequency (n=308) | Number of preschool children who received VAS (%) | | Chi-square (χ2) | df | P-value |
|---|---|---|---|---|---|---|---|
| | | | Yes | No | | | |
| **Age** | 12-59 months | 223 | 53(17.2) | 170(55.2) | 101.73 | 1 | **0.000** |
| | 6-11 months | 85 | 74(24.0) | 11(3.6) | | | |
| **Gender** | Female | 161 | 63(20.4) | 98(31.8) | 0.61 | 1 | 0.432 |
| | Male | 147 | 64(20.8) | 83(27.0) | | | |
| **Birth order** | 1st-2nd | 202 | 83(27.0) | 119(38.6) | 0.02 | 2 | 0.986 |
| | 3rd-4th | 86 | 36(11.6) | 50(16.2) | | | |
| | 5+ | 20 | 8(2.6) | 12(4.0) | | | |
| **Residence** | Rural | 231 | 95(30.8) | 136(44.1) | 0.026 | 1 | 0.946 |
| | Urban | 77 | 32(10.4) | 45(14.7) | | | |
| **Caregivers education level** | None | 21 | 2(0.7) | 19(6.2) | 9.58 | 3 | **0.022** |
| | Primary | 121 | 53(17.2) | 68(22,1) | | | |
| | Secondary | 112 | 50(16.2) | 62(20.1) | | | |
| | Tertiary | 54 | 22(7.1) | 32(10.4) | | | |
| **Distance to health facility** | 1-2km | 145 | 64(20.8) | 81(26.3) | 6.146 | 2 | **0.046** |
| | 3-4km | 130 | 56(18.2) | 74(24.0) | | | |
| | 5km+ | 33 | 7(2.3) | 26(8.4) | | | |
| **Live in a permanent house** | No | 178 | 51(16.6) | 79(25.6) | 0.0782 | 1 | 0.779 |
| | Yes | 130 | 76(24.7) | 102(33.1) | | | |

Table 4.3 shows that out of the 223 preschool children aged between 12-59 months, 53 preschool children (17.2%) received vitamin A supplements while 170 preschool children (55.2%) did not. On the other hand, 74 preschool children (24.0%) aged between 6-11months, received vitamin A supplements while the remaining 3.6% did not. When this variable was analyzed using the chi-square test, the relationship of age of the child with vitamin A supplementation was found to be statistically significant ($\chi^2$=101.73, $n$=308, $df$=1, $p$=0.000).

Of the 161 female preschool children, 63(20.4%) received vitamin A supplements while 98(31.8%) did not. On the other hand, 64(20.8%) male preschool children, received vitamin A supplements while the remaining 83(27%) did not (see Table 4.3). When this variable was analyzed, the relationship with vitamin A supplementation was found to be statistically insignificant ($\chi^2$=0.61, $n$=308, $df$=1, $p$=0.432).

The birth order of preschool children was grouped into three categories for analysis purposes. Out of the 202 preschool children who were in the first and second birth order, 83(27%) received vitamin A supplements while 119(38.6%) did not. Among preschool children in the third and fourth birth order, 36(11.6%) received vitamin A supplements while 50(16.2%) did not. On the other hand, 8(2.6%) preschool children, in the fifth and above birth order received vitamin A supplements while the remaining 12(4%) did not, (Table 4.3). The relationship between vitamin A supplementation coverage and the birth order of preschool children was statistically insignificant ($\chi^2$=0.02, $n$=308, $df$=2, $p$=0.986).

From the 231 preschool children who resided in the rural areas, 95(30.8%) received vitamin A supplements while 136(44.1%) did not. On the other hand, 32(10.4%) preschool children residing in the urban areas received vitamin A supplements while 45(14.7%) did not, (Table 4.3). The relationship between vitamin A supplementation coverage and the residence was statistically insignificant ($\chi^2$=0.026, $n$=308, $df$=1, $p$=0.946).

The education level of caregivers was divided into none, primary, secondary and tertiary. Out of the 21 preschool children of caregivers with no formal education, 2 (0.7%) received vitamin A supplements whilst 19(6.2%) did not. 53(17.2%), 50(16.2%), and 22(7.1%) preschool children of

caregivers with primary, secondary and tertiary level of education received vitamin A respectively. On the other hand, 68(22.1%), 62(20.1%), and 32(10.1%) preschool children of the above caregivers did not receive vitamin A supplements respectively, (Table 4.3). There was a statistically significant relationship between vitamin A supplementation coverage and caregivers education level ($\chi^2$=9.58, $n$=308, $df$=3, $p$=0.0224).

Among 145 preschool children of caregivers residing within 1-2kms from the nearest health facility, 64(20.8%) received Vitamin A supplements whilst 81(26.3%) did not. Among preschool children of caregivers residing 3-4kms away from the nearest health facility, 56(18.2%) received the supplements while 74(24%) did not. On the other hand, among preschool children of caregivers residing 5kms and above, 7(2.3%) received vitamin A supplements, (Table 4.3). A statistically significant relationship occurred between vitamin A supplementation coverage and distance ($\chi^2$=6.146, $n$=308, $df$=2, $p$=0.0463).

Out of the 130 living in a permanent house, 51(16.6%) received vitamin A supplements whilst 79 (25.6%) did not. On the other hand, among preschool children living in a non permanent house, 76(24.7%) received vitamin A while the remaining 102 (33.1%) did not). The relationship with vitamin A supplementation was found to be statistically insignificant ($\chi^2$=0.0782, $n$=308, $df$=1, $p$=0.7798).

To explain these relationships further, odds ratio was computed to find out the strength and direction of association between vitamin A supplementation coverage and these household factors (age, gender, birth order, residence, education level, distance and type of house) as shown in Table 4.4.

