Shendi University

Faculty of Postgraduate And Scientific research

Prevalence of Malnutrition among Children Under Five Years of Age, Angola Area, Umbada Locality, Khartoum State

(2015 – 2017)
Atheists required for **M.sc** degree in public health

By: Elfatih Ahmed Yousif Omer

M.B.B.S 2005 (Red Sea University)

Supervisor:
Dr. Adam Dawria Ibrahim
PhD Public Health
Assistant professor at Shendi University

2017

Dedication

I dedicated this work

To my father .… To my mother ……who are always supported and encouraged me to success

To my family …and To everyone who helped me to learn new things and to reach this level.

Acknowledgements

ABSTRACT

BACKGROUND: Malnutrition is one of the leading causes of morbidity and mortality in children under the age of five years in developing countries.

OBJECTIVES: The study aimed to study the magnitude and risk factors of malnutrition among less than five years children in Angola area in Umbada Locality, Khartoum state.

MATERIAL &METHODS:

A cross-sectional prevalence study was undertaken in Angola area in Umbada Locality. About 282 mothers and children under five yrs were selected by a systematic random sampling for six clusters in each cluster a number of 47 subject s were selected. Children under five years ages were carefully assessed and their weights and heights taken. A questionnaire was filled by mothers. Data were collected about socio-demographic variables and possible risk factors associated with malnutrition in addition to observation check list regarding sanitation, waste collection and disposal, water sources and houses health environment and methods of keeping food. Children were classified into normal, mild, moderate and severe degrees of malnutrition according to the three approaches (height, weight and age). Data was analyzed through SPSS program.

RESULTS:

The total prevalence of malnutrition was 24.4%. Female children were more affected by malnutrition than were male children. The study observed that age, mother's education and father's education were found to be important factors in prevalence. The cases found were classified into 19.1% severe malnutrition, 4.6% moderate and 0.7% mild malnutrition while 75.5% were found normal. Children were weaned earlier mostly during one and half year. Most of mothers who were working had breastfeed their Childs after and before work. Local food was the commonest supplement. There was a high prevalence of infectious diseases among

children in the area, especially diarrheas, and respiratory tract infections, malaria and measles. Wrong concepts were common among mothers about visits for MCH centers; they thought there was no need.

Conclusion & recommendations: Malnutrition was prevalent among children under five years in Angola area. Health and nutrition education, as well as training of health workers are strongly recommended.

مستخلص الدراسة

الخلفية:

سوء التغذية واحد من الاسباب التى تقود للامراضية والوفيات فى الدول النامية.

الاهداف:

هدفت الدراسة لدراسة معدل الانتشار وعوامل الاخطار لسوء التغذية بين الاطفال الاقل من خمسة سنوات فى منطقة انقولا بمحلية امبده بولاية الخرطوم.

الوسائل والمعدات:

اجريت دراسة وصفية لتحديد معدل الانتشار فى منطقة انقولا بمحلية امبده . حوالى ٢٨٢ من الامهات اللائى لديهن اطفال اقل من خمسة سنوات تم اختيارهم بالعينة العدلية المنتظمة لعدد ستة عناقيد فى كل عنقود عدد ٤٧ من مجتمع الدراسة تم اختيارهم . اعمار الاطفال اقل من خمسة سنوات تم تقييمها بحرص واوزانهم واطوالهم تم اخذها. الاستبيان تم ملئه بواسطة الامهات المعلومات جمعت حول المتغيرات الاجتماعية الاقتصــادية و عوامــل الاختطار المحتملة المرتبطة بسؤ التغذية بالاضافة الى قائمة ملاحظات فيما يختص بالاصحاح ، جمــع النفايات والتخلص منها ، مصادر مياه الشرب وبيئة المساكن وطرق حفظ الاطعمة   .الاطفال المصابين تم تصنيفهم الى طبيعين ، متوسط، وحادى سؤ التغذية وفقــا للمـداخل الــثلاث (

الطول ، الوزن والعمر) . تم تحليل المعلومات من خلال برنامج الحزم الاحصائية للعلوم الاجتماعية.

النتائج:

مجموع معدل الانتشار هو ٢٤.٤ %. الاناث من الاطفال اكثر اصابة بسوء التغذية من الذكور من الاطفال. لاحظت الدراسة ان العمر، تعليم الامهات وتعليم الاباء وجدوا من اهم العوامل فى تحديد معدل انتشار المرض. معدل الانتشار تم تصنيفه الى ١٩.٤ % حاد، ٤.٦ % متوسط و ٠.٧ .% بسيط بينما ٧٥ .%% وجدوا طبيعيين. معظم الامهات عاملات يرضعن اطفالهن بعد وقبل العمل. الطعام المحلى اكثر شيوعا فى الاطعام الاضافى للاطفال. هنالك معدل انتشار عالى بين الاطفال فى المنطقة كالاسهال ،الالتهابات التنفسية ، الملاريا والحصبة. المفاهيم الخاطئة شائعة بين الامهات فيما يختص بزيارة مراكز الامومة والطفولة ، يعتقدون انه ليس هنالك حوجة. كذلك استخدام الكاسات فى اطعام الاطفال اكثر استخداما بين المستجوبين .

الخاتمة والتوصيات:

سوء التغذية منتشر بين الاطفال اقل من خمسة سنوات فى منطقة انقولا محلية امبده . التثقيف الصحى والتغذية وكذلك تدريب العاملين الصحيين يوصى به بشدة.

Table of contents

List of Abbreviations

Abbreviation	Description
CI	Confidence Interval
CM	Centimetre
GHF	Global Health Food Program
HIV	Human immune Virus
kcal	kilocalorie
MCH	Maternal and child Health
OR	Odd Ratio
PEM	Protein Energy Malnutrition
rT3	Triiodothyronine
SD	Standard Deviation
SHF	supplementary Health Feeding
Vit K	Vitamin K
WHO	World Health Organization

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION, JUSTIFICATION AND OBJECTIVES

1. Introduction:

Malnutrition is an important risk factor for illness and death contributing to more than half of death in children worldwide; child malnutrition was associated with 54% of death in children in developing countries 2001. Protein Energy Malnutrition (PEM), first described in the 1920, is observed most frequency in hospitalized and chronically ill children in the United States. In Arab17.3 million (42.9%) children underweight, 24.9 million (43.3%) are stunted and 5.2 million are wasted. In addition sever; acute malnutrition is a problem in countries with complex emergencies e.g. (Somalia, Sudan) or those under economic and political sanction. In Sudan percentage of children aged moderately malnutrition are wasting prevalence % below 2SD is 14.8%, Wasting prevalence %below 3SD is 3.5%. It killed 112 children per 1000 live birth. Anthropometric measurements were taken from 3461 children under 5year of age in rural communities in East Sudan. 73 % of the children fell below -2 standard deviations from the median using WHO weight for height reference tables. Water low classification showed that about half of the children were wasted.

1.2. Justification:

According to a study conducted by WHO during 1988 the findings confirmed that more a third of the world's children are affected. For all the indicators (wasting, stunting, and underweight) low or moderate prevalence occurs in Latin America.

In Asia most countries have high or very high prevalence and in Africa a combination of both situations are found. A recent nutritional survey held during 2007 in Khartoum State by FMOH in collaboration with Care Sudan revealed that more than 15 % of children under 5 years of age are malnourished, depending on these finding and according to the world health organization recommendation on such a situation that supplementary feeding program should be excited as follows:

* when the general rations is less than 1,500 kcal/person.

* when the nutritional assessment reveals that greater than 20 % of Children under 5 years age acutely malnourished as determined by a scoreless that falls between 10% and 20% and the general rations are less than 1900 kcal. Where there is a high incidence of measles or diarrheal diseases. Care Sudan in collaboration with Global Health Food Program (GHF) created a supplementary feeding program (SHF) for the under 5 year's malnourished children. An additional report from ministry of health Khartoum state (annual report 2007) stated that, the incidence of gastroenteritis is very high in the Angola Area among displaced under 5 years children. According to the above reasons, it is decided to study. Prevalence and risk factors associated with malnutrition among children less than 5 years of age. This will enable recommending interventions which could help in improving the situation and hence benefit the under five children living in the area.

1.3. Objectives

1.3.1. General objective

To study the prevalence and possible risk factors of malnutrition among under five years in Angola Area in Umbada Locality, Khartoum State, 2015-2017.

1.3.2. Specific objectives

1. To calculate prevalence of malnutrition among children under five years of age in Angola Area.

2. To identify the possible risk factors of malnutrition among children less than five years of age in the Angola Area.

CHAPTER TWO

LITREATURE REVIEW

2.1. Definition:

The world health organization defines malnutrition as "The cellular imbalance between supply of nutrition and energy and the body's demand for them to ensure growth, maintenance, and specific function Women and young children are the most adversely affected group; one quarter to one half of women of childbearing age in Africa and South Asia are underweight, which contributes to the number of low birth weight infants born annual. [1]

The WHO estimate that by the year 2015, the prevalence of malnutrition will have decreased to 17.6 % globally, with 113.4 million children younger than five year affected as measured by low weight for age. The over whelming majority of these children, 112.8 million will live in developing counters with 70% of these children in Asia, particularly the south central region, and 26% in Africa. And additional 165 million (29%) children will have stunted length /height secondary to poor nutrition. currently, more than have of young children in south Asia have PEM, which is 6.5 times the prevalence in western hemisphere. In sub-Saharan Africa, 30% of children have PEM. Despite marked improvement globally in the prevalence of malnutrition, rates of under nutrition and stunting have continued to rise in Africa where rate of under nutrition and stunting have risen from 24% to 26.8% and 47.3% t0 48% respectively, since 1990, with worst increased occurring in eastern region of Africa. [2]

2.2. Clinical background:

2.2.1. Signs and symptoms

History

According to the American Society for Parenteral and Enteral Nutrition (ASPEN), malnutrition can be classified as either being illness related (secondary to another disease or injury) non-illness related, (attributable to environmental/behavioral causes) or a combination of the two.

The most common and clinically significant micronutrient deficiencies and their consequences include the following:

• Iron: Fatigue, anemia, decreased cognitive function, headache, glossitis, and nail changes

• Iodine: Goiter, developmental delay, and mental retardation

• Vitamin D: Poor growth, rickets, and hypocalcemia

• Vitamin A: Night blindness, xerophthalmia, poor growth, and hair changes

• Folate - Glossitis, anemia (megaloblastic), and neural tube defects (in fetuses of women without folate supplementation)

• Zinc: Anemia, dwarfism, hepatosplenomegaly, hyperpigmentation and hypogonadism, acrodermatitis enteropathica, diminished immune response, and poor wound healing.

2.2.2. Physical examination

Physical findings that are associated with PEM include the following:

• Decreased subcutaneous tissue: Areas that are most affected are the legs, arms, buttocks, and face

• Edema: Areas that are most affected are the distal extremities and anasarca (generalized edema)

• Oral changes: Cheilosis, angular stomatitis, and papillar atrophy

• Abdominal findings: Abdominal distention secondary to poor abdominal musculature and hepatomegaly secondary to fatty infiltration

• Skin changes: Dry, peeling skin with raw, exposed areas; hyperpigmented plaques over areas of trauma

• Nail changes: Fissured or ridged nails

• Hair changes: Thin, sparse, brittle hair that is easily pulled out and that turns a dull brown or reddish color. [3]

2.2.3. Diagnosis

• Initial diagnostic laboratory studies include the following:

Complete blood count, Sedimentation rate, Serum electrolytes, Urinalysis Culture, Stool specimens, Protein studies, Renal function tests, liver function tests, Additional laboratory studies, Thyroid functions or sweat chloride tests, particularly if height velocity is abnormal.

• Nutritional status studies

• Practical nutritional assessment includes the following:

    A. Complete history, including a detailed dietary history

    B. Growth measurements, including weight and length/height; head circumference in children younger than three years

    C. Complete physical examination

2.2.4. Management

Children with chronic malnutrition may require caloric intakes of more than 120-150 kcal/kg/day to achieve appropriate weight gain. Most children with mild malnutrition respond to increased oral caloric intake and supplementation with vitamin, iron, and folate supplements. The requirement for increased protein is met typically by increasing the food intake. Management must be carried out in centers by physicians familiar with nutritional disorders as nutritional recovery syndrome may include excessive sweating and hepatomegaly. Refeeding syndrome is a potentially life threatening condition that occurs with administration of high calorie feeds in severely malnourished children. This potentially fatal condition is associated with electrolyte disturbances including hypokalemia and hypophosphatemia.

2.2.5. Prevention

The prevention of malnutrition in children starts with an emphasis on prenatal nutrition and good prenatal care. Promotion of breastfeeding is particularly crucial in developing countries where safe alternatives to human milk are unavailable. Health care providers should also counsel parents on the appropriate introduction of nutritious supplemental foods.

2.2.6. Classification of Malnutrition:

Kwashiorkor and marasmus are two forms of PEM that have been described but there has been a paradigm shift in diagnosing pediatric malnutrition. The new schema for defining malnutrition incorporates the concepts of chronicity, etiology, and pathogenesis of malnutrition; its relationship with inflammation; and its impact on functional outcomes. The distinction between the two forms of PEM is based on the presence of edema (kwashiorkor) or absence of edema (marasmus). Marasmus involves inadequate intake of protein and calories, whereas a child with kwashiorkor has fair-to-normal calorie intake with inadequate protein intake. Although significant clinical differences between kwashiorkor and marasmus are noted, some studies suggest that marasmus represents an adaptation to starvation whereas kwashiorkor represents a dysadaptation to starvation.

In addition to PEM, children may be affected by micronutrient deficiencies, which also have a detrimental effect on growth and development. The most common and clinically significant micronutrient deficiencies in children and childbearing women throughout the world include deficiencies of iron, iodine, zinc, and vitamin A and are estimated to affect as many as two billion people. Although fortification programs have helped diminish deficiencies of iodine and vitamin A in individuals in the United States, these deficiencies remain a significant cause of morbidity in developing countries, whereas deficiencies of vitamin C, B, and D have improved in recent years. Micronutrient deficiencies and protein and calorie deficiencies must be addressed for optimal growth and development to be attained in these individuals. [4]

Table (2-1) Welcome classification of malnutrition

Case	Body weight as % of standard	Edema	Deficit in weight for age
Underweight	60 – 80%	-	Mild
Nutrition dwarf	< 60%	-	Mild
Marasmus	< 60%	-	Marked
Kwashiorkor	60 – 80%	+	Mild
Marasmus-kwashiorkor	< 60%	+	Marked

Weight-for-age = (weight of the patient /weight of normal child of the same age) *100.

2.2.7. Pathophysiology

Malnutrition affects virtually every organ system. Dietary protein is needed to provide amino acids for synthesis of body proteins and other compounds that have various functional roles. Energy is essential for all biochemical and physiologic functions in the body. Furthermore, micronutrients are essential in many metabolic functions in the body as components and cofactors in enzymatic processes.

In addition to the impairment of physical growth and of cognitive and other physiologic functions, immune response changes occur early in the course of significant malnutrition in a child. These immune response changes correlate with poor outcomes and mimic the changes observed in children with acquired immune deficiency syndrome (AIDS). Loss of delayed hypersensitivity, fewer T lymphocytes, impaired lymphocyte response, impaired phagocytosis secondary to decreased complement and certain cytokines, and decreased secretory immunoglobulin A (IgA) are some changes that may occur. These immune changes predispose children to severe and chronic infections, most commonly, infectious diarrhea, which further compromises nutrition causing anorexia, decreased nutrient absorption, increased metabolic needs, and direct nutrient losses.

Early studies of malnourished children showed changes in the developing brain, including, a slowed rate of growth of the brain, lower brain weight, thinner cerebral cortex, decreased number of neurons, insufficient myelinization, and changes in the dendritic spines. More recently, neuroimaging studies have found severe alterations in the dendritic spine apparatus of cortical neurons in infants with severe protein-calorie malnutrition. These changes are similar to those described in patients with mental retardation of different causes. There have not been definite studies to show that these changes are causal rather than coincidental.

Other pathologic changes include fatty degeneration of the liver and heart, atrophy of the small bowel, and decreased intravascular volume leading to secondary hyperaldosteronism.

Hormonal adaptation to the stress of malnutrition:

The evolution of marasmus, less than 1% of all children in the United States have chronic malnutrition. Incidence of malnutrition is less than 10%, even in the highest risk group (children in shelters for the homeless). Some studies indicate that poor growth secondary to inadequate nutrition occurs in as many as 10% of children in rural areas. Studies of hospitalized children suggest that as many as one fourth of patients had some form of acute PEM and 27% had chronic PEM.

2.2.8. Mortality and Morbidity

Malnutrition is directly responsible for 300,000 deaths per year in children younger than five years in developing countries and contributes indirectly to more than half of all deaths in children worldwide. In addition, it increases health care costs.

The adverse effects of malnutrition include physical and developmental manifestations. Poor weight gain and slowing of linear growth occur. Impairment of immunologic functions in these children mimics those observed in children with AIDS, predisposing them to opportunistic and other typical childhood infections.

In developing countries, poor perinatal conditions account for 23% of deaths in children younger than five. Malnourished women are at high risk of giving birth to low birth weight infants. Many low birth weight infants (15-20% of all births worldwide) face severe short-term and long-term health consequences, such as growth failure in infancy and childhood, which increases risk of morbidity and early death. [5]

2.3. malnutrition in community surveys:

The most widely used method of classification of PEM is that suggested by Gomez (1956). It is based on deficit in weight/ age, to measure the severity of underweight.

A study in Nigeria 2004 in Lagos which is one of the poorest countries in which chronic malnutrition is high. This study state that there was a high prevalence of stunting, underweight and wasting that is 54.6% , 35% and 6% respectively .It was also noted that children aged 12-23 months and Khmu ethnic children had a highs prevalence of stunting (65%and 66%).However, it was also found that boys were more prone to be stunted and underweight. Furthermore, restricted intake of meats, vegetables during illness, and low maternal education were risk factors for child

malnutrition in the study area. Socioeconomic and demographic factors, low maternal education ,poor nutrition knowledge for mother and feeding practices for sick children are affecting children health regarding stunting and underweight. It was recommended that an improvement in societal infrastructure, better maternal education and nutrition are needed to address the child malnutrition issue. [6]

2.4. Risk factor of malnutrition:

Inadequate intake of food both in quantity and quality:

Inadequate food is the most common cause of malnutrition worldwide. In developing countries, inadequate food intake is secondary to insufficient or inappropriate food supplies or early cessation of breast feeding .In some areas, cultural and religious food customs may play a Role. Inadequate sanitation further endangers children by increasing the risk of infectious diseases that increase nutrition losses and alters multiple demands.

