



Shendi University
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**Assessment of Mothers Knowledge about
Nutrition and Nutritional Status of Basic School
Children in Shendi Town**

A thesis submitted for requirement of PhD degree in pediatric nursing

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قال تعالى:

﴿ وَقُلْ رَبِّ زِدْنِي عِلْمًا ﴾

صدق الله العظيم

سورة طه الآية (114)

Dedication

To

My father

My mother

My husband

My sisters

For spark my life

(My son & my daughter)

All Head managers of schools

*My college in Shendi university faculty of
nursing sciences*

I dedicate this study

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Abstract:

Good nutrition is essential for optimal health and disease prevention. Educating a child early in life about the importance of healthy eating habits can play a role in safe guarding the child against future disease. Mother's perfect nutrition knowledge plays an important role in their children health.

The aims of the study were to assess mother's knowledge about nutrition and nutritional assessment of basic school children in Shendi town. This descriptive cross- sectional community based study was carried out on 500 mothers and their children through multi stage simple random sampling.

The study showed that mothers knowledge about definition of nutrition and essential food component was poor only (9.2%) and (15%) respectively had good knowledge. Also (10%) had good knowledge about definition of vitamin and vitamin deficiency. Knowledge about water as general was poor in spite of it's importance. The fair knowledge about importance of water ,indication of more fluid intake and inadequate fluid intake were (6.8%), (26%) and (8.4%) respectively.

The study indicated that more than three quarters (78.8%) of mothers included in the study had deficient knowledge about definition and causes of obesity. Regarding food behavior more than two third had poor knowledge about correct food behavior. The overall knowledge about nutrition was poor and mother's educational level didn't affect their knowledge about nutrition.

The growth is a better indicator for nutrition. Nutritional assessment showed a high prevalence of underweight in studied school children (85%) and obesity was found in only (0.6 %) by using BMI according to CDC.

It is recommended that the ministry of health together with the ministry of education should strengthen nutrition education to ensure that the parents should cope with early nutritional status monitoring both at home and at health facility, regular check up should be organized for school children and to offer a free breakfast for children who cannot afford.

ملخص البحث:

التغذية والعادات التغذوية الجيدة في المراحل المبكرة من عمر الأطفال ومعرفة الأمهات بها تلعب دوراً مهماً في المحافظة علي الصحة والوقاية من الامراض .

أجريت هذه الدراسة الوصفية المقطعية المجتمعية بمدينة شندي لهدف معرفة الأمهات عن التغذية والحالة التغذوية للأطفال في سن المدرسة . وتضم الدراسة 500 أم مع أطفالهن عن طريق العينة متعددة المراحل .

أوضحت الدراسة أن معرفة الأمهات عن تعريف وأهمية التغذية ضعيفة عدا 9.2% و 15% علي التوالي لديهن معرفة جيدة . وأيضاً 10% من الأمهات لديهن معرفة جيدة عن الفايتمينات ونقصها . ووضح جلياً أن معرفة الامهات عن الماء ضعيفة رغم أهميتها . فقط 6.8% و 26% و 8.4% علي التوالي لديهن معرفة متوسطة عن أهمية الماء وزيادة شربه وقلته . كما أثبتت الدراسة أن مايفوق 78% من مجتمع الدراسة لديهن معرفة ضعيفة عن تعريف وأسباب السمنة والسلوك الغذائي و المعرفة العامة حول التغذية ضعيفة ولم يؤثر المستوي التعليمي للأم علي فهمها .

بما أن النمو أحد المؤشرات الجيدة للتغذية أظهرت الدراسة معدل إنتشار عالي من الأطفال في سن المدرسة ناقصي الوزن 85% والسمنة توجد فقط في 0.6% (وفقاً لمركز التحكم في الامراض) .

خرجت الدراسة بالعديد من التوصيات أهمها أن تقوم وزارة الصحة بالتعاون مع وزارة التربية والتعليم بتعزيز التوعية التغذوية لضمان أن يتعامل الوالدين مع الحالة الغذائية في المنزل أو المنشآت الصحية كما يجب عمل فحص دوري لأطفال المدارس وتوفير لهم وجبة الإفطار مجاناً للأطفال الذين لا يستطيعون شرائها .