**Table 4.4: Strength of the relationship between household factors and vitamin A coverage**

| Variable | Frequency (n=308) | (%) of total sample | Odds Ratio (OR) | 95% CI | p-value |
|---|---|---|---|---|---|
| **Age** | | | | | |
| 12-59months | 223 | 72.4 | 1.00 | | |
| 6-11months | 85 | 27.6 | 21.578 | 10.66-43.63 | **0.000** |
| **Gender** | | | | | |
| Female | 161 | 52.3 | 1.00 | | |
| Male | 147 | 47.7 | 1.2344 | 0.76-2.00 | 0.393 |
| **Birth order** | | | | | |
| 1-2 | 202 | 65.6 | 1.00 | | |
| 3-4 | 86 | 27.9 | 0.9026 | 0.49-1.66 | 0.740 |
| 5+ | 20 | 6.5 | 0.9483 | 0.32-2.83 | 0.924 |
| **Residence** | | | | | |
| Rural | 231 | 75 | 1.00 | | |
| Urban | 77 | 25 | 0.9649 | 0.55-1.68 | 0.900 |
| **Caregivers education level** | | | | | |
| None | 21 | 6.8 | 1.00 | | |
| Primary | 121 | 39.3 | 7.4044 | 1.65-33.20 | **0.008** |
| Secondary | 112 | 36.3 | 7.6613 | 1.70-34.46 | **0.008** |
| Tertiary | 54 | 17.5 | 6.53 | 1.37-30.92 | **0.018** |
| **Distance to health facility** | | | | | |
| 1-2km | 145 | 47.1 | 1.00 | | |
| 3-4km | 130 | 42.2 | 0.8752 | 0.53-1.45 | 0.607 |
| 5km+ | 33 | 10.7 | 0.29 | 0.11-0.74 | **0.009** |
| **Live in a semi or permanent house** | | | | | |
| No | 178 | 57.8 | 1.00 | | |
| Yes | 130 | 42.2 | 0.708 | 0.42-1.18 | 0.188 |

**Note that odds ratio of 1.00 was the reference category in each variable.**

When gender was analyzed, the relationship with vitamin A supplementation was found to be statistically insignificant (Male/Female: Odds Ratio=1.2344, 95%C.I (0.76 – 2.00), p=0.3936). This implies that the odd of receiving vitamin A among male children was 20% higher when compared to the odds of receiving vitamin A among female children. However, at a significance level of 0.05, this difference in the odds of receiving vitamin A was not significant and therefore

the gender of the child was not a determinant of receiving vitamin A among preschool children in Gucha district.

The relationship of age of the child with vitamin A supplementation was found to be statistically significant (Odds Ratio=21.578, 95%CI (10.66-43.63), p=0.000), (see Table 4.4). This implies that receiving vitamin A among preschool children is related to their age in Gucha District. The relationship between vitamin A supplementation coverage and preschool children of birth order 3-4 was statistically insignificant (Odds Ratio=0.9026, 95%CI (0.49-1.66), p=0.7407) and birth order five and above (Odds Ratio=0.94, 95%C.I (0.32- 2.83), p=0.9242) compared with preschool children of birth order 1-2, (Table 4.4). Birth order therefore did not seem to influence the probability of receiving vitamin A among preschool children in Gucha district.

Their was a statistically significant relationship between vitamin A supplementation coverage and caregivers with primary education level (OR=7.4044, 95%CI (1.65-33.20), p=0.0089), secondary education level (OR=7.6613, 95%CI (1.70-34.46), p=0.008) and tertiary education level (OR=6.53, 95%CI (1.37-30.92), p=0.018), (see Table 4). A statistically significant relationship between vitamin A supplementation coverage and distance of 5 kilometers and above was also found (OR=0.29, 95%CI (0.11-0.74), p=0.0099) (Table 4.4). The relationship between vitamin A supplementation coverage and the residence was statistically insignificant (OR=0.9649, 95%CI (0.55-1.68), p=0.9002), (see Table 4.4) and the relationship between living in a semi/permanent house and vitamin A supplementation was found to be statistically insignificant (OR=0.708, 95%CI (0.42-1.18), p=0.1881), (Table 4).

This study found out that a majority of caregivers in Gucha district has basic education (primary and secondary) while only a few of them do not have any formal education (6.8%). These

caregivers are charged with the responsibility of taking care of preschool children. Therefore they ought to ensure that they access key health and nutrition interventions like vitamin A supplementation. In Gucha District, the education level of caregivers was significant to the low vitamin A supplementation coverage among preschool children. Any formal education as from primary education was found to be significant (p=0.008) when compared to none formal education. A similar, study in India also found out that the association between receipt of vitamin A by the child and literacy status of mother was significant (p=0.001) to the low coverage of Vitamin A supplements (Sachdeva & Datta, 2009). Similar results were also confirmed in Ethiopia where maternal education and paternal education were associated with the child receiving a vitamin A capsule compared with no years of formal parental education (Semba et al., 2008). On the other hand, a study in Mali found out that fathers' education instead of mothers was strongly and significantly associated with children's coverage because mothers always consult fathers before they make any decisions regarding children's health and nutrition (Ayoya et al., 2007). However, the study in Gucha district did not differentiate between paternal and maternal education because the fathers were few (3%). A literacy level of caregivers is important in this District to improve the coverage levels because vitamin A supplementation messages are communicated in posters and in a language that requires formal education.

Knowledge of caregivers on vitamin A supplementation is very important in vitamin A supplementation coverage. In Gucha district it was found out that the majority of caregivers (64.6%) did not have knowledge on at least one importance of vitamin A supplements to preschool children. Knowledge of the importance of vitamin A will enable caregivers to demand for it. Moreover, the more informed people are of the benefits of vitamin A supplements, the more likely they are to participate in routine vitamin A supplementation. In Guinea, more than

half of the respondents stated at least one importance of vitamin A supplement depicting that the higher the education level, the more knowledge the respondents had of the advantages of vitamin A supplements (Bendech et al., 2007).