Ubesie 2012 noted that PEM was more common among children from lower social class (69.4%) and those predominantly breast fed for three month or less 40.6% compared to exclusively breast fed (18.9%) . the reason for this may not be unconnected to fact that poor family have low purchasing power for adequate nutrition for their families . illiteracy on other hand may influence feeding practice the lower rate of exclusive breast feeding noted in third review despite the Baby friendly initiative is also worrisome. Poverty and illiteracy as risk factors for PEM. [7]

 In Ibadan southern Nigeria a observed high incidence of kwashiorkor .This could probably be due to low protein containing food stuff in that region when compared with the northern part. In the northern region of Nigeria there is more of inadequate calorie intake rather than inadequacy of protein in the diet. A miasma was also found to be more common among children of the ages between six and 12 months while kwashiorkor and marasmic –kwashiorkor were higher between the ages of to 18 months and 19 to 23monthes respectively. The Majority of the malnourished children were resident in high-density areas or the areas of the town where poor home facilities, poor environmental sanitation and low socioeconomic status of the patient were identified as key factor. In addition most of the mothers, 46(81.7%) had no formal education or attended only primary or Islamic schools .Some of the

mothers married at very early age when, they were nutritionally deficient others were married into polygamist homes. Strong association was observed between big family size and malnutrition. [8]

Haydar 2012 in Eastern Sudan study beliefs on breast feeding and weaning. This study found that supplementary feeding consisted of porridge and milk only in rural areas, while in urban areas eggs, bean and custard are added. Grandmothers and other elderly women in rural areas who bear harmful beliefs had greatest influence on weaning , mothers weaned their children abruptly, a mother spill breast milk on the floor in front of the child prior of feeding and faith of healer may be called in to reduce the psychological Trauma. On the other hand, some urban mothers wean their children gradually. They may begin by decreasing the number of breast feeds or breast feed after the child has eaten a heavy meal. [9]

Birth interval might not have been associated with malnutrition since the birth interval being practiced here ranged from two to three years. breastfed for 12-24 month, and in case the breast milk was not exclusive as pap and other carbohydrate introduced early (before six months).This contributed to the incidence rate of PEM as additional food might not have been hygienically handled. Therefore sporadic-episode of diarrhea And vomiting were common before this age .prior to the presentation, some of the mother had discontinued milk feeding. It was evident therefore, that the onset of the disease was closely related to the age and practice of weaning. Also it was observed that there inadequate utilization of available immunization services, only 46.7% of the malnourished children had received the full course of the Triple vaccines while 53.3% of the children had been immunized against either measles or small –pox. However, this underutilization is not peculiar to Nigeria. It is a phenomenon in most developing countries the predominant factor observed here was lack of education, ignorance and cultural beliefs. [10]

Syed AHM 2013 had shown several determinate of growth retardation among the societal variable. Only income and maternal education level were significantly associated with eight deficits. Maternal had the strongest effect on growth, with little variation in Magnitude or all steps of logistic regression. Children of illiterate mothers were 17 times more likely to present growth deficit than the children of mothers with 11 years, which reflects the importance of education mothers for the development of healthy children. [11]

Baudelogue, Yaoundé, (1984) his survey of health status, bio-demographics', and use of health care services of all children under two years of age. During the admission procedure, each child mother or surrogate mother was interviewed and the child was according to study protocol, additional data were collected by review of hospital records the study findings underscore the broad health benefits of immunization. Furthermore, any prior contact of mother or child with the health care system appears to be associated with better nutritional status on hospital admission. [12]

Poor socioeconomic background, poor housing condition, non-availability of latrine, not complete immunization, profuse breast –feeding and nutritionally in adequate diet were found to be risk factor of malnutrition multiple logistic regression of regression analysis showed that a strong association between PEM and diet lacking in animal food intervention measures should take the multi-factorial causation breast milk is the ideal food for infants; it provides the main source of nourishment in the first year of child life. Under normal condition, no other food is required by the body until four- five months after birth. However, after four- five months, mothers' milk should be supplemented by additional food rich in protein and other nutrition "all infants should be fed exclusively breast milk from birth to four- six months of age. The inference of this statement is that 100% of infants up to exact age four months should be exclusively breast fed in order to meet their nutritional requirement, complementary foods should be introduced to the majority of infants during a transitional period lasting six months (that is, during the fifth and sixth months of live .Thus, nearly all infants older than exact six months should be receiving complementary food in addition to breast milk. Children should be breast fed for at least one years of age. [13]

Breast feeding is way of providing ideal food for the healthy growth and development of infants. It is also an integral part of the reproductive process with important implication. Review of evidence has shown that, on a population basis, exclusive breast feeding for six months is the optimal way of feeding infants .There infants should receive complementary foods with continued breast feeding up to 2 years of age or beyond. [14]

Study conducted by Samir Mohamed Ali on (2012), his results depict that, physical symptoms of anemia are loss of appetite (87.7%), paleness(93.5%), exhaust, and

eating clay (29%), while for night blindness they were xerophthalmia (20%); Pinot spots (52%);karatomalacia (12%), and Cornea ulceration (4%). Acute malnutrition constituted 63% of cases of children suffering anemia and night blindness. Children suffering anemia and night blindness distributed among different age groups have very low percent of hemoglobin concentration below 60% standard, confirming for prevalence of Iron deficiency anemia. Malnutrition was highest among children aged 1-3 year old, and females are less malnourished compared to males. There was low energy (calories), Iron and Vitamin A levels of intake among these children. [15]

Results are reported from a one-year follow-up study conducted in 1983 and 1984 of 445

Elsamani, Sudan1988, Sudanese children aged less than five years that was designed to address the hypothesis that malnutrition increases the incidence of diarrheal disease. Children were weighed and measured at two-month intervals ("child intervals") and diarrhea incidence was ascertained during biweekly house visits. During child intervals that followed a prior episode of diarrhea, underweight (weight-for-age less than 90% of expected) was associated with a higher incidence of diarrhea after adjusting for the potential confounding effects of age and socioeconomic factors (odds ratio (OR) = 1.7, 95% confidence interval (CI) = 1.1-2.8). During child intervals with no history of diarrhea in the preceding interval, the association with underweight was less (OR = 1.2, 95% CI = 0.9-1.6); among these children, stunting (height-for-age less than 95% of expected) was significantly associated with diarrhea (OR = 1.4, 95% CI = 1.0-1.8). Moderate malnutrition (weight-for-age less than 75% of expected) was associated with a twofold increased risk of multiple episodes of diarrhea during a follow-up interval whether or not diarrhea had occurred in the preceding interval (OR = 2.0, 95% CI = 1.2-3.5) after adjusting for age, socioeconomic factors, and diarrhea in preceding interval. Age, rainy season, and history of diarrhea in preceding interval were found to be strongly associated with incidence of diarrhea. These data are consistent with the hypothesis that malnutrition increases the risk of childhood diarrhea. [16]

In a retrospective study conducted in Ethiopia on the outcome of severely malnourished fewer than five children over a period of one year, out of 493

severely malnourished children, marasmus was seen in 36% of cases and kwashiorkor in 64% cases. They were associated with pneumonia (10%), TB (6.6%), HIV positive (4.6%) and septicemia (8.5%). Overall mortality rate was found to be 7.1%, out of which 28.6% had died within 48hr of admission. The recovery rate was 88.4%, 4.5% cases left against medical advice. Study concluded that early deaths were due to the poor condition of the children on admission, leading to failure of treatment and late mortality was related to electrolyte imbalances. These were considered to be an important factor in improving the outcome of malnourished patients. [15]

In a prospective study conducted in 48 malnutrition treatment centre run by Department of Health and Family Welfare in the 24 districts of Jharkhand state over a period of 2 years on severely acute malnutrition children of 6 to 59 months of age showed, out of 3595 children admitted, 55% were girls, 77.7% were 6–23 months old. On the day of admission, 94(2.6%) of the 3595 children admitted had bilateral pitting oedema while the remaining 3501(97.4%) had severe wasting. Among the 3501 children with severe wasting, 32.6% had medical complications; 1.1% had malaria, 1.7% had tuberculosis, 2.3% had diarrhea/severe dehydration, 3.5% had a respiratory tract infection, 6.9% had severe anemia, 9.9% had high fever and 6.5% had multiple complications; 67.4% had no oedema and no medical complication. 34.4% had oedema or medical complications. Among the 3595 children who were admitted, 177(4.9%) were transferred to a district hospital or other facility for medical reasons. Of the remaining 3418 children, 0.6% (n 20) died, 18.4% (n 628) left against medical advice and 81.0% (n 2770) discharged. Children average weight gain was 9.6 (SD 8.4) g/kg body weight per day and their average length of stay was 16.0 (SD 5.7) day. Among the 2770 children who were discharged from the programme, 39.4% (n 1090) gained 15% or more of their initial weight while 60.6% (n 1680) gained less than 15% of their initial weight. [18]

A retrospective study was conducted in Eastern Sudan for 2 years on morbidity and mortality of children with severe acute malnutrition of less than five year of age. Study has showed that out of the 1097 children, oedematous severe malnutrition was found in 179(16.3%) children. Most of children (72.6%) having severe malnutrition were <2 years old. Out of the 1097 children, 61(5.5%) were died, 237 (21.6%) were discharged against medical advice and 799(72.8%) were discharged

with improvement. Of the 61 children who died 11(18.0%) had septicemia following diarrhea and respiratory tract infection. [19]

In a retrospective study conducted in Ethiopia on the outcome of acute severe malnutrition in children less than 5 years over a period of 5 years. Out of 335 children, marasmus was found to be most common type of malnutrition (52.0%) followed by kwashiorkor (23.3%) and marasmic kwashiorkor (24.7%). The overall case fatality rate was 61 (18.4%); 28.4% for marasmic-kwashiorkor, 16.9% for kwashiorkor and 14.5% for marasmus. Significant risk of death were observed in those with history of bottle feeding, diarrhea with severe dehydration, altered level of consciousness, total serum protein of 5 g/dl and less and patients having marasmic kwashiorkor. [20]

In a prospective audit of 101 children aged 6 to 59 months, admitted with severe malnutrition in Kenya, for 3 months, showed that marasmus (58%) was found to be most frequent type of severe malnutrition followed by marasmic-kwashiorkor (27%) and kwashiorkor (15%). The median age of children was 13.0 months. The mean age for children with marasmus was 14.4 months; kwashiorkor was 21.9 months and marasmic-kwashiorkor 18.7 months. This study found that diarrhea (70%) and pneumonia (51%) were common co-morbid conditions. (36 A retrospective study on clinical profile and outcome of severely malnourished 164 children conducted in Ethiopia found that marasmus was more prevalent in infants, kwashiorkor during second and third year. The mean age for marasmus, kwashiorkor and marasmic kwashiorkor incidence were 16.9, 25.9 and 27.3 months respectively. Death occurred in 21.6% cases. The study concluded that presence of diarrhea, oedema, stunting and short mean duration of hospital stay were predictors of death. [21]

CHAPTER 3

METHODOLOGY

3.1. Study design

Across-sectional community based study to select household with children from six months to 59 month of age.

3.2. Study area

Angola Area lies in Umbbada Locality, its buildings are of red bricks, and the common diseases among children are diarrheal diseases, malaria and acute respiratory infections. The total population 0f the area was 56 534 who come from different part of the country. Children below five years of age in area were 10386 (according to the area popular committees, 2010).The rainy season starts in the middle of July and ends in October, with annual rainfall between 100 to 700 mm, but this is influenced by climatic changes. The summer season is characterized by high temperature degree and drought the temperature may reach up to 45 degrees centigrade. Health services include five health centers and five private clinics.

3.3. Study population

Study populations are children age six to 59 months of age and their

mothers/care takers in Angola Area.

3. 4. Inclusion criteria

People who lived in Angola area

Child age more than six months

Child age 59 months

Mothers/ care takers of child age six- 59 months

3.5. Exclusion criteria

Area other than Angola area in Umbada locality

Child age less than six months

Child age 60 months or more

3.6. Sample units

A child six to 59 months of age and his mother/care takers.

3.7. Sample size

The sample size was estimated, based on the rate of prevalence of nutritional deficiency diseases in Khartoum State which was10% (Khartoum State, Ministry of Health, 2009), the following formula was used:

$$n = \frac{z^2 * p * q}{d^2} * \text{design defect}$$

n = the minimal required sample size

Z = 1.96 (the value in normal curve corresponding five level of confidence)

 P = prevalence rate of nutritional deficiency (10%)

 q = 1-p

 d = 0.05(marginal error)

Design defect = 2

 276 bias be rounded to **282** children.

$$n = \frac{(1.96)^2 * 0.9 * 0.1}{(.05)^2} * 2 = 138.2976 * 2 = 276.59$$

3.8. Sampling technique

In this cross –sectional community based study; sampling had been done by dividing the area to six clusters. In each cluster 47 children's that age between six and 59 months and their mothers/caretakers were randomly chosen.

3.9. Selection of eligible households

Households and children within each cluster had been selected as follow:

The starting point was in the middle of every block, then choosing the direction to follow, a pen was rolled, then the nearest house to the sharp end was taken. Then moving to the right and counting according to the sample interval (number of houses in the cluster divided by 47). The next house was chosen. This was continued till the 47 subjects were collected in each cluster. In each house the eligible child measurements and observations were taken and his mother/care taker is interviewed. If the selected houses not eligible then the neighboring houses was chosen.

3.10. Methods of data collection

The questionnaire

Anthropometric measurement: height and weight

Clinical examinations

3.11. Description of study variables

3.11.1.Weight

The Scale 25kg hanging spring scale marked out in steps 0.1 kg, then weighing pants was attached to the lower hook of the scale; an instrument was adjusted to zero. The weighing pants were taken off and the handed to the weighed. The child was freed from all heavy clothing and the weighting pants were put on the child then was suspended from the weighing scale by the handless of the pants. It had been hanged freely moreover portable electrical scales marked in 100 steps was used; it was set zero.

3.11.2. Height

Children up to two years (23 months 85 cm length) of age were measured on horizontal measuring board-shoes were removed. The child was placed gently on to the board, the soles of the feet flat against the fixed vertical part, the head near the cursor or moving part. The child was laid straight in the middle of the board looking directly up. The feet was held firmly against the foot board and placed on the knees of the child, while the child head will be holed gently, and the cursor against the crown of the headland reads out the length to the nearest 0.1 CM.

Children over two years of age (or over 85cm) were measured standing on horizontal surface against vertical measuring device. It was made sure that the child stands straight, with the heels, knees and shoulders against the wall, while the cursor was lowered on to crown of the head, compressing the hair. The height was read out as before, to nearest 0.1cm

3.11.3. Age

The birth data was entered on the recording form (questionnaire) and when the age was known by the mothers it was recorded in months when the age was uncertain no effort had been made to estimate it and for the local calendar was used. Instead lengths had been used to group children by approximate age:

60 to 84.9 cm is equivalent to 6 months, 85 to 100 cm was equivalent to 24 to 56 months because the population is stunted.

3.11.4. Edema

It is the key clinical sign of severe of protein energy malnutrition carrying very high mortality rate in young children .the moderate thumb pressure was applied to the back of the food or the ankle for a few second. If there is edema -an impression would remain for some time where the edema fluid had been pressed out of the tissue .only when both feet show edema then it was recorded.

3.12. vaccination status

Vaccination statuses were checked by reviewing children less than five years of age immunization cards (MCH cards) within area.

3.13. Method of data analysis

Data were analyzed by microcomputer software programmers SPSS. The differences were checked used chi square test. The P.value less than 0.05 considered significant.

3.14. Indicators

Indicators that were used in this cross- sectional community –based study were: height for age (for chronic malnutrition), weight for age (for acute malnutrition) and edema.

3.15. Ethical consideration

The research was approved by the faculty of post graduate studies of the University of Shendi. Also the consent of the child mother/care taker was taken and those who agreed were included in the study.

4. RESULTS

Table (1): Distribution of respondents' by sex, Angola area Umbada locality Khartoum State 2015-2017

	Frequency	Percent
Male	111	39.4
Female	171	60.6
Total	282	100.0

60.6% of total respondents were female while 39.4% of them were males.

Fig (1): Distribution of ages among respondents,

, Angola area Umbada locality Khartoum State 2015-2017
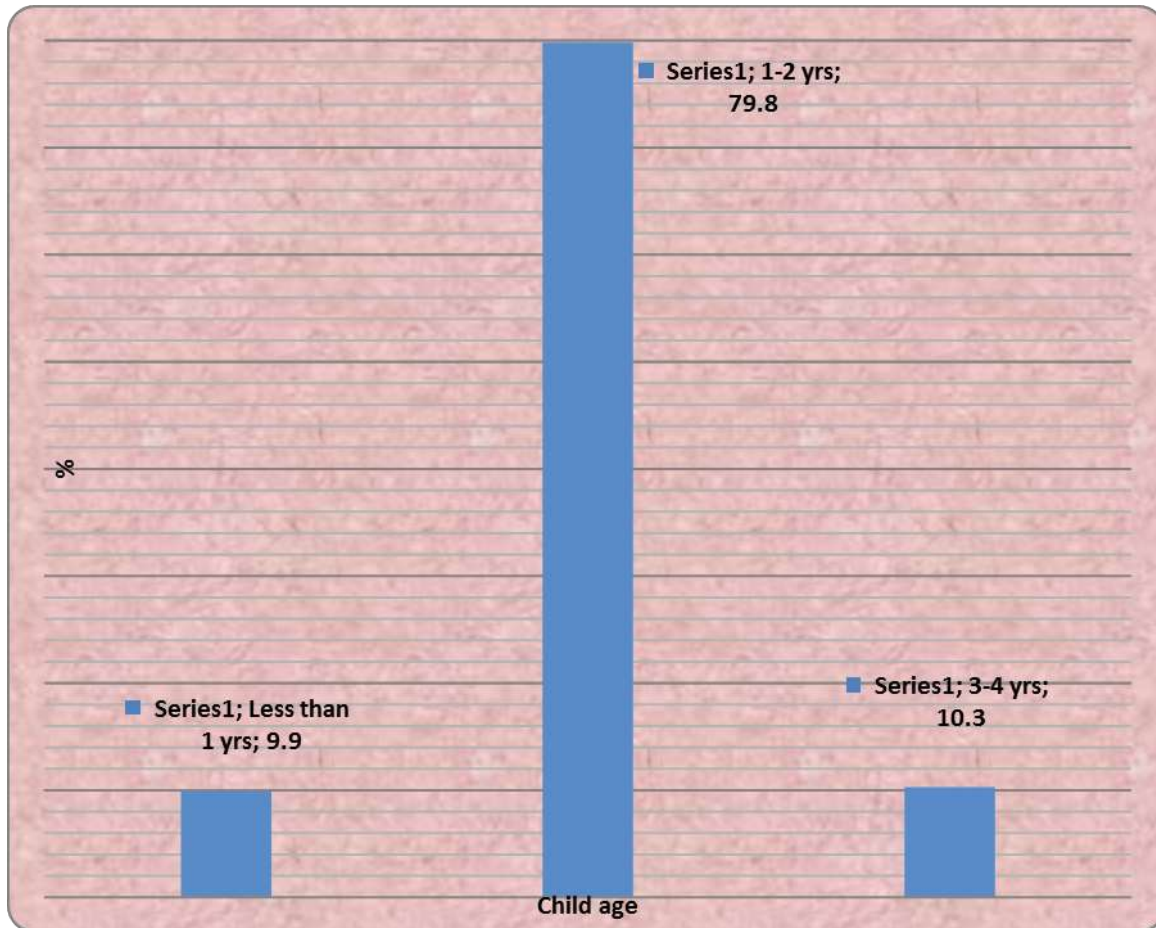
n=282
80% of the respondents' age is between 1-2 yrs

Fig (2): Distribution of Children by nutrition status according to Sudan standards, Angola area Umbada locality Khartoum State 2015-2017

n=282

75.5% of the children were found normal, 0.7% had mild malnutrition, and 4.7%

had moderate malnutrition while 19.1% had severe malnutrition.