The distance covered by caregivers to the nearest health facility is also related to vitamin A supplementation coverage among preschool children. The study showed that in Gucha district majority (52.9%) of the caregivers cover a distance of 3km-5km to the nearest health facility for vitamin A supplementation. This is a long distance considering the hilly terrain of the area and the all weather roads with few public service vehicles depicting that many of them walk to these facilities together with the child. Furthermore vitamin A supplementation coverage was associated ($p=0.009$) with distance to the health facility. Those who covered a distance of more than 5km were less likely to have taken the supplement than those who covered a distance of 1-2km. A study done in Ghana by Hill et al. (2007) agrees that travelling to the health facility is a potential barrier for vitamin A supplementation. Systems of distributing health care services that rely on household members to travel to a clinic for service have been suspected of worsening socio economic differentials in health outcomes (Victoria et al., 2000). It is important to note that there are limited documented data on distance and vitamin A supplementation coverage to preschool children.

The type of area of residence (rural verses urban) is a factor that has been studied in relation to vitamin A supplementation coverage. For instance, in Mali a study found a significant association between living in a rural area in Mali and low vitamin A supplementation coverage Ayoya et al., 2007). Similarly, a study in China revealed that the high-risk group dwelled in rural regions and did not take a regular vitamin A supplement (Rongwang et al., 2007). In contrast, Gucha district which has a majority (75%) of the caregivers that reside in rural areas did not

produce a significant (p-0.900) relationship between residence and vitamin A supplementation coverage. The health facilities in Gucha district are randomly distributed with the urban population accessing the district hospital and a number of other clinics in town. Arguably, both the rural areas and the urban areas in Gucha district are important targets for supplementation as long as VAD is a health problem. Similarly, vitamin A approaches need to be improved in children living in deprived areas like urban slums (Dole et al., 2009).

Age, gender and birth order of preschool children can influence their receipt of vitamin A supplements and therefore very important in supplementation coverage as shown in studies. The age range of children for vitamin A supplements is 6-59 months given twice in a year. The study showed that the majority of preschool children in Gucha district are 12-59months old (72.4%). This study found that preschool children in this age group do not receive vitamin A supplements frequently compared to those who are 6-11months. One probable explanation is that children in this age group hardly visit the facilities completing immunization. Those few who are given vitamin A supplements attend the facilities for other services like when they are sick and not specifically for vitamin A supplementation. In Gucha District there was a significant (p-0.000) relationship between age of the child and vitamin A supplementation coverage. Some children though fully immunized for vaccine-preventable disease up to the age-of-one year in India had not received vitamin A-first dose supplement, suggesting that an opportunity had been missed (Sachdeva & Datta, 2009). However, in Cambodia there was no significant difference in child age and vitamin A supplementation in children (Grover et al., 2008).

Some societies due to their cultural beliefs favor male children than female children. Additionally the male children are given preference in accessing health interventions in these societies. However in Gucha district no difference (p-0.393) was noted on gender of preschool

children. Therefore, there was no difference in gender in vitamin A supplementation coverage because children in this district are equally valued. Similarly, in Tanzania, coverage of vitamin A supplements was similar for boys and girls (Masanja et al., 2006).

Caregivers may have a tendency of giving preference to children of the first order and this is also related to their receipt of vitamin A supplements. In Gucha district majority of the preschool children are of birth order 1-2 (65.6%). These children did not necessarily have a better coverage when compared with children of birth order three and above. Analysis of the birth order did not show a significant (p=0.740) relationship with vitamin A coverage. In contrast, a study in India by Sachdeva and Datta (2009) observed that a higher proportion of children with birth order-one in comparison to birth order-three or above received vitamin A (p=0.001).

Socio-economic status of caregivers is vital in influencing their accessibility to health interventions. This can further influence the coverage of vitamin A supplements among preschool children. In this study the type of house where the caregivers lived was used to measure their socio economic status. In Gucha district majority 57.8%) of the caregivers did not live in a permanent house depicting their low socio economic status and many of them practice subsistence farming. However no significant (p-0.188) relationship was shown between their low socio economic status and vitamin A supplementation coverage in this district. In Nepal, a country that has achieved high vitamin A supplementation coverage, found out that the children still missed by the program (12.5%) disproportionately represent the poorest of the poor families and residents of certain ecological and development sub regions (Thapa, 2009). In contrast, vitamin A supplementation achieved a major increase in coverage without any decrease in socio-economic equity in Tanzania: coverage was uniformly distributed across the districts (Masanja et al., 2006).

## 4.5 Service provider factors related to vitamin A supplementation coverage to preschool children in Gucha district

Majority (96.0%) of health workers in this study know the importance of vitamin A supplements to preschool children, (see Table 4.5). Out of 24 health workers, 12 of them (48.0%) have undergone training on vitamin A supplementation. Documentation on tally sheets is done by 3 health workers (12.0%) after giving vitamin A supplements to preschool children. Additionally, only 6 health workers (24.0%) explained to caregivers why their preschool children are given vitamin A supplements, (Table 4.5).

**Table 4.5: Service provider factors related to vitamin A supplementation coverage**

| Variable | n | Frequency | (%) of total sample |
|---|---|---|---|
| **Health workers knowledge on VAS** | | | |
| Importance of VAS | 25 | 24 | 96.0 |
| Dosage of VAS | 25 | 23 | 92.0 |
| Frequency of giving VAS | 25 | 21 | 84.0 |
| **Health workers trained on VAS** | 25 | 12 | 48.0 |
| **Documentation of VAS by health workers** | | | |
| Tally sheets | 25 | 3 | 12.0 |
| Child health cards | 25 | 5 | 20.0 |
| **Awareness done by health workers on VAS** | | | |
| Caregivers told about VAS | 25 | 6 | 24.0 |
| Not told about VAS | 25 | 19 | 76.0 |

Knowledge of health workers administering vitamin A supplements to preschool children is a very important factor in vitamin A supplementation coverage. The study in Gucha district showed that majority of the health workers had knowledge on vitamin A supplementation. They knew the importance of the supplements, dosages and when it is given to preschool children.

These findings were similar to a study done in Mali where the knowledge about vitamin A target group, frequency of giving, dosage, and its importance was high among the health professionals (Ayoya et al., 2007).

Health workers working in the maternal and child health clinics (MCH) are trained on vitamin A supplementation on the job in order to enable them administer vitamin A supplements efficiently to preschool children. They undergo a three day training session which is not very frequent because these sessions are often held a few days presiding a campaign like malaria or polio campaign. This study in Gucha district revealed that less than half of the health workers are trained on vitamin A supplementation. This finding is in harmony with a similar study in South Africa which identified inadequate training as the main problem in vitamin A supplementation (Hendricks et al., 2007).

Health workers are required to document administration of vitamin A supplements to preschool children. The child's age and dosage of vitamin A supplement are recorded in tally sheets and the child's health card. Documentation is very important since what is recorded in tally sheets is what is used to calculate vitamin A supplementation coverage over a period of time. What is recorded in the health cards shows what the child has been given and when to come back for another dose of vitamin A supplement. However, this study in Gucha District confirmed that almost all health workers do not recordvitamin A adminstration in the child health cards nor do a majority of them do so in the tally sheets. From observations these health workers were few compared to the tasks they had to handle like treat, immunize, administer vitamin A and perform administrative work. Likewise in Tanzania, routine health programs are weak due to poorly motivated and often overburdened health staffs who are not supervised (Masanja et al., 2006). Inadequate documentation, impacts negatively on vitamin A coverage. Incomplete

documentation leads to an underestimation of the actual number of preschool children receiving vitamin A supplements. On the other hand, not recording the return date on the child's card, denies the caregiver an opportunity to plan when the child should be brought back for supplementation.

Awareness creation is done by health workers before giving vitamin A supplements to preschool children. The care giver is made aware of the importance of vitamin A supplements, when given and its deficiency. This can be done face to face to an individual or group counseling when the number is large for vitamin A supplementation. According to this study, majority of health workers in Gucha District neither provided information on vitamin A supplementation nor asked questions, but merely told the caregivers to facilitate opening the child's mouth for vitamin A supplement. This could be attributed by the few staff in facilities compared to the work they are supposed to do thus health talks are not prioritized. A report of a meeting of the District health management teams in Zambia identifies poor, uncaring reception at health facilities often discourage caregivers from going back to demand the service for the second time (DHMT, 1999).

### 4.6 The role of the District Health Management Team (DHMT) and key informants on vitamin A supplementation in Gucha District

The roles of the district health management team and the key informants in Gucha district are planning and implementation of vitamin A supplementation program, training of health workers on vitamin A supplementation, awareness creation in the community on vitamin A supplementation and conducting supervision. The DHMT consists of five members who perform different roles in vitamin A supplementation within the district. All five members are expected to

be conversant with the program and are able to conduct supportive supervision by use of a supervisory checklist in the absence of the other members. The District Nutrition Officer (DNO) is in charge of all the nutrition activities within the district which includes growth monitoring, giving vitamin A supplements, conducting nutritional health talks to patients, nutrition counseling, giving food by prescription and planning diets for all the patients. In addition she/he is expected to conduct regular support supervision and expound on nutritional policies in the district.

The District Public Health Nurse (DPHN) ensures that all the facilities within the district have adequate number of nurses, immunizations are done in all the facilities, storage of all the antigens and vaccines is done appropriately, provide enough antigens and vaccines for the entire district, calculate the target population for both immunization and in consultation with the DNO set targets for vitamin A supplements and keep all the records on immunizations. Since peripheral health facilities do not normally have nutrition staff to dispense the supplements, and the program is integrated with routine immunization, the DPHN and DNO supervise the nurses distributing the vitamin A supplements.

The District Public Health Officer (DPHO) is in charge of all public health officers who normally work in the community to address issues such as sanitation, health and hygiene, distributing of treated mosquito nets, giving health talks in the community and prevention of diseases rather than treatment. This cadre of staff is best suited to raise community awareness of vitamin A supplementation because of their close links with the community. Moreover, during defaulter tracing for immunization and tuberculosis, this cadre of staff dispense vitamin A

supplements together with the vaccines. They also give vitamin A supplements to preschool children especially during immunization campaigns.

The District Medical Officer of Health (DMOH) is in charge of all the activities of the ministry of health within the entire district. He ensures that all the facilities offer the services as stipulated by the ministry of health and supervises the implementation of all the activities. The medical officer of health is also the chairperson of the District Health Management Team and holds meetings with them regularly. On vitamin A supplementation he ensures that all the facilities have enough vitamin A supplements, staffs are trained on vitamin A supplements and the community is aware of the supplements. He collaborates with the private facilities to give vitamin A supplements since they serve the same community and he does the supervision of all the activities regarding vitamin A supplementation in the district.

The District Records Officer is in charge of all the records related to health programs within the district. When vitamin A supplements are given to the preschool child and documentation done, the records officer calculates the coverage of vitamin A supplementation for the month and for the year. He also keeps records on immunizations of different antigens for different age groups. Timely feedback and forwarding of reports related to vitamin A supplementation is a critical role of the DMRO. This not only serves to monitor the implementation of the program but also a source of motivation of health workers implementing the program in the peripheral health facilities.

This team is also charged with the responsibility of training of all the health workers on vitamin A supplements. This is only done when they have been trained at the provincial level to become trainers of trainers at the district level. They train health workers on the importance of giving

vitamin A supplements to preschool children, dosage of vitamin A supplements for different ages and its deficiency. They are also trained on how to pass these messages to the caregivers and how to encourage them to come back for vitamin A supplements. These health workers are also trained on how documentation is done after administering vitamin A supplements to preschool children.