Fig (3): Distribution of respondents by father educational level,, Angola area Umbada locality Khartoum State 2015-2017
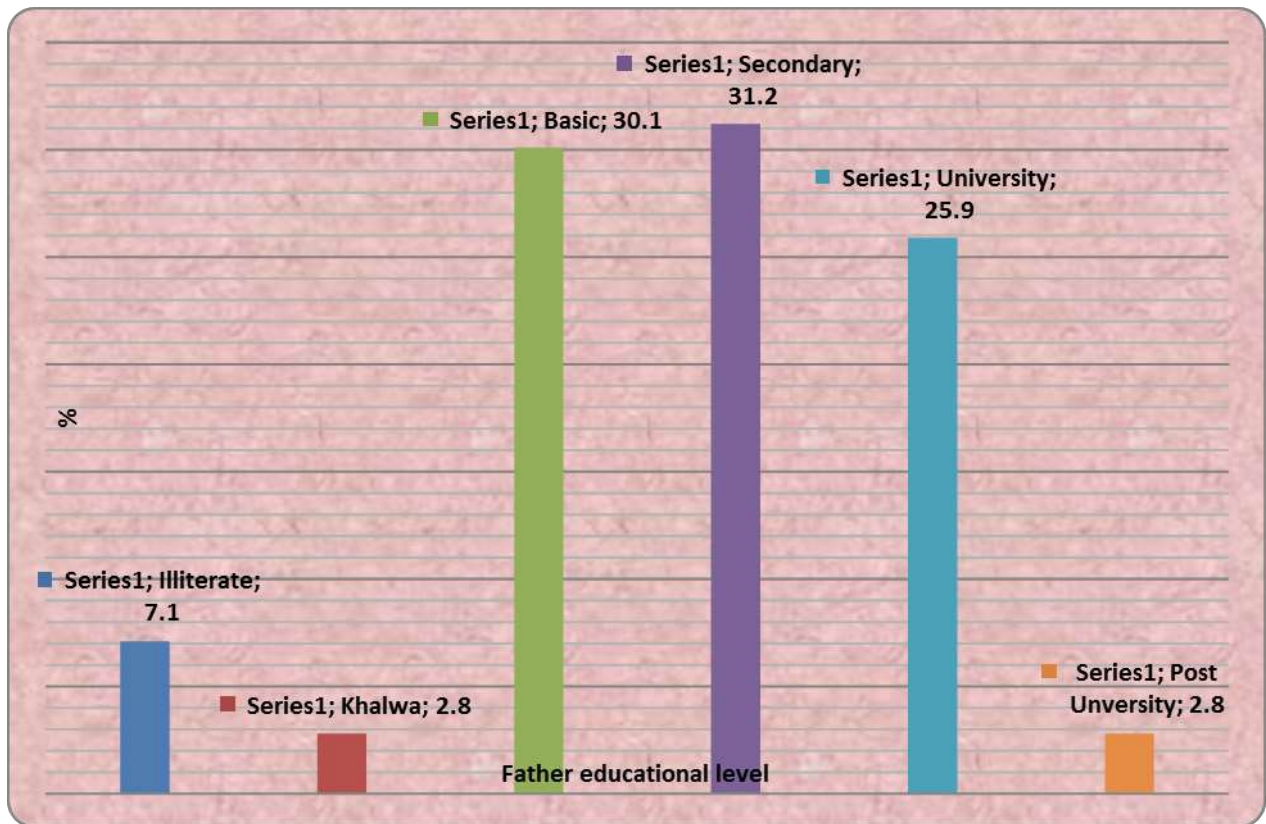
n=282

Most of respondents' fathers had secondary education (31.2%) and 30.1% had basic education.

Fig (4): Distribution of respondents by mothers' educational level, , Angola area Umbada locality Khartoum State 2015-2017
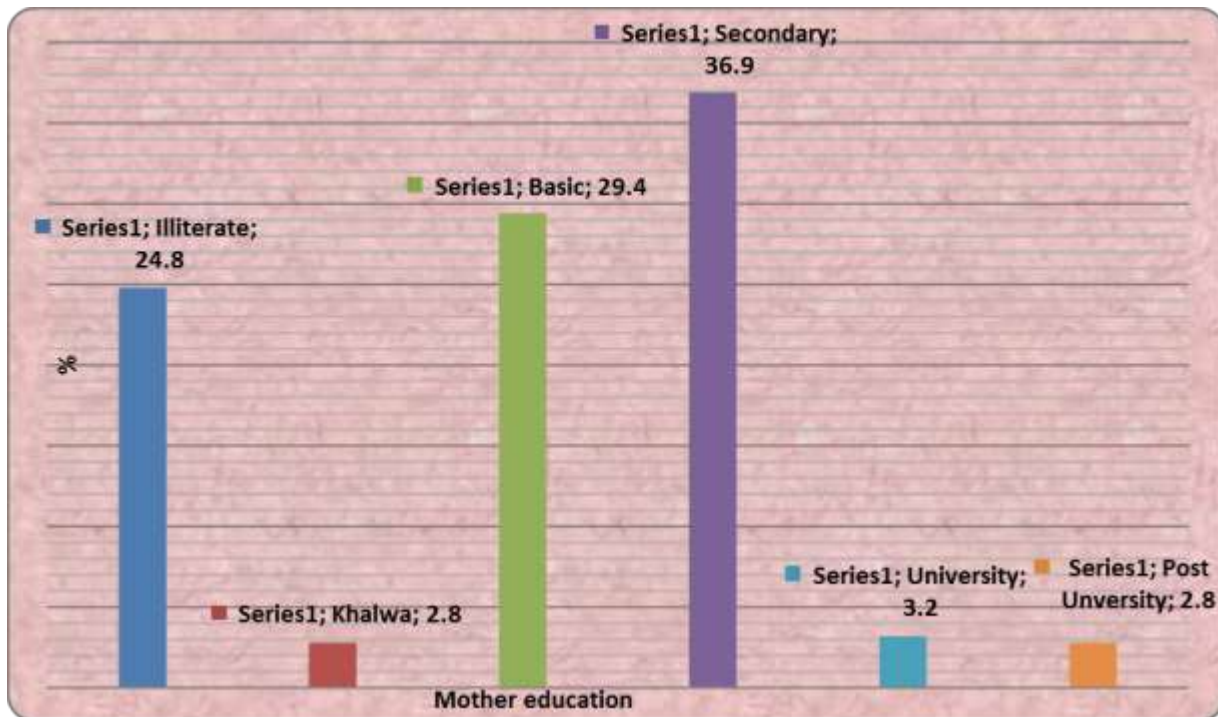
n=282

The majority of the mothers had secondary education (36.9%), 29.4% had basic education.

Fig (5): Distribution of respondents by family size,, Angola area Umbada locality Khartoum State 2015-2017
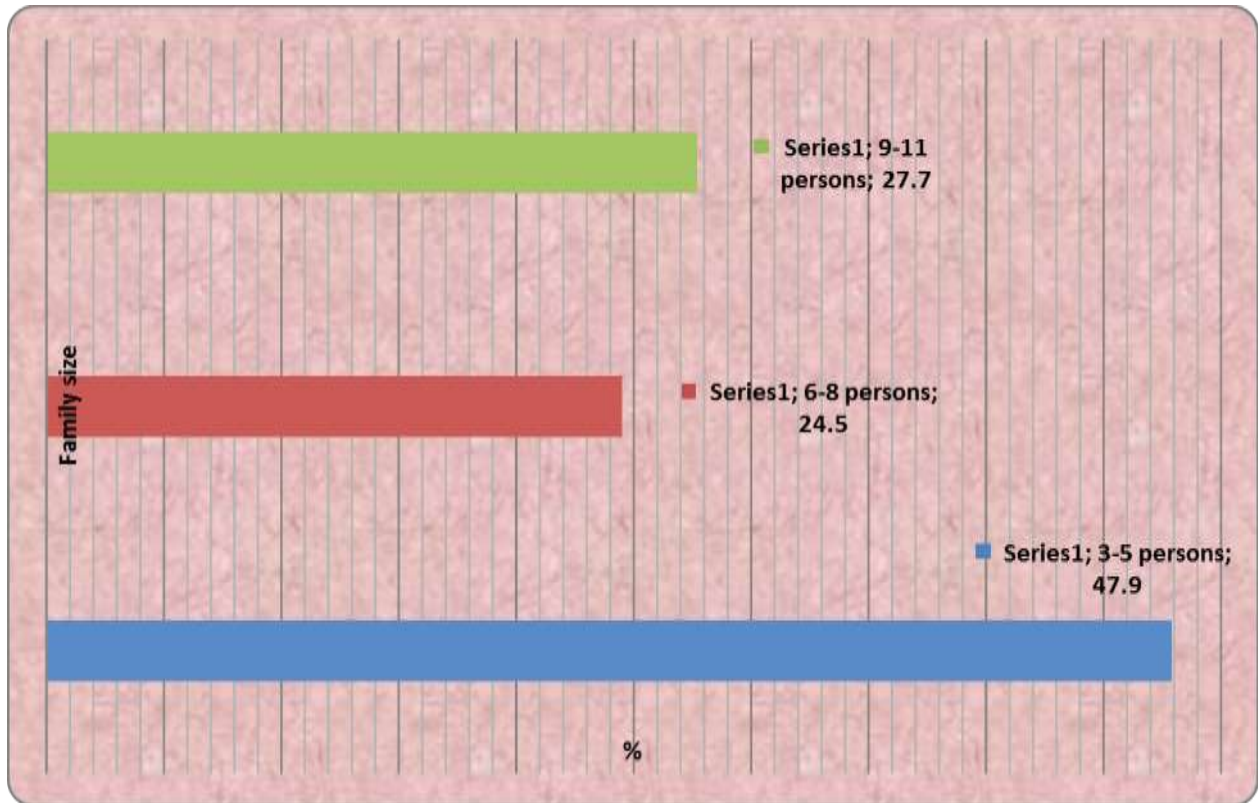
n=282
Approximately 50% of the respondents had a family size of 3-5 persons.

Fig (6) Distribution of respondents by whether they heard about malnutrition, , Angola area Umbada locality Khartoum State 2015-2017

Series1; No;
41.1; 41%

Series1; Yes;
58.9; 59%
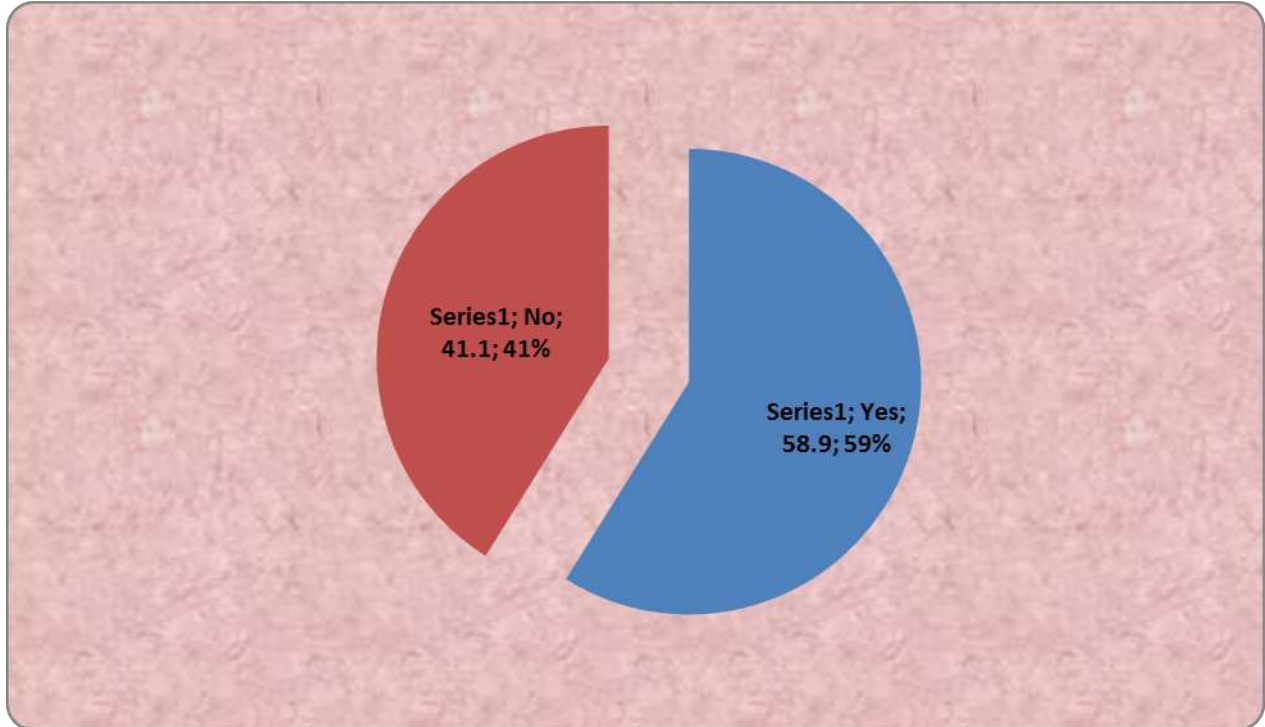
n=282

More than half of the respondents heard by malnutrition.

Fig (7) Distribution of respondents by knowledge of malnutrition definition,, Angola area Umbada locality Khartoum State 2015-2017
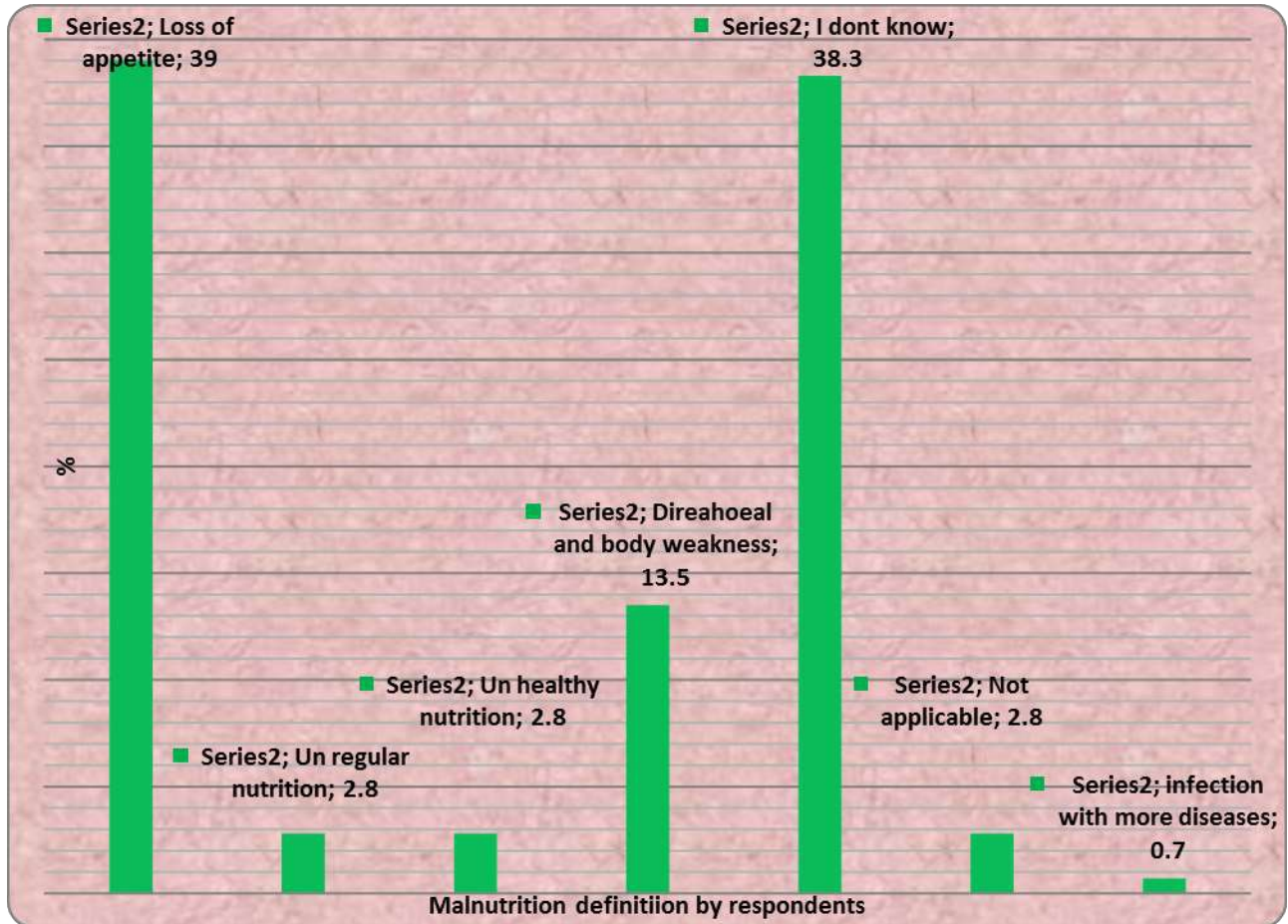
n=282