Awareness creation of vitamin A supplementation among the caregivers in the community is also done by the DHMT together with the key informants. The key informants who are the chiefs and community leaders interact with members of the community and pass to them information on vitamin A supplements. They hold meetings (*baraza)* with the community members and communicate the importance of vitamin A supplements. Other messages passed to the community during such meetings include: when and where vitamin A should be given, signs and symptoms of vitamin A deficiencies and nutritional advice on which foods to eat in order to get vitamin A. Other channels of communication between health workers and the community used by the DHMT are announcements in radio, posters and public address systems. Poster method is favored during routine supplementation whilst use of the public address system is the most preferred during campaigns.

Supervision of vitamin A supplementation activities is done by the district health management team. During supervision the tally sheets are checked and stocks of vitamin A supplements increased to cater for the targeted preschool children. The procedure of giving vitamin A supplement is also checked and how documentation is done. The shortcomings are noted, improvements made and coverage levels are checked to ascertain whether all the preschool children are reached by the intervention.

Planning and implementation of vitamin A supplementation program at the district level is one of the key roles of the District Health Management Team. Based on a National Strategic Health Sector Plan (NSSHP 2), the DHMT prepares operational plans for health activities (including vitamin A supplementation) on an annual basis. The planning process uses the bottoms – up approach and all implementing facilities (both private and public health facilities) are requested to submit their inputs based on a given format to the District Nutrition Officer (DNO). Community participation in the planning process as is the norm in Mali (Ayoya et al., 2007) is not practiced in Gucha district. The community only participates in the implementation of vitamin A supplementation through the use of community leaders in the sensitization campaigns and organizing for outreach services. Using the submissions from the implementing health facilities, the DNO then prepares an interim plan that is discussed by the entire DHMT before it is captured in the district Annual Operational Plan (AOP). This plan outlines the activities, gives a timeline for implementation, and indicates the source of funding and the person responsible for the implementation of the activity. Discussions with the DNO identified inadequate funding as the main barrier to operationalize the plans. This sentiment is captured in the following quotation by the DNO:

*"....year in year out, I have prepared plans but the implementation is a different story. I wish for once they could fund my activities according to the plan."*

The involvement of the private sector(campaigns by UNICEF) in the distribution of vitamin A supplements in Gucha district is commendable. The role of the private sector in increasing the reach and adherence of supplementation program is well documented (Pangaribuan et al., 2004). Additionally, nutrition programs succeed when integrated into existing health programs like

malaria intervention programs. In Gucha District the integration of vitamin A supplementation and immunization is evident. However, the integration could be expanded and improved further.

Awareness creation of vitamin A supplements to the recipients is another role of the DHMT and the key informants. This is critical in vitamin A supplementation given that lack of information among the recipients precludes them from seeking for the service. Too often, the level of community awareness is overestimated and the decisions about what channels to use are based on the belief and personal preferences of people who think they know the target audiences well but in fact do not. Statements such as the one below from one DHMT members could in fact be misleading and deceiving if not based on good evidence.

*"....community awareness is 100% in this district because every morning health workers give health talks to pregnant women and caregivers of children brought for immunization. We therefore carry out extensive community mobilization only days preceding a major campaign which is normally once a year or after every two years."*

Successful supplementation programs require appropriately designed information and communication strategies (Hill et al., 2007). This study has shown that the DHMT and key informants in Gucha district used posters, radio, health talks (*Barazas*) and public address systems to pass information on vitamin A supplements. Furthermore, this study confirmed that all these methods are used during campaigns unlike posters which are used on daily basis during routine supplementation. However an interview with the caregivers on how they receive messages on vitamin A supplements revealed that, majority of them get information from the Ministry of health staff during health talks held every morning in some health facilities and through announcements by public address system a few days preceding a major campaign. In

Gucha District, use of posters and radio by the DHMT were ineffective channels of reaching caregivers with Vitamin A supplementation messages. This finding is in agreement with a study in Mali which found out that the use of radio and television had a limited reach in the community (Ayoya et al., 2007).

Training of health workers who administer vitamin A supplements to preschool children is done by the DHMT. Issues regarding the importance of vitamin A supplements, target groups, dosages, frequency of giving and outcome of vitamin A deficiency are discussed explicitly during training. This study revealed that the DHMT in Gucha district train health workers only when campaigns approach and not during the routine supplementation. To explain the few (inadequate) training sessions, the DMOH complained of lack of resources to conduct basic training and refresher trainings for newly recruited staff and old staff respectively. His frustrations are captured in the following verbatim statement:

*".....we plan for refresher trainings for our staff in the annual operational plan every year. However, unless there is a campaign, nobody is interested in financing such an activity. It is assumed that we all know everything about vitamin A."*

The need for a trained staff cannot be overemphasized. In South Africa many primary health care (PHC) managers indicated that health staff had been trained to implement the Vitamin A Supplementation Program in order to increase coverage (Hendricks et al., 2007). A study in Niger revealed that effective training and flexible delivery mechanisms improved vitamin A supplementation coverage to preschool children (Aguayo et al., 2005). Therefore, health workers who are trained well on vitamin A supplements will ensure preschool children are given supplements and documentation will be done to increase coverage.

Supervision of vitamin A supplementation is essential in monitoring and it is one of the roles of the DHMT. Frequent supervision guarantees adequate stocks of vitamin A supplements and tally sheets as well as monitoring the progress of vitamin A supplementation. During supervision, follow up of trained health workers is done and activities improved based on the weaknesses observed. According to this study, in Gucha district, supervision of vitamin A supplementation by the DHMT is unplanned and sporadic and notably done when need arises for example a disease outbreak as described below by the DPHN:

*".....nowadays, you hardly find enough DHMT members to form a quorum to conduct support supervision. Today the DMOH is attending a district executive committee meeting, tomorrow, the DPHO is attending a training in Nairobi, the next day I am in Kisumu for a review meeting and the day after that the entire DHMT is attending a training in Mash Park in Kisii. When do we have time to conduct support supervision? This has made our supervision to be erratic."*

Regular support supervision does not only facilitate monitoring of vitamin A activities in the health facilities but also motivate staff to improve on performance. In Mozambique health workers' supervision and monitoring skills was found to be important in increasing coverage (Aguayo et al., 2005). Also, Nojilana and Labadorios (2007) found that in South Africa, monitoring the effectiveness of interventions like vitamin A supplementation improves the outcome (coverage and adherence). Documentation of service provision is one area that requires very close supervision. Inadequate supervision coupled with inadequate numbers of health workers especially in peripheral health facilities undermines service provision and particularly documentation as described below by one health worker in a health center in the district.

*".....you have mothers waiting for you, you have children waiting for you, you have so many other people to attend to that you rarely remember to tally for services rendered."*

Proper documentation is particularly significant in estimating vitamin A supplementation coverage. If tallying is inadequate, then the coverage will be an underestimate of the true coverage. Equally important, is the recording of supplements delivered on the child's card. This serves to remind caregivers when the next dose of vitamin A is due. In addition, this card might be the only record that health workers have of a child's supplementation history if the facility register is not well maintained or for clients who have moved from another health facility.

# CHAPTER FIVE

# CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the research findings. Conclusions on important findings of the research are given with recommendations. Important areas for further research are also identified.

## 6.1 Conclusions

The following conclusions were made from this study:

1. Vitamin A supplementation coverage to preschool children in Gucha District is low (41.2%) compared to the reported coverage of (67.0%) which is also lower than the target coverage of 70%.
2. The age of preschool children, education level of caregivers and distance covered by caregivers to the nearest health facilities were significantly related to vitamin A supplementation coverage in Gucha district. Additionally, the birth order of preschool children, gender, residence and socioeconomic status of caregivers were not related to vitamin A supplementation coverage in Gucha District.
3. Documentation in child health cards and tally sheets is mostly not done by health workers after administering vitamin A supplements to preschool children in Gucha District.
4. The roles of the district health management team and the key informants in Gucha District were planning and implementation of the vitamin A supplementation program, training of health workers on supplementation, conducting supervision on vitamin A supplementation and awareness creation. However, supervision of the vitamin A supplementation program by the district health management team in Gucha district is unplanned.

## 6.2 Recommendations

These are the recommendations made from this study:

1. Caregivers should be sensitized on the importance of taking their preschool children back to the health facilities for vitamin A supplements after they are through with immunization until they turn 59 months.
2. The Ministry of Health should increase the reach of vitamin A supplementation services by organizing outreach services in far to reach areas and by integrating vitamin A activities with other health related services like mosquito net distribution and outreach immunization services.
3. There is need for health workers to record the number of all preschool children given vitamin A supplements in tally sheets when they visit the health facility for immunization, treatment and growth monitoring.
4. Regular supportive supervision by the district health management team should be strengthened as well as adopting communication channels like health talks and use of the public address system, that are relevant in the community during awareness creation.

## 6.3 Suggested areas for further research

This study suggests the following areas for further research:

1. An evaluation of a campaign based vitamin A supplementation program in comparison to the routine vitamin A supplementation program.
2. Assessment of populations residing in the poorer regions in relation to their utilization of nutrition intervention services like receiving of vitamin A supplements.
3. Establishment of the ways of sustaining and improving vitamin A supplementation programs in the community.

## REFERENCES


Aguayo, M. (2003). Maintaining high Vitamin A supplementation coverage in children. Lessons from Niger. *Nutrition in Development Series*, Issue 5.

Aguayo, V., Baker, S., Crespin, X., Hamani, H., & MamadoulTaibou, A. (2005, March 26). Maintaining high Vitamin A supplementation coverage in children: lessons from Niger. *Food Nutrition Bulletin*, pp. 26-31.

Aguayo, V., Kahn, S., Ishmael, C., & Meershoek, S. (2005, February 8). Vitamin A deficiency and child mortality in Mozambique. *Public Health Nutrition*, pp. 29-31.

Andrew, M., Eric, G., Ulrich, E., Gerald, T., Cesar, G., & Jeffrey, I. (2008). New challenges in studying nutrition-disease interactions in the developing world. *Journal of Clinical Investment*, 1322-1329.

Ayoya, A., Mohammed, A., Shawn, K., Fatimata, Q., Konake, A., Amenatou, T., et al. (2007, October 10). Determinants of high Vitamin A supplemntation among preschool children in Mali. *Public Health Nutrition*, pp. 1241-1246.

Bendech, M., Gil, G., Fode, K., Aissatou, T., Midiaou, B., & Shawn, K. (2007). National Vitamin A supplementation coverage survey among 6-59 months old children in Guinea, West Africa. *Journal of Tropical Pediatrics*, 190-196.

Benn, C., Aaby, P., Nielson, J., Binka, F., & Ross, D. (2009). Does Vitamin A supplementation interact with routine vaccinations? An analysis of the Ghana Vitamin A supplementation Trial. *American Journal of Clinical Nutrition*, 629-639.

Berger, S., Pee, S., Bloem, M., Halati, S., & Semba, R. (2007). Malnutrition and morbidity are higher in children who are missed by periodic Vitamin A capsule distribution for child survival in rural Indonesia. *Journal of Nutrition*, 1328-1333.

Berger, S., Pee, S., Bloem, M., Italati, S., & Semba, R. (2008, April 12). Malnutrition and morbidity among preschool children are not reached by the national Vitamin A program in urban slun areas of Indonesia. *Public Health*, pp. 371-378.

Bharmal, F., & Omar, A. (2001). Evaluation of Vitamin A supplentation in Gulshan-e-Sikandarabad. *Journal of the Pakistan Medical Association*, 247-250.