Fig (8) Distribution of respondents Knowledge of better food for their children, Angola area Umbada locality Khartoum State 2015-2017
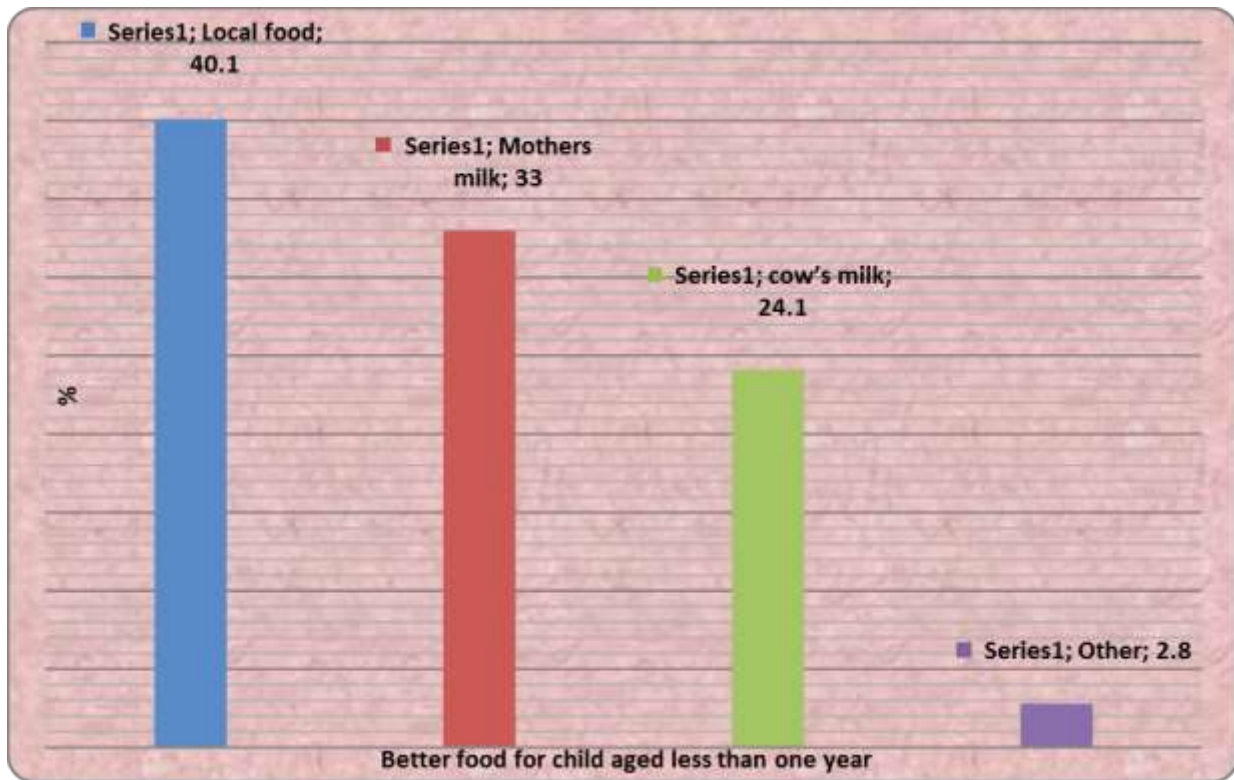
n=282

Fig (9) Distribution of respondents by whether they believe that mother milk is enough for their children in the first months of childhood, , Angola area Umbada locality Khartoum State 2015-2017

Series1; No; 56.4; 56%

Series1; Yes; 43.6; 44%
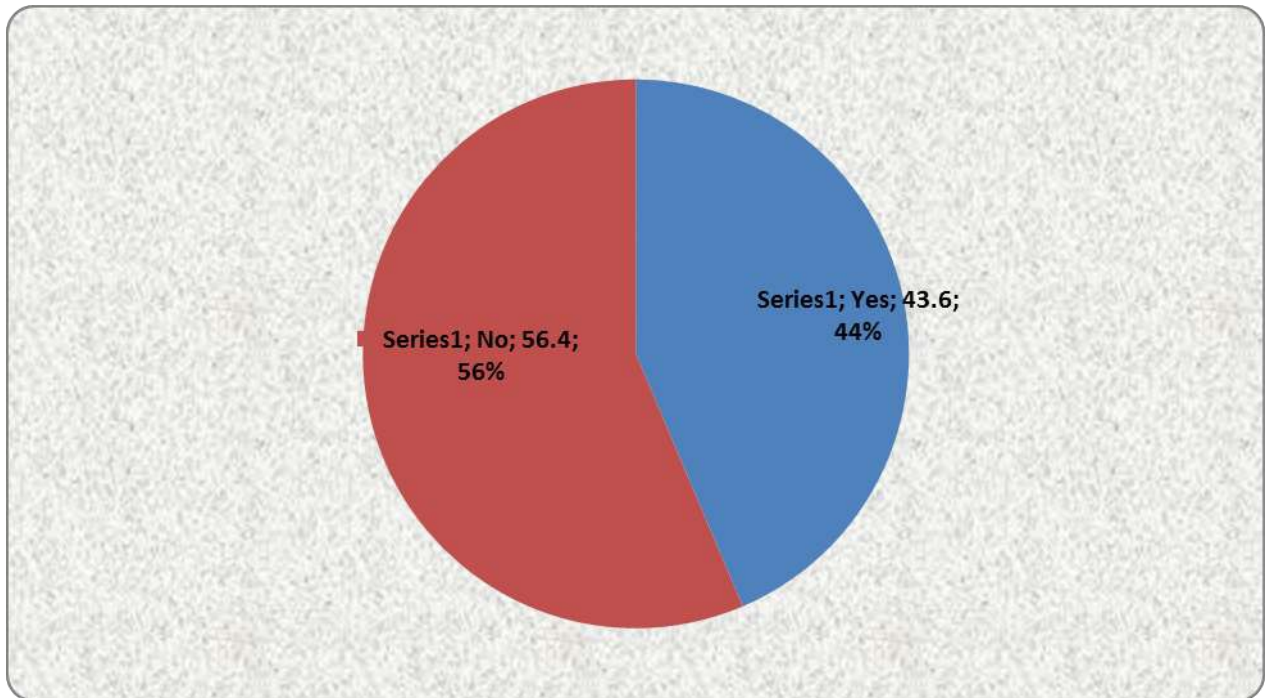
n=282

Fig (10) Distribution of respondents by use ofbetter diet during pregnancy,
, Angola area Umbada locality Khartoum State 2015-2017
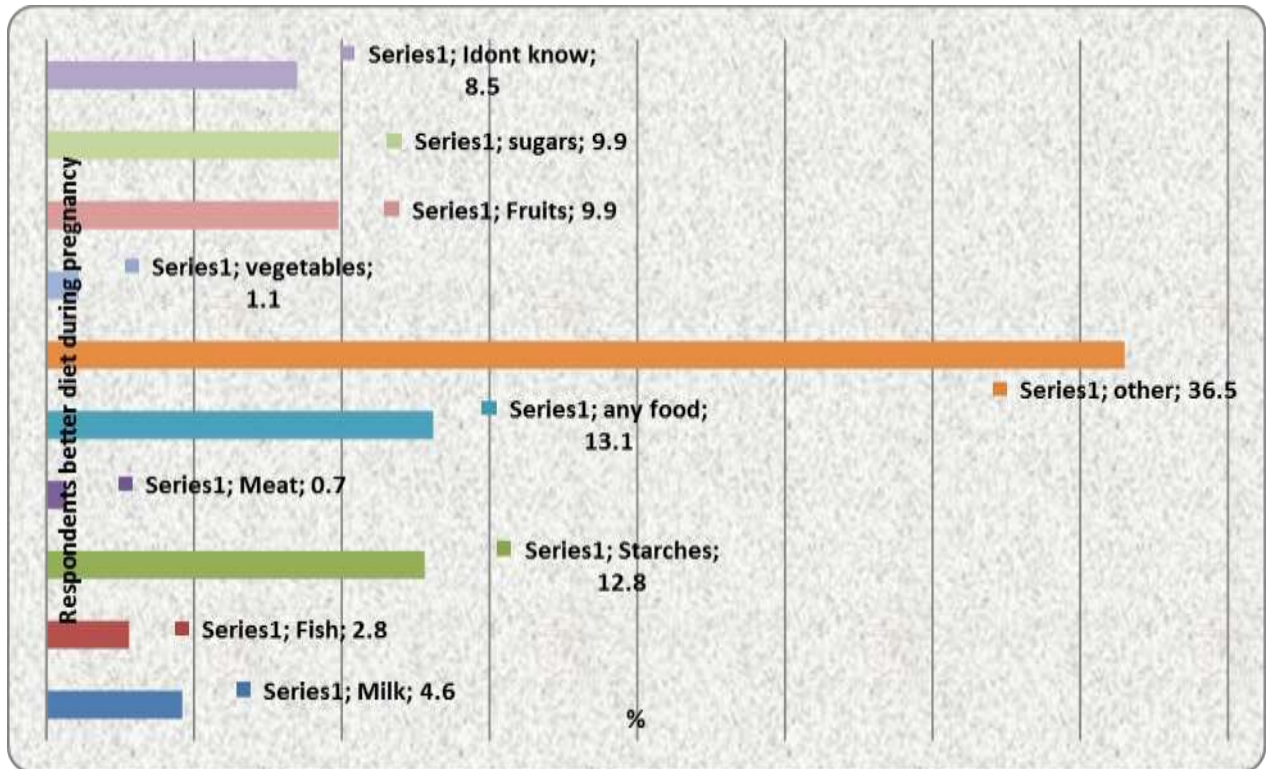
n=282

Fig (11) Distribution of respondents by type of food avoided during pregnancy, , Angola area Umbada locality Khartoum State 2015-2017
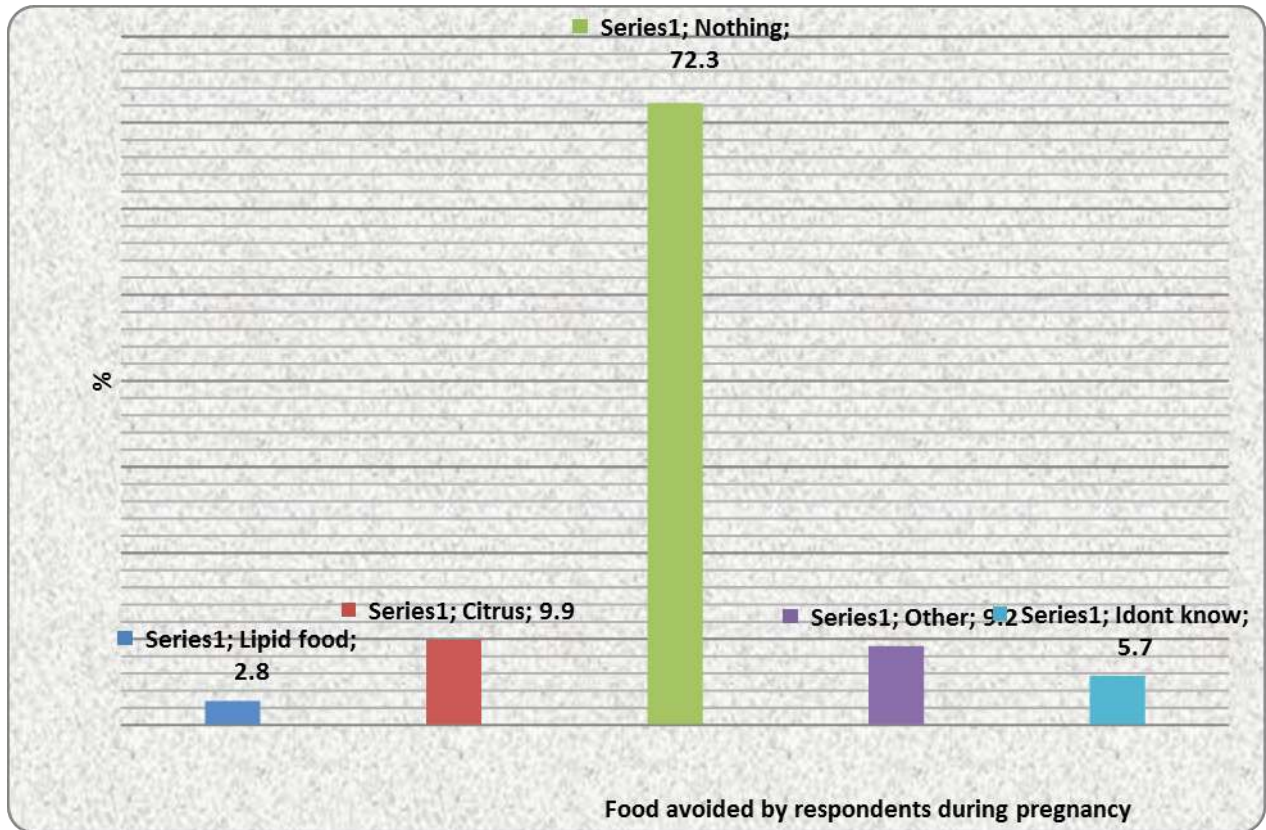
n=282

The majority of respondents (72.3%) had no food to avoid during pregnancy.

Fig (12) Distribution of respondents by whetherthey breast feed their Child during the previous pregnancy, , Angola area Umbada locality Khartoum State 2015-2017
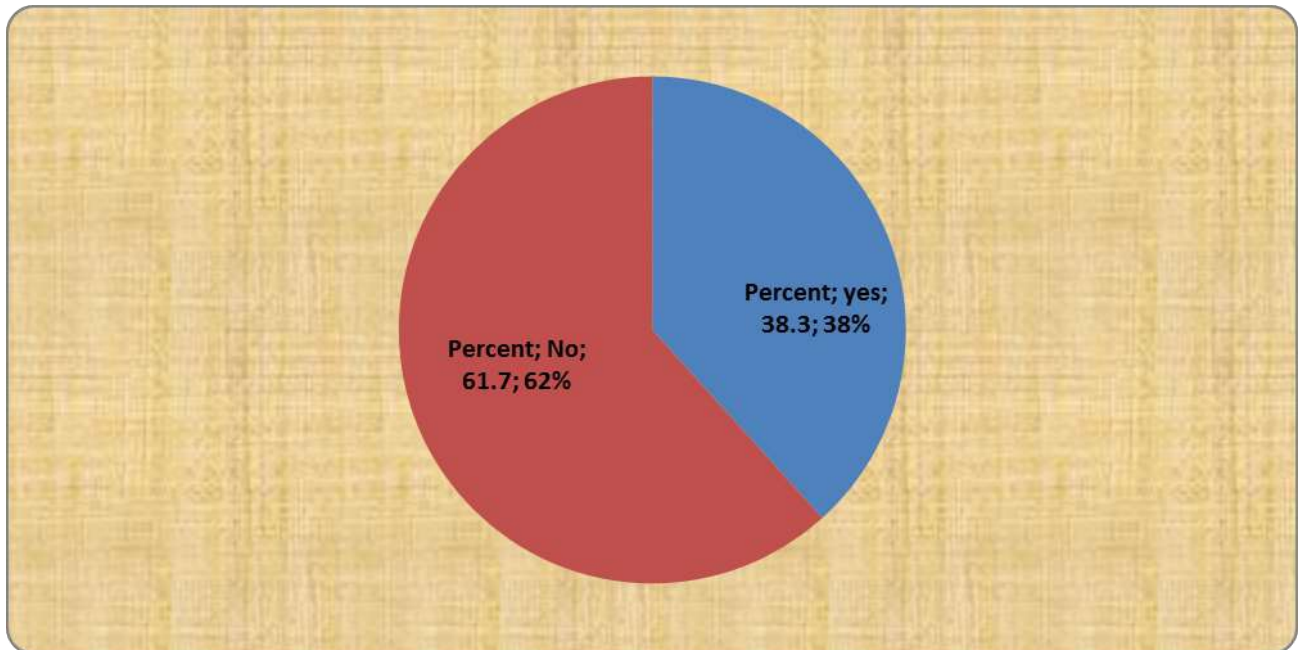
n=282

More than 60% of the respondents' breast feed their Child during the previous pregnancy.

Fig (13) Shows reasons given by respondents on why they did not breast feed their Childs during previous pregnancy, , Angola area Umbada locality Khartoum State 2015-2017
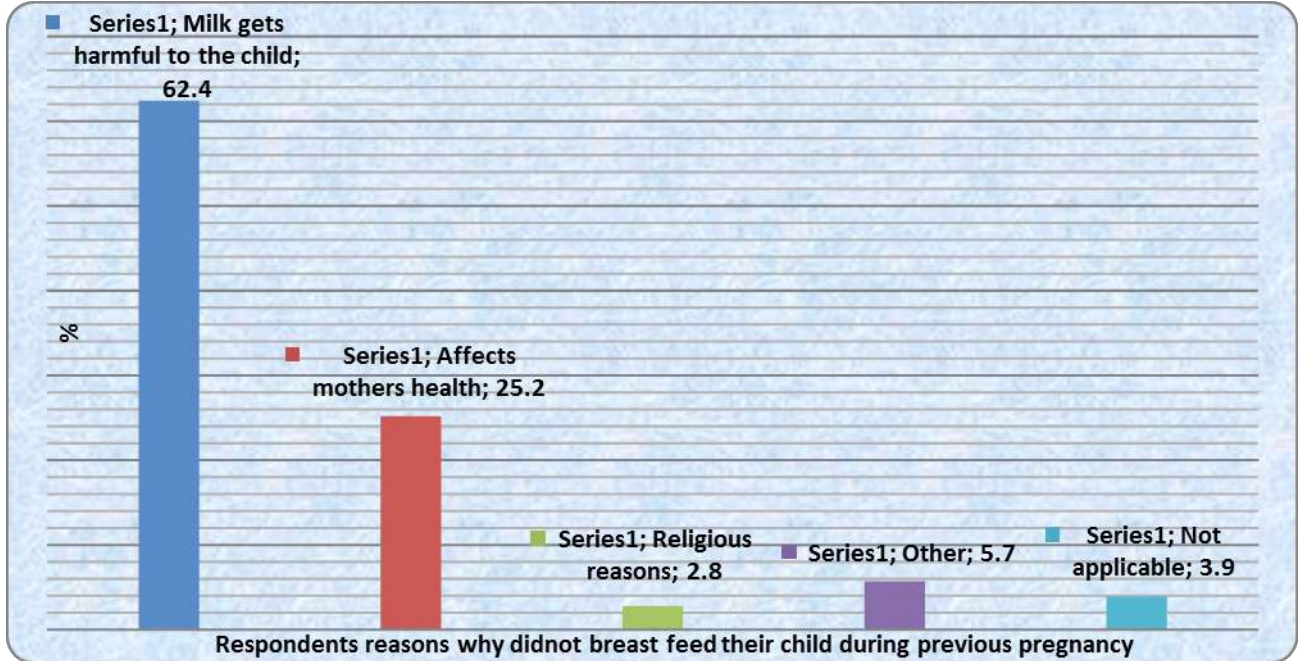
n =174

Over 62% of the respondents mentioned that they did not breast feed their Childs during previous pregnancy because they thought that milk get harmful to their Children.