Bishai, D., Samir, K., Waters, H., Koenig, M., Katz, J., Kharty, S., et al. (2005). The impact of Vitamin A supplementation on mortality inequities among children in Nepal. *Health Policy Plan.*

Bloem, M., Kiess, L., & Moench, R. (2003). *Proceedings of the XX International Vitamin A Consultative Group Meeting.* Geneva.

Choi, Y., Bishai, D., & Hill, K. (2005). Socioeconomic differentials in supplementation of vitamin A; Evidence from Philippines. *Journal of Health, Population and Nutrition*, 156-164.

Christine, S. B., Gesario, M., Amabelia, R., Henrik, R., Ann, B. F., Dorthe, C., et al. (2009). The effects of Vitamin A supplementation administered with missing vaccines during immunization days in Guine-Bissau. *International Journal of Epidemiology*, 304-314.

Darlow, C., & Graham, M. (2005). Vitamin A supplementation for preventing morbidity and mortality in very low birth weight infants (Conchrane review). *Conchrane Library*, Issue 2.data: www.worldbank.org/hnp.

DHMT (1999). *Report on Vitamin A orientation meeting with district health management teams.* Zambia.

Dole, K., Gilbert, C., Deshpande, M., & Khandekar, R. (2009). Prevalence and determinants of xerophthalmia in preschool children in urban slums, Pune, India- a preliminary assessment. *Ophthalmic Epidemiology*, 8-14.

Fiedler, J., Dado, D., Maglalang, H., Juban, N., Capistrano, M., & Magpantay, M. (2000). Cost analysis as a Vitamin A program and evaluation tool: a case study of the Phillipines. *Social Sciences Medical*, 223-242.

Gorstein, J., Shreshtra, R., Pandey, S., Adhikari, R., & Pradhan, A. (2003). Current status of Vitamin A deficiency and the National Vitamin A control program in Nepal: result of the 1998 National Micronutrient Status Survey. *Asia Pacific Journal of Clinical Nutrition*, 96-103.

Grover, D., Pee, S., Sun, K., Raju, V., Bloem, M., & Semba, R. (2008). Vitamin A supplemntation in Cambodia: Program coverage and associations with greater maternal formal education. *Asia Pacific Journal of Clinical Nutrition*, 446-450.

Harsha, B., Kalyan, D., Rishi, R., Kamalesh, G., Parikshit, G., Purukayastha, et al. (2008). Causes of childhood blindness in the northeastern states of India. *Indian Journal of Ophthalmology*, 495-499.

Hellen Keller International and MOST (2004). Rapid assessment of Vitamin A supplementation to young children and postpartum mothers in mainland Tanzania. *Tanzania Food and nutrition Center Report.*

Hellen Keller International (2003, May 5). Vitamin A capsule coverage improves between the August 1999 and February 2002 vitamin A distribution months. *Indonesia Crisis Bulletin*, pp. 12-17.

Hendricks, M., Beardsley, J., Bourne, L., Mzamo, B., & Golden, B. (2007, October 10). Are opportunities for Vitamin A supplementation being utilized at primary health-care clinics in the Western Cape Province of South Africa. *Public Health Nutrition*, pp. 1082-1088.

Hill, Z., Kirkwood, B., Kendall, C., Adjei, E., Arthur, P., & Agyemang, C. (2007, August 10). Factors that affect the adoption and maintenance of weekly Vitamin A supplementation among women in Ghana. *Public Health Nutrition*, pp. 827- 833.

Hopkins, J. (2004). Public Health at a Glance. *Global Vitamin A Website.*

(http://www.jhsph.edu/CHN/GlobalVAD.html)

Humphrey, J., & Rice, A. (2000). Vitamin A supplementation of young infants. *Lancet*, 422-424.

Jiang, J., Lin, L., Lian, G., & Greiner, T. (2008). Vitamin A deficiency and child feeding in Beijing and Guizhou, China. *World Journal of Pediatrics*, 20-25.

Kabaka, S., Wamae, A., Wefwafwa, T., Murage-Rowa, L., & Wanyoike, C. (2009). An analysis of the social mobilization strategy to increase vitamin A supplementation coverage through routine hea th services –the case of the Malezi Bora strategy in Kenya. Nairobi: MOH.

Katz, J., Keith, P., Lee, W., Subarna, K., Elizabeth, K., Parul, C., et al. (2002). Determinants of maternal Vitamin A or Beta-carotene supplementation coverage: village- based female distributors in Nepal. *American Journal of Public Health*, 1105-1107.

Kenya Demographic Health Survey (2004). *Kenya Demographic Health Survey 2003 results*. CBS, MOH, KEMRI, NCPD, CDC, Nairobi

Lanata, C., Stroh, G., & Black, E. (1988). Lot quality assurance sampling in health monitoring. Letters to the Editor. *Lancet,* 122–23.

Laura, E., Stephanie, A. R., & Robert, E. (2004). Undernutrition an underlying cause of malaria morbidity in children less than five years old. *American Journal of Tropical Medicine and Hygiene*, 55-63.

Masanja, H., Joanne, S., Hassan, M., Meere, S., Joseph, M., Godwin, N., et al. (2006). Vitamin A supplementation in Tanzania: the impact of a change in pregmatic delivery strategy on coverage. *BMC Health Services Research*, 1472-6963.

Masanja, H., Savigny, D., Smithson, P., Schellenberg, J., John, T., Mbuya, C., et al. (2008). Child survival gains in Tanzania: analysis of data from Demographic and Health Surveys. *Lancet*, 1276-1283.

Milagres, R., Nunes, L., & Pinheiro-Sant'Ana, H. (2007). Vitamin A deficiency among children in Brazil and worldwide. *Cien Saude Colet*, 1253-1266.

Ministry of Health (1999). *Annual Health Plan.* Nairobi: MOH.

Ministry of Health (2003). *Annual Health Plan.* Nairobi: MOH.

Ministry of Health (2008). *Annual Health Plan.* Nairobi: MOH.