Fig (14) Distribution of respondents by when they wean their Children, Angola Area Umbada Locality Khartoum State2015 -2017
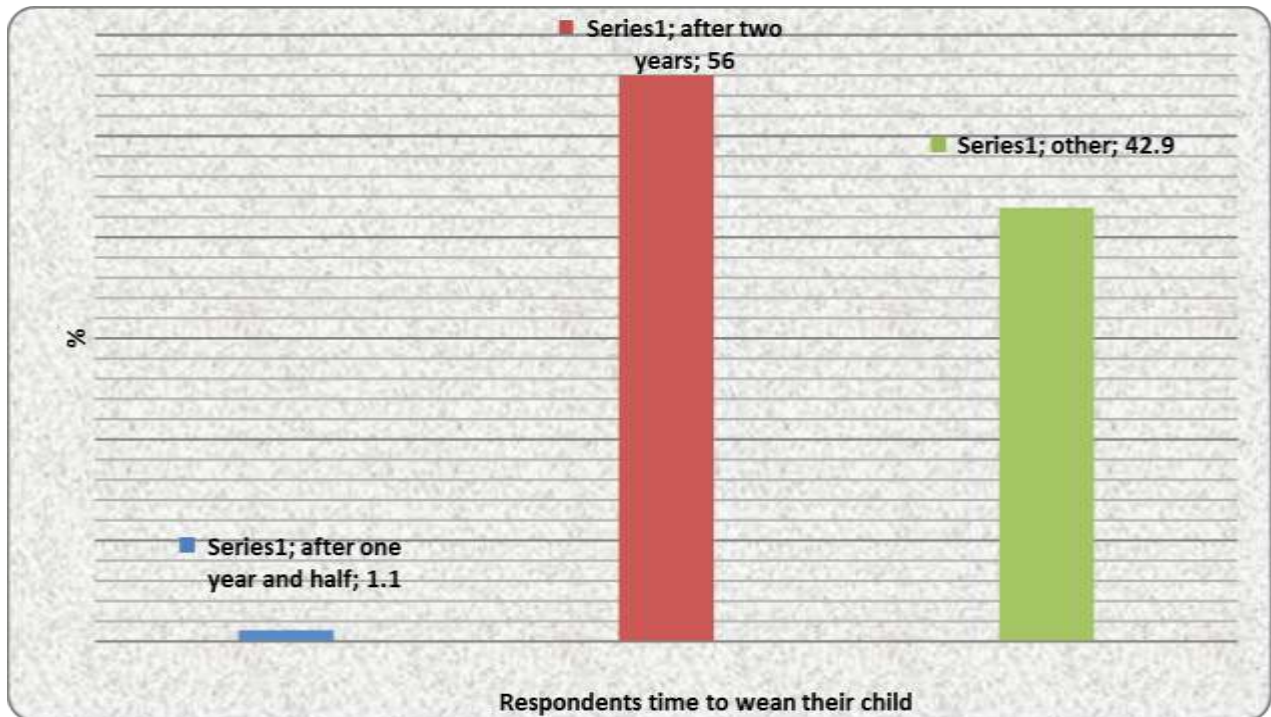
n =282

About 55% of the respondents weaned their Children after 2 years.

Fig (15) Distribution of respondents by their children weaning method, Angola Area Umbada Locality Khartoum State2015 -2017
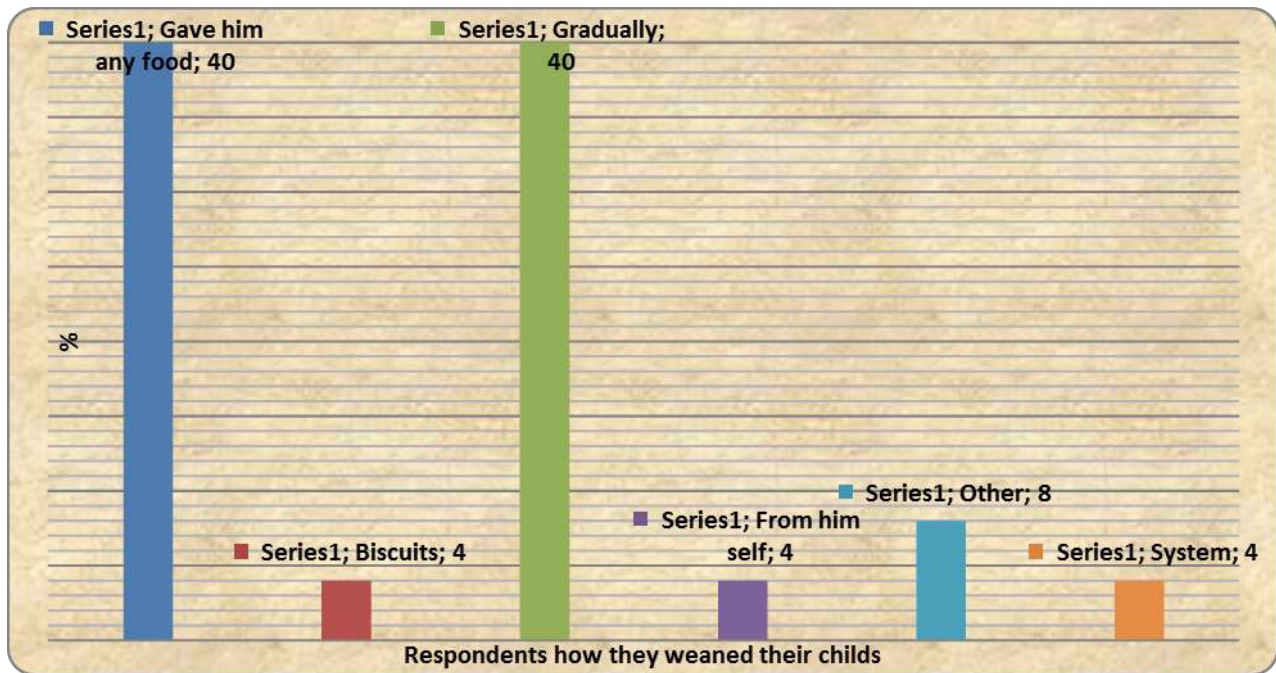
n =282

40% weaned their children by gave them different foods and the same percentage mentioned gradually they weaned their children.

Fig (16) Respondents type of food give to your child after weaning, Angola Area Umbada Locality Khartoum State2015 -2017
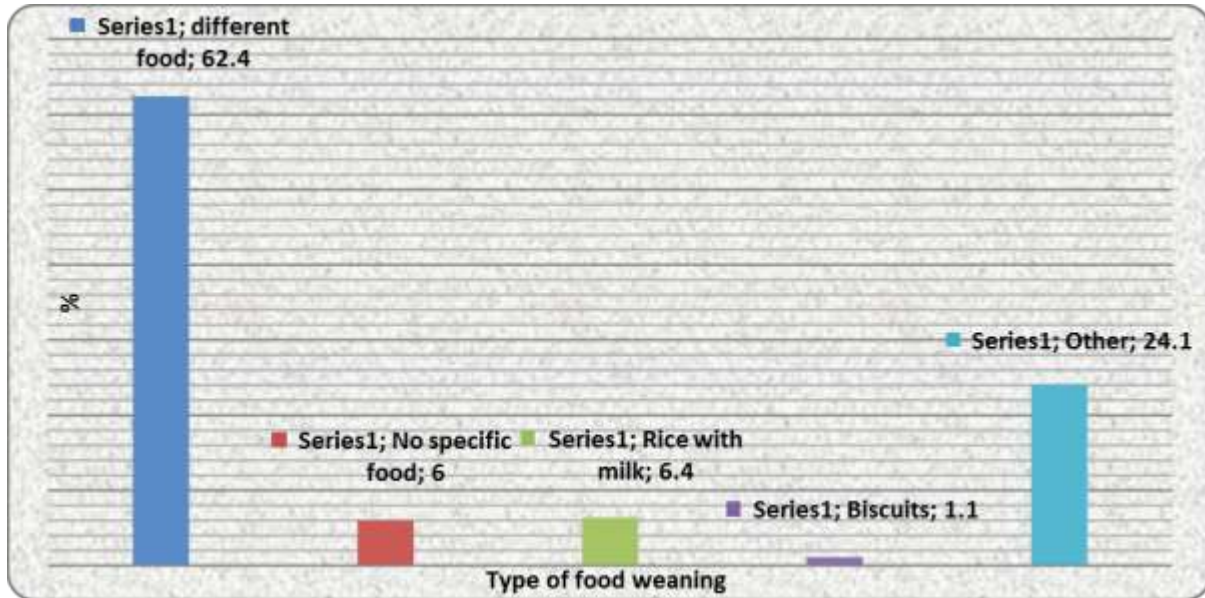
n =282

The majority of respondents gave different foods to their child after weaning.

Fig (17) Distribution of respondentsby methods of feeding used, Angola Area Umbada Locality Khartoum State2015 -2017
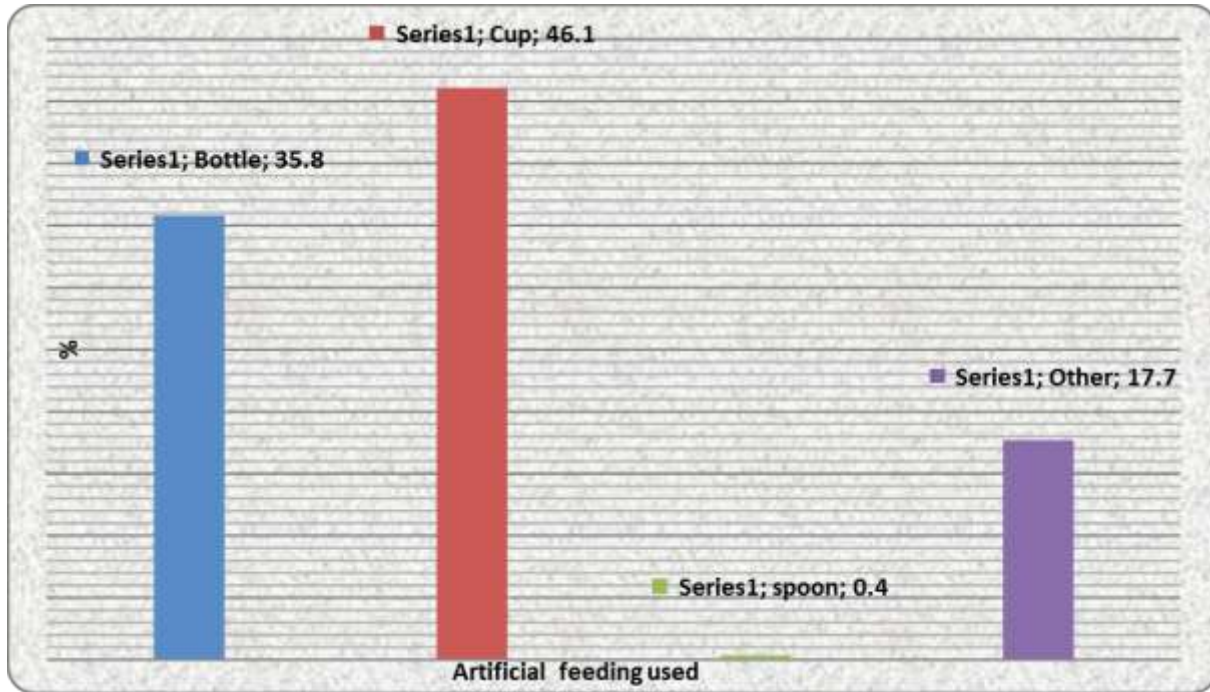
n =282

Most of respondents (46.1%)used cup for feeding their children.

Fig (18) Distribution of respondents by time of starting complementary feeding,
Angola Area Umbada Locality Khartoum State2015 -2017
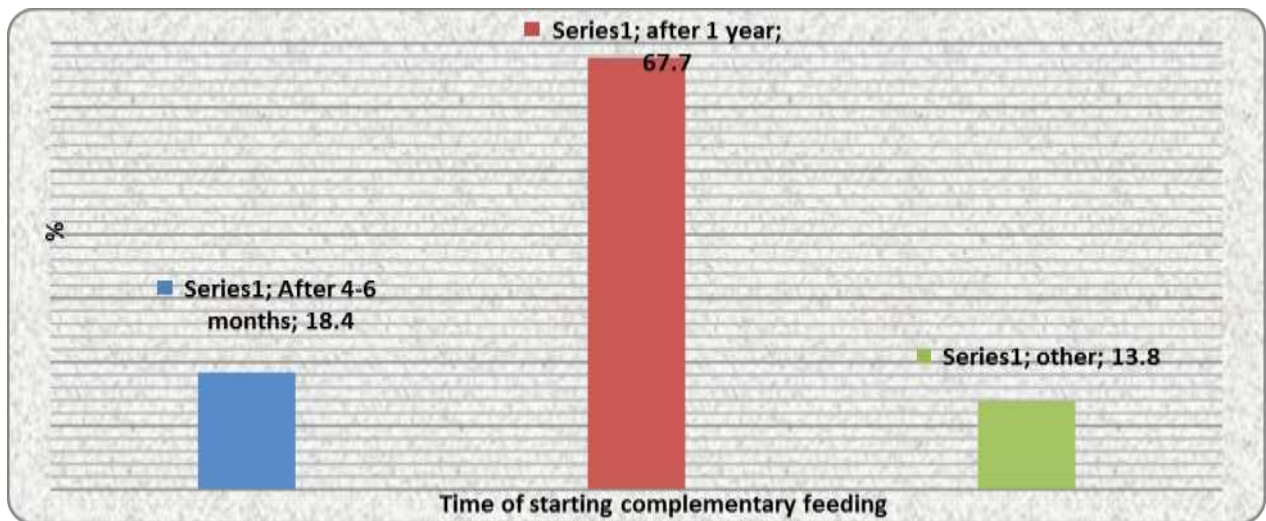
n =282

Most of respondents (67.7%) started complementary feeding after 1 yrs.

Fig (19) Distribution of respondentsby suddenly weaning their Childs or not,
Angola Area Umbada Locality Khartoum State2015 -2017

Series1; No; 43.3; 43%

Series1; yes; 56.7; 57%
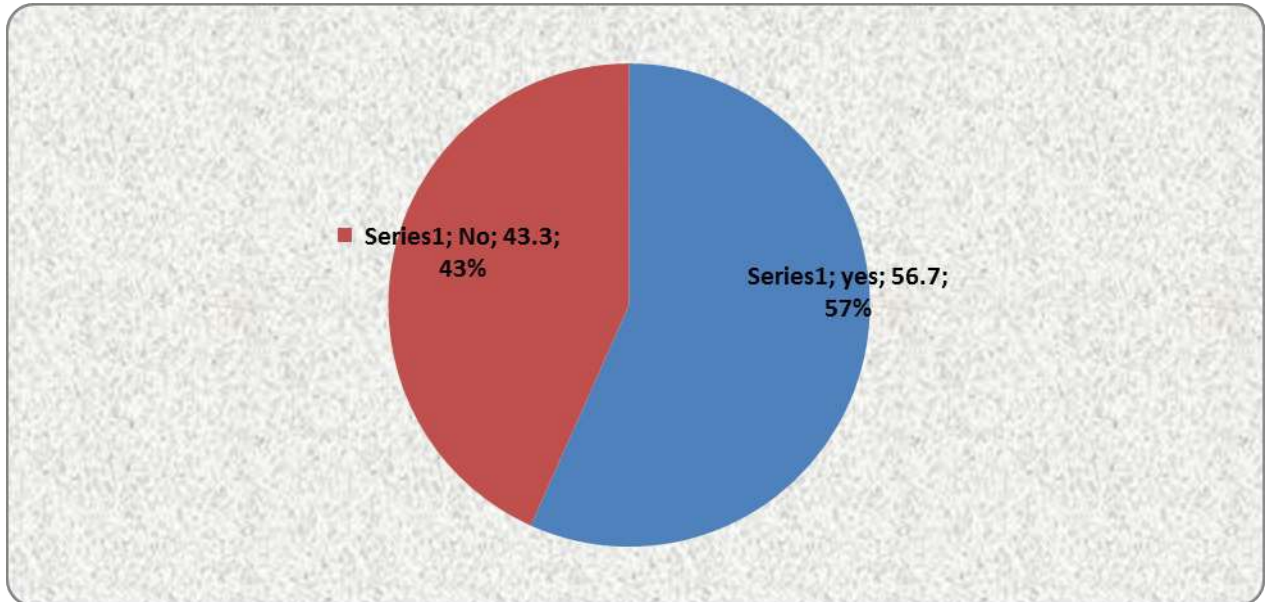
n =282

56.7% said they suddenly weaned their children.

Fig (20) Showing reasons of sudden weaning,
Angola Area Umbada Locality Khartoum State2015 -2017
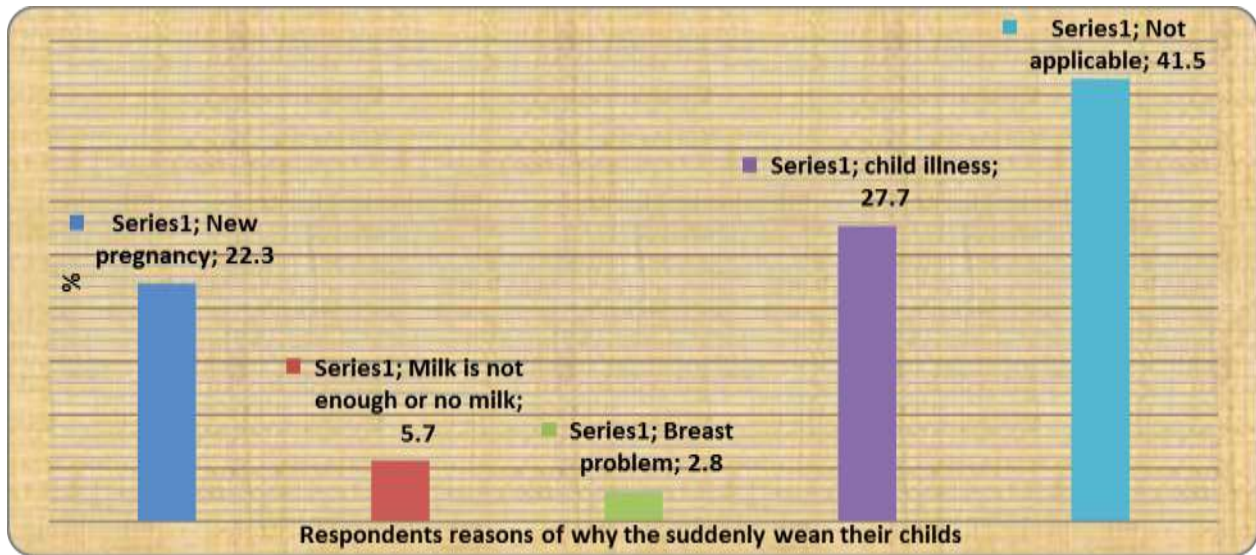
n =160

About 27.7% of the respondents suddenly weaned their Childs because of child illness, 22.3% for new pregnancy, 5.7% because milk is not enough or no milk while 2.8% because of breast problems.

Fig (21) Distribution of respondentsby if they are working or not, Angola Area Umbada Locality Khartoum State2015 -2017

Series1; No; 26.6; 27%

Series1; yes; 73.4; 73%
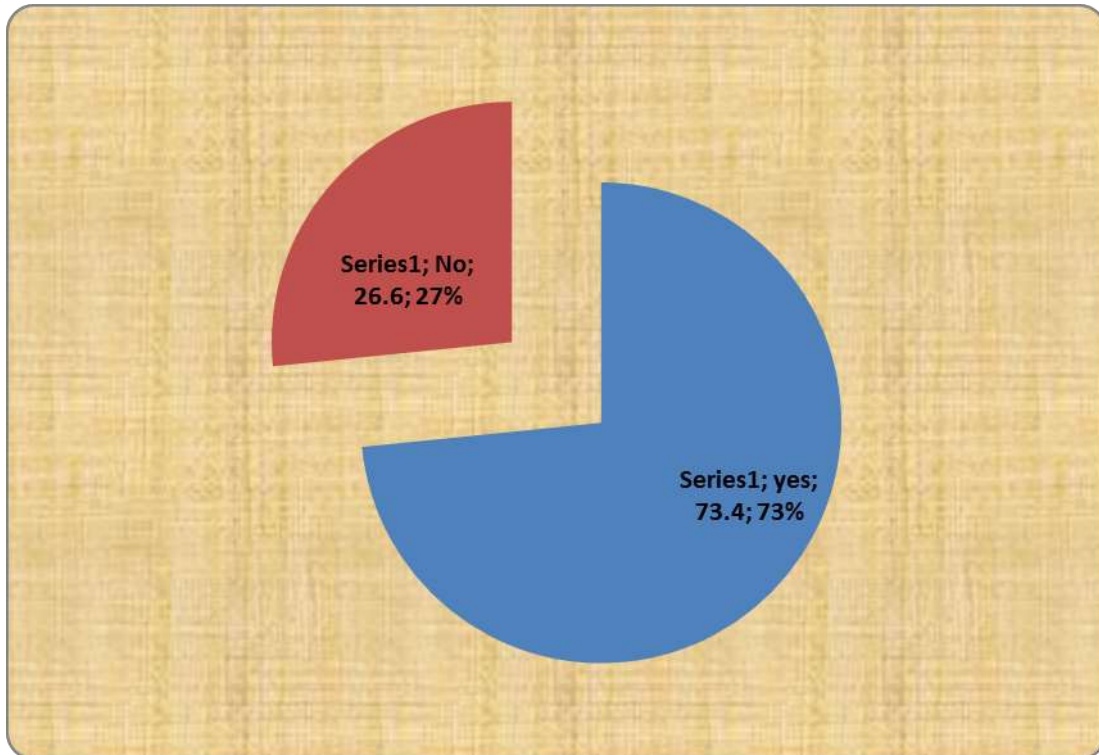
n =282

Most of the respondents (73.4%) were working.

Fig (22) Distribution of working mother bytime for breast feeding their Children, Angola Area Umbada Locality Khartoum State2015 -2017
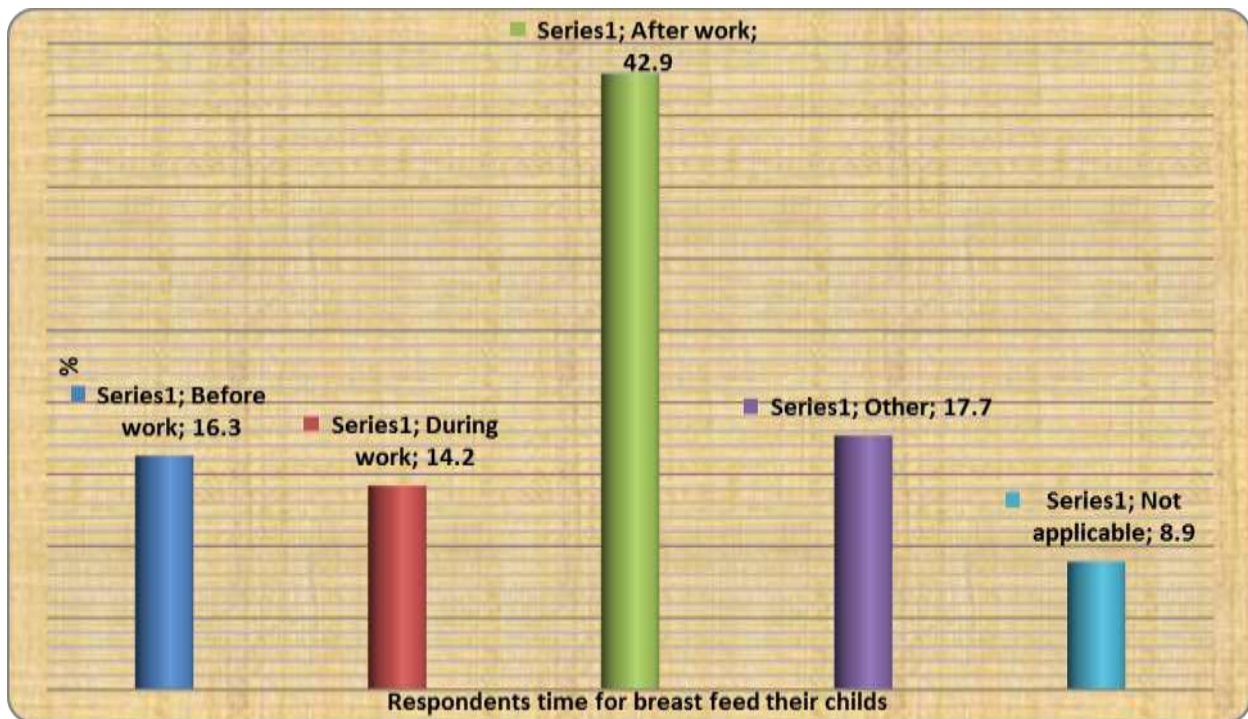
n =207

Respondents breast feed their Children after work (42.9%), 16.3% before work, 14.2% during work and 17.7% in other time.

Fig (23) Distribution of respondents by whether utilized MCH services during pregnancy or not, Angola Area Umbada Locality Khartoum State2015 -2017
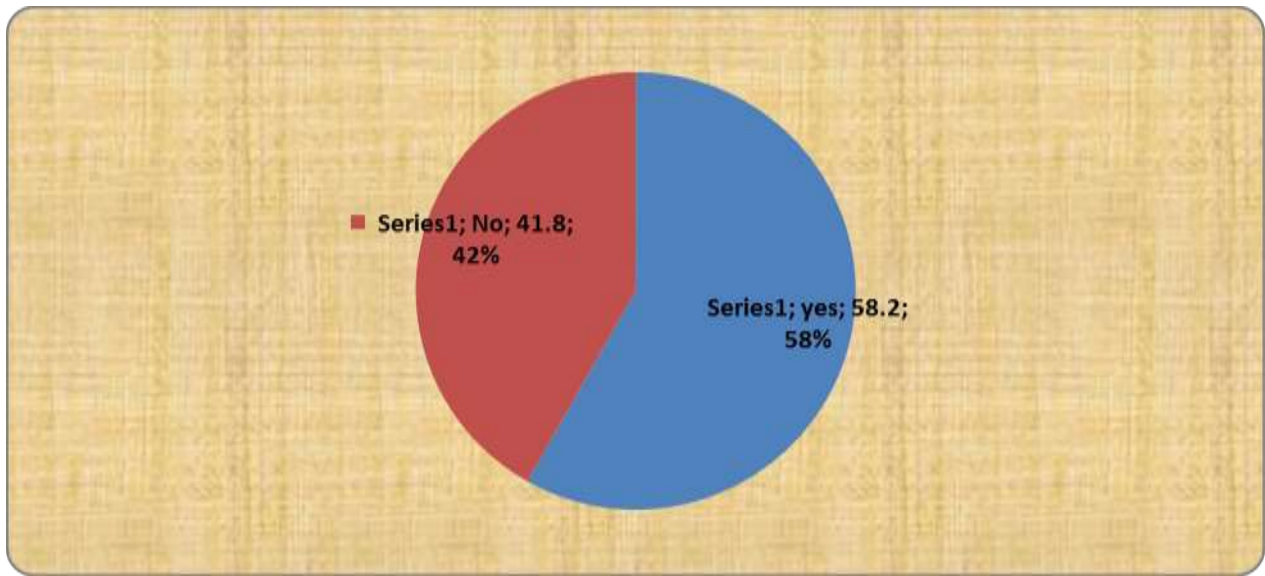
n =282

More than 58% of the respondents answered that they utilized from MCH services during pregnancy.

Fig (24) Showing reasons of why respondents did not utilized MCH services duringpregnancy, Angola Area Umbada Locality Khartoum State2015 -2017

n =282

About 56% of the respondents they did not utilized MCH services their pregnancy period because they thought that there was no need.

Fig (25) Distribution of the study population by frequency of direahea,
Angola Area Umbada Locality Khartoum State2015 -2017
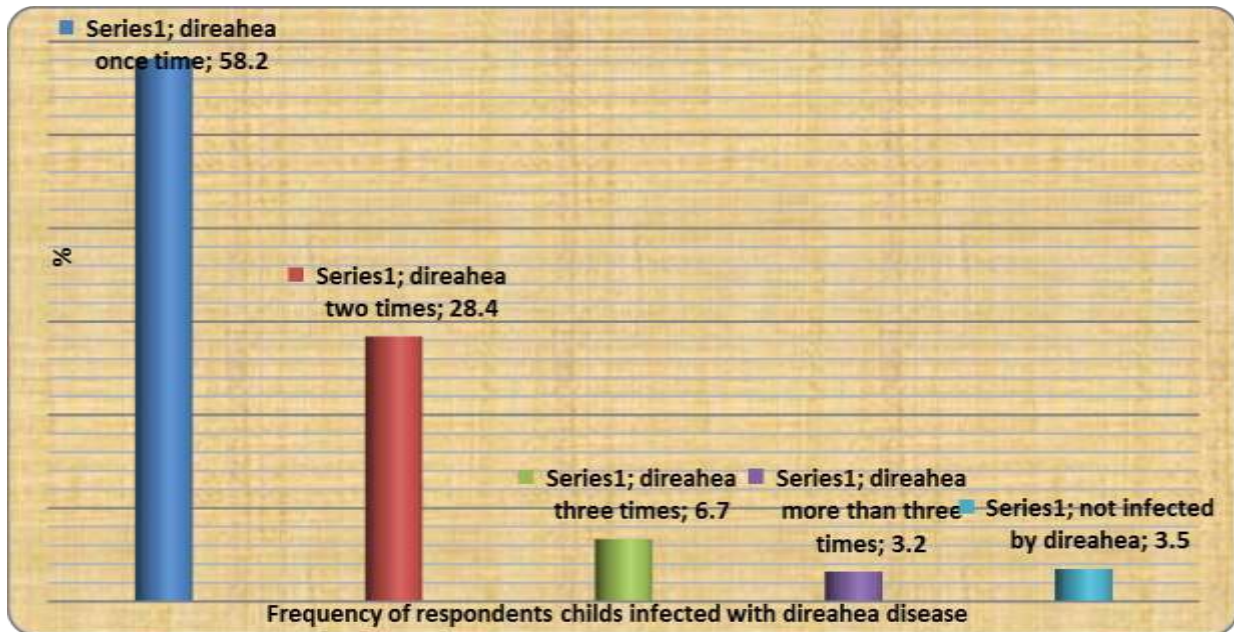
n =282

96% of childrenhad direahea once or more, only 3.5% did not suffer from the disease.

Fig (26)Distribution of respondents by frequency of respiratory tract infections,

Angola Area Umbada Locality Khartoum State2015 -2017
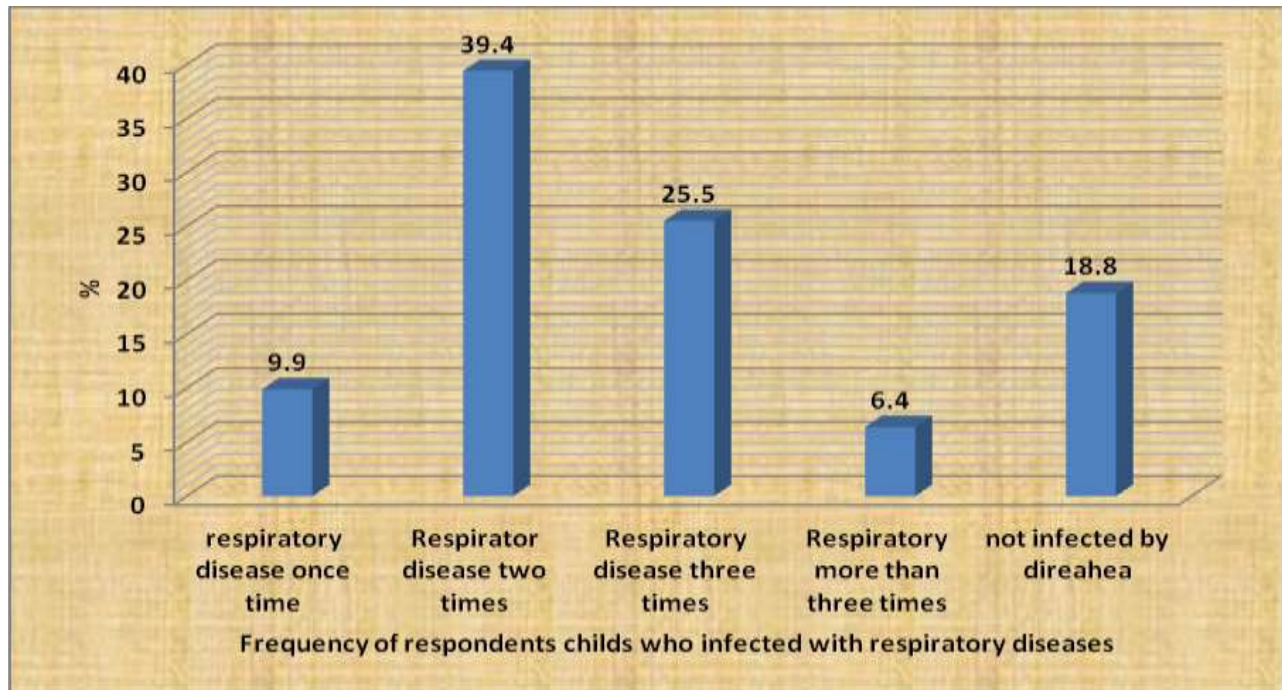
n =282

81.2% of studied childrenhad one or more episodes of respiratory infections,

only 18.8% did not experience such infection.

Fig (27)Distribution of studied children by who had malaria, Angola Area Umbada Locality Khartoum State2015 -2017
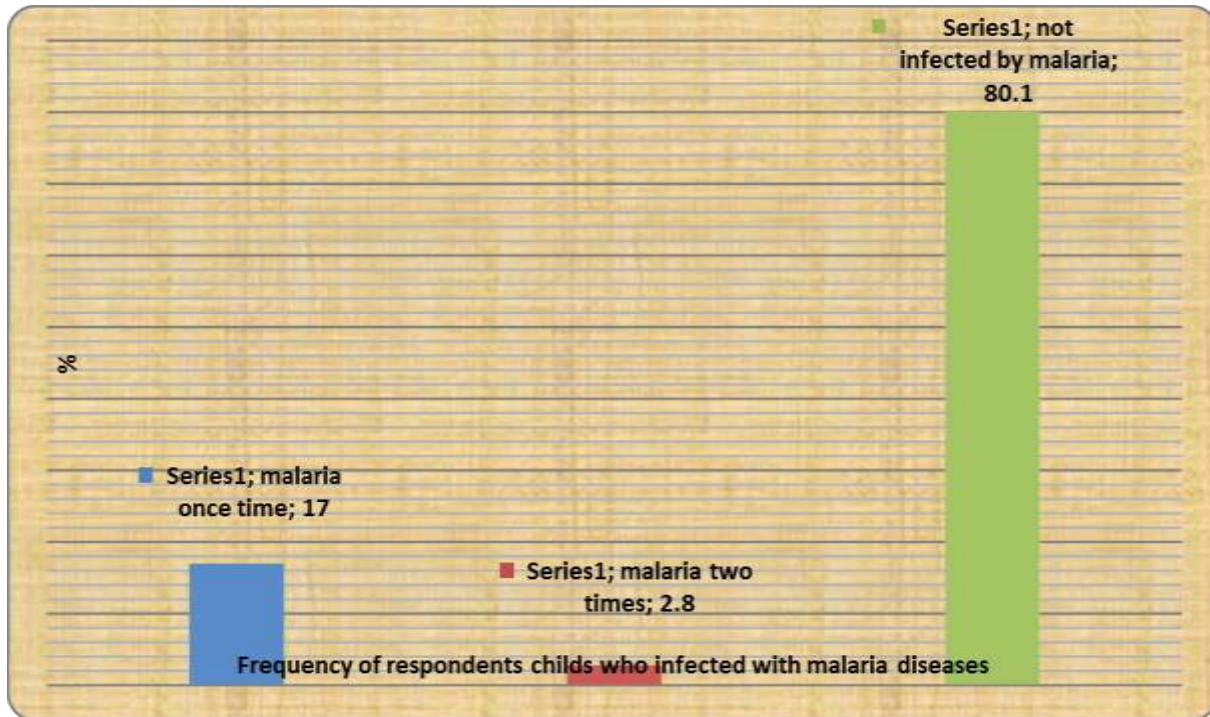
n =282

The majority of respondents Childs (80.1%) were not infected with malaria.