Ministry of Planning - Gucha District (2002). *District Development Plan 2002-2008.* Nairobi: Government Press.

Mora, J., & Bonilla, J. (2002). Successful Vitamin A supplementation in Nicaragua. *Newsletter 3* .

MOST and USAID (2004). *Cost Analysis of the National Vitamin A supplemntation Programs in Ghana, Nepal and Zambia: A synthesis of three studies.* Virginia USA.

Muennig, P., Daniel, P., Randall, I., & Mansuenchan, P. (1999). Cost effectiveness of strategies for the treatment of intestinal parasites in immigrants. *Massachusetts Medical Society*, 773-779.

Mugenda, O. M., & Mugenda, A. G. (2003). *Research Methods - Quantitative and Qualitative Approaches.* Nairobi: Acts Press.

Munesh, K. S., Vikas, B., & Swami, H. M. (2004). Outbreak of measles amongst vaccinated children in a slum of Chandigarh. *Indian Journal of Medical Sciences*, 47-53.

Murray, C., & Lopez, A. (1996). *The global Burden of disease: a comprehensive assessment of mortality and disability from disease, injuries, and risk factors in 1990 and projected to 2020.* Harvard school of public health.

Nabakwe, E., Lichtenbelt, W., Ngare, D., Wierik, M., Westerterp, K., & Owino, O. (2005). Vitamin A deficiency and anaemia in young children living in a malaria endemic district of western Kenya. *East African Medical Journal*, 300-306.

Ngare, D., Muttunga, J., & Njonge, E. (2000). Vitamin A deficiency in pre-school children in Kenya. *East African Medical Journal*, 421-424.

Nojilana, B., & Labadorios, D. (2007). Estimating the burden of disease attributable to vitamin A deficiency in South Africa in 2000. *South African Medical Journal*, 748-753.

Oliveira, J., & Rondo, P. (2007). Evidence of the impact of vitamin A supplementation on maternal and child health. *Cad Saude Publica*, 2565-2575.

Pangaribuan, R., Scherbaum, V., Erhardt, J.,Sastroamidjojo, S., & Biesalski, H.(2004). Socioeconomic and familial characteristics influence caretakers' adherence to periodic Vitamin A capsule supplementation program in Central Java, Indonesia. *Journal of Tropical Pediatrics*, 143-148.

Pedro, R. (2002, May). The Philippines Vitamin A Supplementation Program: Indicative impact, policy and program implications. *Bulletin of the micrantrients*, pp. 120 -128.

Ramachandran, R. (2001). Frontline Health. *India's National Magazine*. India.

Richard, D. S., Saskia, D. P., Kai, S., Martin, W. B., & Raju, V. K. (2008). Coverage of the National Vitamin A Supplementation Program in Ethiopia. *Journal of Tropical Pediatrics*, 1093-1096.

Richard, S., Muhilal, Nasrin, M., Zakiuddin, M., Arwin, A., Dewi, P., et al. (1999). Integration of Vitamin A supplementation with the Expanded Program on Immunization does not affect seroconversion to Oral Poliovirus Vaccine in infants. *Journal of Nutrition*, 2203-2205.

Rongwang, Y., Rong, L., Shujiong, M., Liying, S., Xinwen, H., Chai, J., et al. (2007). The survey of serum retinol of the children aged 0-4 years in Zhejiang Province, China. *BMC Public Health*, 264.

Sachdeva, S., & Datta, U. (2009). Vitamin A-first dose supplement coverage evaluation amongst children aged 12-23 months residing in slums of Delhi, India. *Indian Journal of Ophthalmology*, 299-303.

Sankaranarayanan, S., Ma, Y., Bryson, M., Li, N., & Ross, A. (2007). Neonatal-age treatment with Vitamin A delays post weaning, Vitamin A deficiency and increases the antibody response to T-cell dependent antigens in young adult rats fed a vitamin A-deficient diet. *Journal of Nutrition*, 1229-1235.

Schultink, W. (2002). Use of under five mortality rate as an indicator for Vitamin A deficiency in a population. *Journal of Nutrition* , 2881-2883.

Semba, R., Saskia, D., Kai, S., Bloem, M., & Raju, V. (2008). Coverage of national Vitamin A supplementation program in Ethiopia. *Journal of Tropical Pediatrics*,141-144.

Stella, M., Michael, D., & Peter, G. (1997). Vitamin - Mineral Supplement Use Among Preschool Children in the United States. *The Journal of American Academy of Pediatrics*, 100-105.

Swami, M. (2002). Mass supplementation of vitamin A linked to national immunization days. *The Indian Journal of Pediatrics*, 675-682.

Thakore, J. (2003). Vitamin A deficiency. *Medicine Instant Access Bulletin* .

Thapa, S. (2009, June). Nepal's vitamin A supplementation programme, 15 years on: Sustained growth in coverage and equity and children still missed. *Global Public Health*, pp. 1-10.

UNICEF (2004). Vitamin A deficiency. *UNICEF global database on Vitamin A supplementation coverage.*

UNICEF (2005). *Key polio indicators for children in West and Central Africa UNICEF global database on vitamin A supplementation coverage.*

USAID (2005). *Tanzania Country Strategic Plan 2005-2014 Booklet.*

Victoria, C., Vaughan, J., Barros, F., Silva, A., & Tomasi, E. (2000). Explaining trends in inequities: Evidence from Brazilian child health studies. *Lancet*, 1093-1098.

Villamor, E., & Fawzi, W. (2005). Effects of Vitamin A Supplementation on Immune Responses and Correlation with Clinical Outcomes.*Clinical Microbiology Reviews.*

West, K., Darnton, H., Semba, R., & Bloem, M. (2001). Vitamin A Deficiency: Nutrition and Health in Developing Countries. *Nutrition Journal*, 267-306.

World Health Organization (2003). *Nutrition and Micronutrient deficiencies. WHO Report.* Geneva - Switzerland.