Fig (28) Distribution of studied children by who had measles or not, Angola Area Umbada Locality Khartoum State2015 -2017

Series1; yes; 2.8; 3%

Series1; No; 97.2; 97%
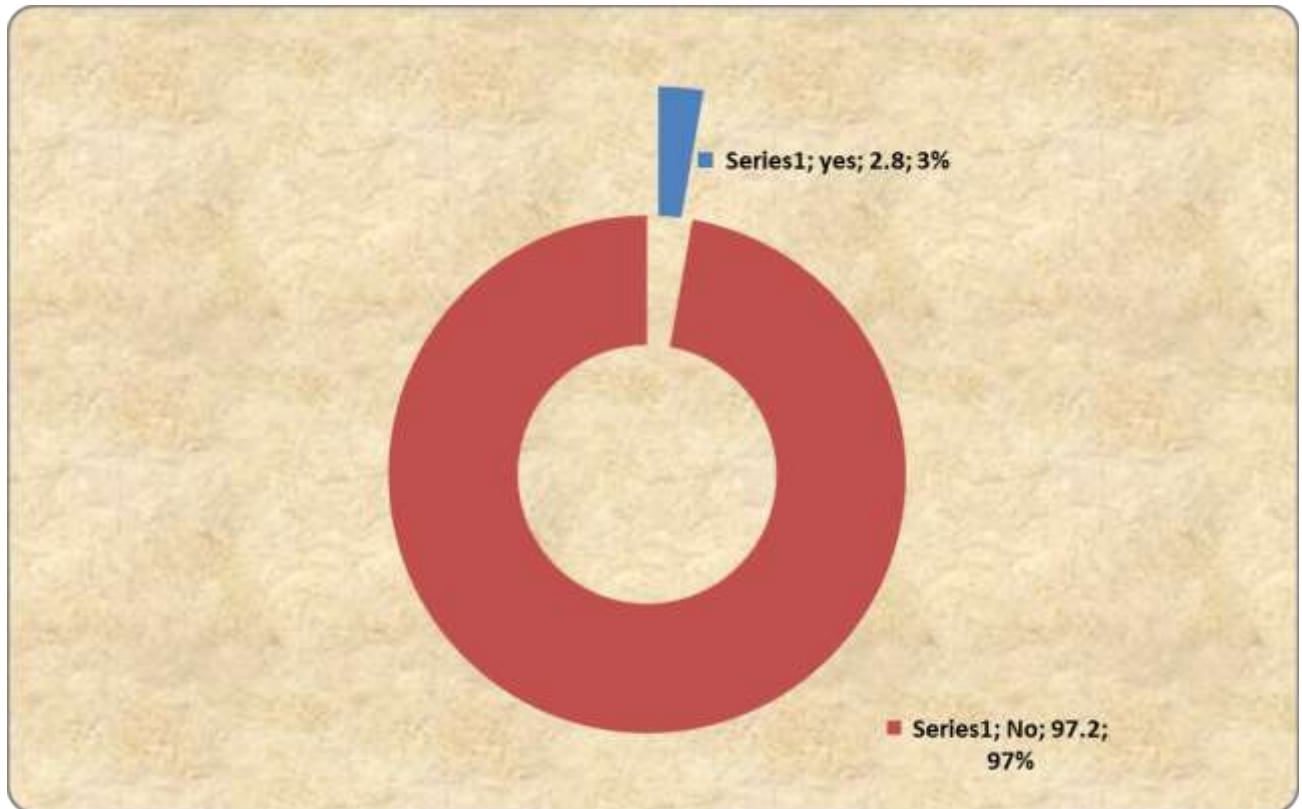
n =282

97.2% of the respondents Childrenwere not infected with measles.

Table (2) Observation checklist results:

Variable	Observation description		
Mother personal hygiene	Description	Frequency	%
	Excellent	41	14.5
	Very good	59	20.9
	Good	180	63.8
	Bad	2	.7
	Total	282	100.0
Child personal hygiene	Excellent	31	11.0
	Very good	22	7.8
	Good	168	59.6
	Bad	61	21.6
	Total	282	100.0
House building material	Carton	14	5.0
	Mud	173	61.3
	Bricks	95	33.7
	Total	282	100.0
Ceiling material	Traditional ceiling	109	38.7
	Wood	8	2.8
	Mud	11	3.9
	Zinc	154	54.6
	Total	282	100.0
Ventilation	Excellent	41	14.5
	Very good	38	13.5
	Good	137	48.6
	Bad	66	23.4
	Total	282	100.0
Lighting	Excellent	32	11.3
	Very good	57	20.2
	Good	127	45.0
	Bad	66	23.4
	Total	282	100.0
	Total	282	100.0
water sources	Public water net	148	52.5
	Well	8	2.8
	Caro	126	44.7
	Total	282	100.0
Drinking water keeping	Pots	16	5.7
	Cistern	73	25.9
	Barrel	150	53.2
	Other	43	15.2
	Total	282	100.0
Methods of liquid waste disposal	Pit latrine	194	68.8
	Ventilated pit latrine	41	14.5
	Septic tank	47	16.7
	Total	282	100.0

Variable	Yes	No	Total
Do you have a kitchen?	263(93.3%)	19(6.7%)	282(100%)
Methods of keeping food	Refrigerator	125(44.3%)	44.3
	Table	148(52.5%)	52.5
	Cupboard	9 (3.2%)	3.2
	Total	100.0	100.0

Table (3) Chi square test for association between Socio-demographic characteristics and Child nutrition status according to Sudan standards,Angola area , Ombada Locality, Khartoum State, 2015-2017.

Socio-demographic characteristics	Child nutrition status according to Sudan standards					Total	Chi-square	p-value
Child sex		Normal	Mild malnutrition	Moderate malnutrition	Severe malnutrition			
	Male	79	0	5	27	111	4.324	.229
	Female	134	2	8	27	171		
	Total	213	2	13	54	282		
Child age	Less than 1 yrs	28	0	0	0	28	138.283	.000
	1-2 yrs	185	2	2	36	225		
	3-4 yrs	0	0	11	18	29		
	Total	213	2	13	54	282		
Mother education	Illiterate	58	0	0	12	70	73.439	.000
	Khalwa	0	0	0	8	8		
	Basic	49	0	10	24	83		
	Secondary	92	2	3	7	104		
	University	6	0	0	3	9		
	Post University	8	0	0	0	8		
	Total	213	2	13	54	282		
Father education	Illiterate	0	0	0	8	20	142.431	.000
	Khalwa	0	0	0	9	8		
	Basic	68	0	8	11	85		
	Secondary	73	2	2	11	88		
	University	64	0	3	6	73		
	Post University	8	0	0	0	8		
	Total	213	2	13	45	282		
Family Size	3-5 persons	116	0	8	11	135	34.062	.000
	6-8 persons	39	2	5	23	69		
	9-11 persons	58	0	0	20	78		
	Total	213	2	13	54	282		

Observational check list:

The results of observational check list in table 2. Show that; 63.8% of mother personal hygiene was good, 14.5% was excellent and 20.9% was very good. While 59.6% of child personal hygiene was good, 11% was excellent and 7.8% was very good. Most of respondent's houses material was mud (61.3%), 33.7% was bricks and 5% was carton. The common ceiling materials were found to be zinc (54.6%) followed by traditional ceiling (38.7%), mud (3.9%) and wood (2.8%) respectively. About 48.6% of the ventilation was good, 14.5% was excellent and 13.5% was very good. However; 45% of lighting was found to be good, 20.2% was very good and 11.3% was excellent. More than half of the respondents had water sources from public water net, 44.7% obtained through Caro and 2.8% their water source was well. Also more than half of the respondents kept their drinking water in barrels, 25.9% in cisterns and 15.2% kept in other sources. Pit latrine was the common methods of liquid waste disposal (68.8%), 16.7% were septic tank and 14.5% was ventilated pit latrine respectively.About 67% of the respondents used other methods for solid waste collection inside houses beside plastic bags (29.4%) and recycle been (3.5%).Over 44% of the respondents carried their waste through waste vehicle, 18.8% burned it and 33.5% thrown near their houses and 3.5% were land filling it. The majority of respondents had kitchens in their houses (93.3%). More than half of the respondents used tables for kept food, 44.3% used refrigerator and 3.2 used cupboard respectively.

Chi square test for association:

Table 3. Shows the statistical analysis for association between Socio-demographic characteristics and Child nutrition status according to Sudan standards. The study indicated that there was no association between child sex and child nutrition status (p> 0.05). While an association was observed between child age and nutritional status (p< 0.05). Since, those who aged less than one year had good nutritional status compared to those who aged 1-yrs where 36 out of 225 (16%) of them had severe malnutrition. Another association was observed between mother education and child nutritional status; (p< 0.05). However; those mothers and fathers who had basic education, illiterate, khalwa and secondary education their Childs had severe malnutrition compared to university and post-university education. An association shown between family size and nutritional status (p< 0.05). Whereas; those who had grater family size their Children had severe malnutrition as shown in table 3.

CHAPTER FIVE

5.1. DISCUSION

This present is measuring the prevalence of malnutrition and the impact of some socio-economic and demographic characteristics of parents (mother and father) on the nutritional status of their children under-five years of age in Angola Area, Umbada locality, Khartoum state in addition to identification of the risk factors of malnutrition among children less than five years in the area.

282 under five years of age and their mothers, drawn from six clusters in Angola Area, participated in the study. The study found that females were one and half fold of males in participation of the study.

Our study found that the majority of respondents were aged between one- two yrs. Child age is important in malnutrition. Study conducted by Afework et.al, 2006 in Northern Ethiopia mentioned that, Child malnutrition increased with age. It appears that both chronic and acute child malnutrition, develop during the weaning period and rise sharply thereafter. The retardation of growth which commences in the latter half of the first year, suggests problems associated with child feeding practices and nutrient inadequacy of the complementary foods. [22]

Our study revealed that the total prevalence of malnutrition in Angola area was found to be 24.4% distributed into 19.1% classified as severe malnutrition, 4.6% moderate malnutrition and 0.7% classified as mild malnutrition according to Sudanese Standards. Our result was lower than that found by Samir and Hashim, 2010, in Rural Western Kordofan. They found that wasting prevalence was 37.9% (19.6% as moderate and 18.3% as severe), Stunting prevalence was 23.7% (12.3% moderate and 11.4% as severe). [23]

Our study showed that the majority of respondent's fathers and mothers education level was secondary and basic education. Parental with illiteracy was significantly associated with the risk to develop malnutrition in children under the age of five The result Similar finding was observed in North Gondar which increases threefold and above to develop a risk of malnutrition. [24]

Our study reported that half of respondents had family size of three- five persons. However, Johanna, 2010 on the Northern Cape under the title of factors

contributing to malnutrition in children 0- 60 months admitted to hospitals in the Northern Cape found that the family size consisted from three- five persons ranged from 5-14%. [25]

Our study observed that more than half of respondents had heard about malnutrition and knew the definition of malnutrition. This is considered to some extent moderate knowledge. The result agreed with Nandaprakash.P. (2005) who demonstrates 58% of the mothers were aware of meaning of malnutrition, and factors which influence it. [26]

Our study detected that local food (e.g.:aseeda, wika, and kisra) and food taboos were the better food for their children's. A study in Sudan disagreed with our study; it mentioned that all the mothers appreciated the food ration given to their children. They thought it improved the children's health and the children enjoyed the ration more than the local foods at home. However only 43%f the respondents thought that mother milk is enough for the child in the first months of childhood. That means there were still high number of mothers did not knew the importance of mother milk. This finding support the result obtained by Cyprian and CPHCE, 2011 Who reported that, 58% of the respondents said they gave cow milk before six months of age and 40% started at or before the age of three months. [27]

Our study indicated different types of food preferred by respondents during pregnancy includes; starches, sugar, fruits, vegetables, fish , milk and meat, while most of them had not specific food. Since, the majority of them had no specific food avoided during pregnancy but a part of them avoided fat food and citrus. The finding is matching to some extent with a study conducted by Afshan et.al, 2008 in a study which was conducted in Antenatal Clinic, Department of Gynecology and Obstetrics at Holy Family Hospital, Rawalpindi. [28]

Our study showed that over 60 percent of the respondents did not breast feed their Childs during pregnancy because they thought milk get harmful to their Childs. This result was not similar to result conducted in Mbaraara Hospital-Uganda, August, 2008. [29]

Our study showed reported that half of the respondents weaned their Childs after two years. However, forty percent of respondents weaned their children gradually and also gave him any food Basil J e.tal; 2011 found that, 48 .8 % of the mothers

weaned their children suddenly or gradually. While 45% of them weaned their Childs at two years of age. The majority of respondents gave anything or food to their child after weaning, rice with milk and biscuits. Different complementary feeding after weaning in study conducted in Gaza (2008) observed different complementary feeding after weaning used by mothers such as vegetable (20.5%) and fruit juice (22%) were common food given by mothers to their babies at the age three to five months and both proportions drastically increased at six to nine months (54.7%, 54.8%). [30]

 Our study showed that cup was the common artificial feeding used followed by bottle. Used of cup may cause diarrhea if not handled hygienically. This result is matching the UNICEF, 1993 statement that low prevalence of breastfeeding is a major problem across the globe, and alternative methods of untreated feeding (with bottle, gastric tube or cup) are in use to feed infants who are unable to breastfeed. Especially in under-resourced settings, bottle-feeding has its own disadvantages, namely risk of infection, nipple confusion in the infant, high cost, etc. [31]

 Our study showed that most of respondents started complementary feeding after one year; since more than half of the respondents suddenly weaned their Children because most of them mentioned for child illness and for new pregnancy. This strong risk factor that may assist in causing malnutrition among children. As a global public health recommendation, infants should be exclusivelybreastfeed for the first six months of life to achieve optimal growth, development and health. Thereafter to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond. [32]

 our study there were 73% working and most of them fed their Children before and after returning from their work. The study in London was found there are direct risks from working but scientific evidence shows that the baby's health and the mother's health are put at risk if the mother does not breast feed until the baby is at least 12 months old. [33]

Our study mothers visited MCH center during pregnancy; while those who did not visited the MCH center because they thought that there were no need and also for

economical reasons. This behavior may expose pregnant women and their babies to health risks.

Our study finding showed that of the mothers Children had been infected with diarrheal disease once and about thirty nine percent of them had infected with respiratory diseases two times, while infection with malaria and measles were rare. This match the study conducted by Amy L et.al, 2000 under the title Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries revealed that the strongest and most consistent relation between malnutrition and an increased risk of death was observed for diarrhea and acute respiratory infection. The evidence, although limited, also suggests a potentially increased risk for death from malaria. A less consistent association was observed between nutritional status and death from measles. Although some hospital-based studies and case–control studies reported an increased risk of mortality from measles, few community-based studies reported any association. [34]

Our study indicated that there was no association between child gender and child nutrition status ($p> 0.05$). While an association was observed between child age and nutritional status ($p<0.05$). Since, those whose ages were less than one year had good nutritional status compared to those who aged one year and above where 36 out of 225 (16%) had severe malnutrition. Another association was observed between mother education and child nutritional status; ($p< 0.05$). However; those mothers and fathers who had basic education, illiterate, khalwa and secondary education their Children had severe malnutrition compared to university and post-university education. An association was shown between family size and nutritional status ($p< 0.05$). Family size also had effect on malnutrition; those who had greater family size their Children had severe malnutrition.

Our study revealed good mothers, Children personal hygiene, ventilation and lighting. However; most of the houses and kitchens ceiling material were made from zinc, and more than half used tables for keeping food. More than half of respondents had water source from Public water net and kept water in barrels. Majority of them had pit latrines. Most of respondents used plastic bags and recycle bins for collection of solid waste inside their houses, and observed an association between Sociodemographic characteristics and Child nutrition status according to Sudan standards. John, 1998 stated that consideration of the

environmental hygiene practices, such as refuse disposal, sale of water and foods by vendors, and child's defecation practices, will no doubt equip future mothers to appreciate the health benefits of good personal and environmental hygiene. [35]

5.2. CONCLUSION

• The results of our study indicated that malnutrition became more prevalent in children under five in Angola area, Khartoum State.

• The main risk factors that were associated with a child becoming malnourished were:

• Mothers and fathers still have only basic education or illiterate.

• High incidence of infection with diarrhea diseases and respiratory infection.

• Large percentage of mothers worked and was unable to take care of their own child.

• Other environmental or household factors that were linked to malnutrition were the type of Ceiling materials and methods for solid waste disposal.

• Most of mothers did not used MCH services.

• Short duration breastfeeding and early use of supplementary foods.

5.3. RECOMMENDATIONS

Our recommendations to Health Education:

• Plan and execute a comprehensive nutrition program with strategies targeting less than five years of age children particularly in needy places where population are poor.

• Establish needed supplementary feeding program for less than five years of age children particularly in needy places where population are poor.

• Plan and implement an effective nutrition education program for mothers/caretakers.

• Encourage pregnant women to utilize the MCH services provided in the health centers.

• Conduct more studies to reveal other possible factors and respond to that.

REFERENCES

1. WHO. Global burden of protein-energy malnutrition, 2000. Draft 15-08-06 .Geneva .Swaziland

2. Mehta NM, Corkins MR, Lyman B, Malone A, Goday PS, Carney LN, et al. Defining pediatric malnutrition: a paradigm shift toward etiology-related definitions. JPEN J Parenter Enteral Nutr. 2013 Jul. 37 (4):460-81. [Medline].

3. Balint JP. Physical findings in nutritional deficiencies. Pediatr Clin North Am. 1998 Feb. 45(1):245-60. [Medline].

4. WHO. Malnutrition-The Global Picture. World Health Organization. Available at http://www.who.int/home-page/.

5. Blossner, Monika, de Onis, Mercedes. Malnutrition: quantifying the health impact at national and local levels. 2005. Available at http://whqlibdoc.who.int/publications/2005/9241591870.

6. Manila et al, Risk factors for protein-energy malnutrition in children under five years, study in luangprobang province, 2004, Laos, Nigeria.

7. Ubesie acIbeziakoNS,ndiokwelu CL,Uzok CM , Nwafar ca 2012 under five pem admitted at the University of Nigeria Teaching Hospital. Enugu: a 10 year retrospective review. Nutr J 11: 43)

8. (Eme Owoaje, Oluwadolapo Onifade, and Adeyimika Desmennu. Pan Afr Med J.2014;17: 161. Published online 2014 Mar 5.).

9. 34. Hyder M. Mahgoub, Adam I. Morbidity and mortality of severe malnutrition among Suanese children in New Halfa Hopital, Estern Sudan. 2012, Trans R Soc Trop Med Hyg. 106:66-68.

10.Fatunde. Seasonal prevalence of protein energy malnutrition.1995, nig.j of paed. 22(3):57-63.

11.Syed AHM, Abdullah and Flora, the risk factors of non fatal drowing in Bangladeshi children, WHO South- East Asia Journal of Public Health Apr 2013.

12.Baudelogue word of the central hospital of Yaoundé, Cameroon, was conducted over a 12-month period (1984).

13. Gelaneh t,assefa a,tedesse Z. PEM in urban children: prevalence and determinants. , 1999, ethiopian medical journals, 36(3):153-66.

14. WHO (2004). Department of Reproductive Health and Research,: 'Global monitoring and evaluation. 2002, World Health Organization.

15. Samir .M A. Nutritional Status of Children Less Than Five Year Old Suffering Anemia and Night Blindness in Khartoum State, Sudan.2012, Mediterranean Journal of Social Sciences. Vol 3 (13).

16. El Samani EF , Willett WC, Ware JH. Association of malnutrition and diarrhea in children aged less than five years. A prospective follow-up study in a rural Sudanese community. 1988, Am J Epidemiol.128(1):93-105.

17. Berti A, Bregani ER, Manenti F, Pizzi C. Outcome of severely malnourished children treated according to UNICEF 2004 guideline: a one year experience in a zone hospital in rural Ethiopia. 2008.Trans R Soc Trop Med Hyg; 102:939-

944.

18. Aguayo VM, Jacob S, Badgaiyan N, Chandra P, Kumar A, Singh K. Providing care for children with severe acute malnutrition in India: new evidence from Jharkhand. .2012, Public Health Nutrition, pp.1-6.

19. Amsalu, S. The outcome of severe malnutrition in North-West Ethiopia: a retrospective analysis of admissions. 2008,Ethiop. Med. J. 44:151-157.

20. Nzioki C, Irimu G, Musoke R, English M. Audit of care for children aged 6 to 59 months admitted with severe malnutrition at Kenyatta National Hospital, Kenya. .2009, International Health. 1:91-96.

21. Moges T, Haidar J.Management and outcome of severly malnourished children admitted to Zewditu Memorial Hopital, Ethiopia. 2009. East Afr J Public Health. 6:162-167.

22. Afework Mulugeta, Fitsum Hagos , Gideon Kruseman , Vincent inderhof , Barbara Stoecker , Zenebe Abraha , Mekonen Yohannes and Girmay G. Samuel Mekelle. Factors Contributing to Child Malnutrition in Tigray,2006, Northern Ethiopia.

23. Samir Mohammad Ali Alredaisy and Hashim Suleiman Ibrahim. Assessment of nutritional status of children less than 10 yrs old in Rural Western Kordofan. 2010, IIOABJ; Vol. 2; Issue 4; 2011:40–49 4.

24. Tefera B (2005) An assessment and analysis of an underlying determinant of malnutrition: Community Health Programme, Faculty of Public Healt Jimma University, Ethiopia.

25. Johanna C.D. Factors contributing to malnutrition in children 0-60 months admitted to hospitals in the Northern Cape. Dissertation submitted in fulfillment of the requirements for the degree Magister Scientiae in Dietetics.2010, South Africa.

26. Nandaprakash.P. " Assessment of knowledge and practices among mothers of under five children regarding prevention of PEM at selected area of Gavipuram Gutthalli Bangalore, with a view to develop an information Guide sheet for mothers Sheets.2005, Dissertation Submitted to Rajiv Gandhi University of Health Sciences, Karnataka, and Bangalore.

27. Cyprian Ouma BSc, CPHCE. Knowledge, attitudes and practices of caretakers of malnourished children in Aweil East and North counties, South Sudan. Nutrition Technical CTC Advisor, 2011. World Vision Africa Regional Office, Kenya.

28. Afshan S, Mahmud A, Farah, Mohammad W, Mahmud R. Women beliefs and practices regarding food during pregnancy: a hospital based study. 2008. Original Prof.1709.

29. Ampeire Isaac Petit. Perception and knowledge of exclusive breastfeeding among women attending abstract antenatal and postnatal clinics. A study from Uganda. . 2008, Official Publication of the Tanzania Medical Students' Association.

30. Basil J. K anona. 1moa in E l-karir, A dnan Al-hindi, A bdelmonem. Breast Feeding, Complementary Feeding, and Weaning practices, among children up to 2 years old in Gaza a strip.2011, Gaza journal .Volume/Issue 7:15-26 (1432).

31. UNICEF. Breastfeeding management and promotion in a Baby Friendly Hospital, an 18 hour course for maternity staff. 1993, New York: UNICEF.

32. World Health Assembly Resolution. Infant and young child nutrition. 2001. WHA Resolution. 54.2.

33. Maternity Action information sheet. Continuing breastfeeding when you return to work.2013. London.

34. Amy L. Rice, Lisa Sacco, Adnan Hyder, Robert E. Black. Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries. 2000, Bulletin of the World Health Organization, 78.

35. John D. Mclennan. Knowledge and Practices of Preventing Diarrhea in Malnourished Children. 1998, J DIARRHOEAL DIS RES; 16(4):235-240.

APPENDICES

Shendi of University

Faculty of post public health program master of public health

Questionnaire on: Prevalence of Malnutrition among Children Under Five Years of Age, Angola Area, Umbada Locality,   Khartoum State, 2016

Division one:

1) Children's sex:

   1- Male (………)   .2- Female (………)

2) Children age: 1)

 1) Below one year (………)

   2)   1-2 years   (…………)
3) 3-4 years (………)

4) under 5 years   (………)

2) Children's
weight…………….Height…………percentage………………….category…

3- Nutrition (according to Sudan slandered) :

1- Normal(………)……

2- Mild malnutrition (…………).

3- Moderate malnutrition (………).

4- Severe malnutrition (…………)

Division two (family):

4- Educational level of the parent:
1-Mother: 1- Illiterate (...........)...2- Khalwa..(..............)   3- Basic(..............)
4-Secondary (..............)   5- University (..............)   6- Higher studies (..............).

2- Father:
1-Mother: 1- illiterate.(..........)   2- Khalwa.(..............)   3- Basic (..............)
4-Secondary (.............)   5- University..(...........)   6- Higher studies (.................).

5) Family size: 1) 3-5person (………) 2) 6-8 person (………)3) 9-11 person(………)
4) more than 11person…(………).

Division three:

6) Do you heard by malnutrition? 1) Yes(………) 2) NO (………)………….

7)   IF yes what is it? ....

8) Why it happens?...

9) What is the beast food for your child under tow years?

1- Local food (……………) 2- Mothers milk (…………)

    3-Cow's milk (……………) 4-Other (specify) (…………)

10) Do you believe that mother's milk in enough for the child in the first months of childhood?

1- Yes (…………)…2- No (………)

11) If yes why…………………………

Division three:

12) What are the components of your diet during pregnancy?

1) Proteins (   ) 2) Carbohydrates (   ) 3) Fats (   ) 4) Fruits (   ) Milk & products (   ).

13) Any other unusual content? IF yes why:

1- Not harmful to me(…………) 2- Not harmful to child (………)

3- for economical reasons(…………)…..4- for religious reasons (…………)

5- Has just habit (…………)….6- other (specify) (………)

14) What type of food do you avoid taking during lactation period? Why?
…………………………………………………………………………….
…………………………………………………………………………

16) Do you breastfeed your previous child during pregnancy?

1) Yes (………)…2) No (……)

17) If no why?

1) Milk gets harmful to the child (   )…2) Affects mother health (………)

3) Religious reason (………) 4) Other (specify)(……………..)

18) How many times do you breast feed your child during day?

19) When do you wean your child? ....

20) How do you wean child? ....

21) Do you give your child specific-meal during complete weaning?

1) Yes (………)2) No(   )

22) What type of food do you give to your child after weaning? ....

Division five:

23) What is artificial-feeding? ....

24) What do you use in artificial –feeding?

1) Bottles ( )2) Cups (   ) 3)Spoons (   ) 4) other (specify) (   )

25) When do you start complementary- feeding?

3

1-Directly …………………………2- After 4-6 months……………
3- After (2months -4)……………4- other (specify)……………………

26) Do you suddenly wean your child?.1-Yes (   ) 2- No (   )

27) If yes ,why?
1- child is old enough(   ) 2) New pregnancy(   ) 3) Milk is not enough or no milk(…………) .4) Breast problem(………).5) child illness(……) 6) Mother working outside(………) .7) other (specify): ……….

28) If you are a working mother, when do you breast feed your child /infant?

1) Before work(………) .2) During work(………) .3) After work(………)

4) Other (specify): ……………………….
29) Do you visit the MCH center when you are pregnant?

1) Yes (………)……….2) No (………).

30- If yes, what encourage you to visit the center?
…………………………………………………………………………
……………………………………………………………….

31) If no, Why?

1) Economical reason (…………) 2) No need (….……) 3) Not accustomed (………)
4) other (specify): ……….

32-How many time often you child got sick by the following diseases during the last two months?

1) Diarrhea episodes:

1-Once (...........) 2- Twice times (.............) 3- Three times (........)   4- More (............)
5- No affected (............).

2) What Type of medication?
....
....

3) Acute respiratory infections?

1-Once (........) 2- Twice times..(.............).3- Three times (..........)   4- More (..........)
5- Not affected (..........).

4

4) What Type of medication?

....

....

5) Malaria

1-Once (.......) 2- Twice times (.......) 3- Three times(..........) 4- More(........)
5- No affected (.........).

1. Observation Check List:

1) Personal hygiene of the Mother:

1- Excellent (   ) 2- Very good (   ) 3- Good (   ) 4- Bad (   )

2) Personal hygiene of the child:

1) Excellent (   ) 2- Very good (   ) 3- Good (   ) 4- Bad

4) Material used for building house:

1- Carton (   ) 2- Mud (   ) 3- Bricks (   )

5) Material used for roof:

1- Hay (   ) 2- Mud (   ) 3- Wood (   ) 4- Zink (   )

6) Ventilation:
1-Excellent (   ) 2- Very good (   ) 3- Good (   ) 4- Bad

7) Number of rooms (   )

8) Source of water supply to the house:

1-Standpipe (   ) 2- Well (   ) 3- Cistern (   )

9) Equipments used for transportation and storage of water:

1- Jerry cans (   ) 2- Barrels (   ) 3- Zeer (   ) 4- Others (Specify) (   )
 10) Human waste disposal:

1- Pit latrine (   ) 2-Ventilated improved pit latrine (VIP) (   ) 3- Septic tank (   )
4- In the open (   ) 5- Other (Specify): ……

11) Mean of collection of house garbage:

1- Plastic sacks (   ) 2- Vessels (   ) 3- Others (Specify) (   )

12) Garbage disposal:

1- Burning (   ) 2- Collection in one place (   ) 3- Pit (   ) 4- Throw in near house (   )

Food preparation & hygiene
13) Have you a kitchen?
 1) Yes   (   )
 2) No   (   )
14) Methods of keeping food:

   1.   Refrigerators   (   )
   2.   Tables   (   )
   3.   Cupboard   (   )
   4.   Shelties   (   )

؟- نوع الطفل : ذكر (   ) أنثى(   )

٢- الطفل:

عمر: اقل من سنة( ) 1-2 سنة (   ) 3-4 سنة (   ) 4) 4- اقل من خمسه
سنة   (   )

وزن :   وزن الطفل ....   الطول ....

٣- حالة التغذية : 1) طبيعة (   ) 2)خفيف (   ) 3) وسط (   ) 4) حاد   (   )

٤- مستوى تعليم الأبوين:

• الام 1- امى (   ) 2-خلوه (   ) 3- أساس (   ) 4- ثانوي (   ) 5- جامع وفوق
الجامعي(   )

• الأب : 1- امى (   ) 2-خلوه (   ) 3- أساس (   ) 4- ثانوي (   ) 5- جامعي
وفوق الجامعي(   )

٥- حجم الأسرة: 1- 3-5 فرد (   ) 2) 6-8 فرد (   ) 3) 9-11فرد (   ) 4) أكثر
من ١١ (   )

٤- هل سمعت عن سوء التغذية؟ 1. نعم (   )   2. لا(   )

٧- ما سبب حدوثه ....

٤- ماهو الطعام المفضل لطفلك اقل من سنتان: 1- أطعمة المحلية (   ) 2- لبن إلام
(   ) 3- لبن البقر (   ) 4- أخرى حدد(   )

7

٩- هل تعتقدين بأن لبن إلام كافي لطفلك في الستة شهور الأولى ؟ 1) نعم ( ) 2) لا ( )

٥٠- ما هو طعامك المفضل أثناء الحمل؟ ....

١١- ماهو الطعام الذي كني تتجنبيه اثناء الحمل ولماذا ....؟

١٢- هل كنت إثناء الحمل ترضعين طفلك السابق ؟ 1) نعم ( ) 2) لا( )

١٣- إذا كانت الإجابة بلا:

1) يؤثر اللبن عليه ( ) 2) يؤثر عليك ( ) 3) أسباب دينية ( ) 4) أخرى حدد( )

١٤- متى تفطمين طفلك ؟ ....

٥١؟- كيف تفطمينه ؟ ....

١٤؟- هل تعطينه وجبة خاصة إثناء الفطام ؟ نعم ( ) لا( )

٥١؟-ما نوع الطعام الذي تعطيه له بعد الفطام ؟ ....

١٨- ماهو نوع إناء الطعام الصناعي الذي تستعملينه؟ بزازة( ) كباية( ) معلقة( ) أخرى ( ) .

١٩؟- متى تبدأى في إعطائه الغذاء الكامل؟

(1مباشرة ( ) 2) 4-6 شهور 3) بعد سنة ( ) 4) أخرى حدد( )

٢٠- هل تفطمينه فجاءه ؟ نعم ( ) لا( )

8

٢١- أذا كانت الإجابة بنعم لماذا:

(1عمره كافي (   ) 2) حمل جديد (   )   3) اللبن غير كافي (   ) 4) مشكلة في الثدي

(   )

الطفل مرض(   )

٢٢-إذا كانت إلام تعمل (متى ترضعينه ؟

؟- قبل العمل (   ) 2) إثناء العمل (   ) 3) بعد العمل 4) أخرى حدد(   )

٢٣- هل تذهبين إلى المركز الصحي عندما يمرض طفلك؟

(1نعم (   ) 2) لا(   )

٢٤- لو الإجابة بلا: 1- أسباب اقتصادية (   ) 2-لايحتاج (   ) 3- أخرى حدد(   )

٢٥- ماهى الإمراض التي أصابت طفلك خلال الشهرين السابقين؟

؟) الإسهال 1) مرة (   ) 2) مرتان(   ) 3) 3مرات (   ) 4) أكثر حدد(   ) 5) لم يصاب (   )

٢)   الالتهابات التنفسية:

١) مرة (   ) 2) مرتان(   ) 3) 3مرات (   ) 4) أكثر حدد (   ) 5) لم يصاب( )

٣) الحصبة(   ) :

٤) الملاريا: 1) مرة (   ) 2) مرتان(   ) 3) 3مرات (   ) 4) أكثر حدد(   ) 5) لم يصاب)

ملاحظات عامة :

١- الصحة الشخصية للام :

١؟   ممتازة( ) 2) جيدة جدا( ) 3) جيدة ( ) 4) سيئة( )

٢- الصحة الشخصية للطفل :

١؟   ممتازة( ) 2) جيدة جدا( ) 3) جيدة ( ) 4) سيئة( )

٣- المواد المستخدمة في البناء :

١؟   كرتون ( ) 2) طين( )3) طوب احمر( )

٤- المواد المستخدمة في السقف :
(1سقف بلدي ( ) 2) خشب ( ) 3)طين( )طين( )4) زنك( )

٥- التهوية :

(1ممتازة( ) 2) جيدة جدا( ) 3) جيدة ( ) 4) سيئة( )

٦- الإضاءة :

١؟   ممتازة( ) 2) جيدة جدا( ) 3) جيدة ( ) 4) سيئة( )

٧- كم عدد وحجم الغرف في المنزل :

(   )

٨- ماهو مصدر مياه الشرب:

؟)   شبكة عامة(   ) 2) بير(   )3) كارو(   )

٩-   المعدات المستخدمة في حفظ المياه:

١- زير(   ) 2-ثلاجة ( ) 3- صهريج(   )4-برميل( ) 5- أخرى حدد ( )

١٠- التخلص من النفايات السائلة:

١- مرحاض بلدي (حفرة) ( ) 2- مرحاض محسن المهوا(   )3-سايفون   ( )
٤- أخرى حدد(   )

١١- جمع النفايات داخل المنزل:

١)أكياس بلاستكية (   ) 2) سلال ( )3- أخرى حدد( )

١٢-التخلص من النفايات الصلبة:

؟- تنقل بعربة النفايات (   )- 2 تحرق ( ) 3- تدفن (   )4- ترمى قرب المنزل (   )

١٣- هل يوجد مطبخ:

11

(1نعم ( )2( ) لا ( )

<u>١٤- طريقة حفظ الأغذية :</u>

(ثلاجة ( ) تريبزة (   ) دولاب (   ) رفوف ( )