List of abbreviations

BMI	Body Mass Index
CD	Celiac disease
CVD	Cardio vascular disease
Cm	Centimeter
CDC	Centre for Disease Control
DNA	Deoxyribonucleic acid
GFD	Gluten-free diet
FAO	Food and Agriculture Organization
Hb	Hemoglobin
Ig	Immunoglobulins
Ib	Bound
IOTF	International Obesity Task Force
Kg	Kilogram
M/g	Milligram
Mcg	Microgram
RDA	Recommended Dietary Allowances
RNA	Ribonucleic acid
RBCs	Red blood cells
SPSS	Statistical Packed for Social Science
SGA	Small for Gestational age
TV	Television
U/L	Upper level
VAD	Vitamin A deficiency
WHO	World Health Organization

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Introduction:

Good nutrition and access to an adequate diet and health are essential for child growth and development, body maintenance and protection from both infectious and non-communicable diseases in life. ⁽¹⁾

Nutrition is the science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. It includes food intake, absorption, assimilation, biosynthesis, catabolism and excretion. ⁽²⁾

Nutrition refers to taking in food and assimilating it metabolically for use by the body. Adequate nutrition is an essential component of growth and development. Nurses are instrumental in giving parents information about normal nutritional needs of infants, children, and adolescents. Common techniques to assess nutrition, is measuring growth. ⁽³⁾

Nutrient is defined as a substance obtained from food and used in the body to promote growth, maintenance, and repair of body tissues. ⁽⁴⁾ Macronutrients provide the bulk of energy that metabolic system needs to function while micronutrients provide the necessary cofactors for metabolism to be carried out. Inorganic chemical compounds such as dietary minerals, water (H₂O), and oxygen may also be considered nutrients. ⁽⁵⁾ The effects of nutrients are dose dependent, shortages are called deficiencies. ⁽⁶⁾

The nutritional needs of the basic school children should be met by choosing foods from all the food groups with the appropriate number of servings from each group in the child's daily diet. Obesity can be a concern during this age. Some children may have a genetic tendency to obesity; environment and a sedentary lifestyle also play a part. ⁽⁷⁾

A healthy diet helps children grow and learn. It also helps prevent obesity and weight-related diseases, such as diabetes. ⁽⁸⁾ A poor diet can cause deficiency diseases such as blindness, anemia and scurvy. ⁽⁹⁾ Also cause

the wasting of kwashiorkor in acute cases, and the stunting of marasmus in chronic cases of malnutrition. ⁽¹⁰⁾

A study was conducted in Bangladesh Dhaka City showed that mothers' perfect nutrition knowledge plays an important role of their children health issue. Most of the respondents (94%) had perfect knowledge on balance diet and (98%) answered correctly on knowledge about blindness prevention. On the other hand all of the total respondents answered correctly that anemia as an effect of malnutrition. Association between knowledge on balanced diet and education of mother was statistically significant ($p=0.001<0.05$). Overall knowledge regarding nutrition among study subjects was not satisfactory. ⁽¹¹⁾

Other study conducted by Mohamed SM, in Dolgo area in the northern region of Sudan .It enrolled 835 primary school children aged 6–14 years. A high prevalence of stunting (7.1%), thinness (23.1%) and anemia (29.7%) were found . ⁽¹²⁾

General objective:

Assessment of mother's knowledge about nutrition and nutritional status of basic school children in Shendi town.

Specific objectives:

1. To assess mother's knowledge about nutrition and nutritional needs for their children.

2. To identify mother's knowledge about nutritional problems in basic school children.

3. To assess mother's knowledge about food behavior in their children.

4. To estimate prevalence of obesity and underweight among studied children.

5. To identify the relation between selected socio demographic characters for mothers and their knowledge about nutrition and nutritional status for their children.

Justification:

- Nutrient and energy requirements change markedly during infancy, childhood and adolescence.
- Healthy eating is important for everyone, especially children, to ensure that they receive all the nutrients they need to grow, develop and improve their health as well as ability to learn and achieve at school.
- Encouraging children to eat healthily now will make them more likely to adopt a healthy life style as they get older.
- Adequate mother's knowledge about nutrition will improve their children health and dietary habits.

Literature review:

2.1. Nutrition:

Nutrition is the basis of life being a factor of permanent action by which the individual, respectively small or large communities have ensured their survival in relation to the environment. Food represents a natural component which provides the energy and the vitality of the body and helps preserve people's health and welfare. ⁽¹³⁾

2.1. 1. Importance of nutrition:

Nutrition is one of the most important factors in protecting and developing human health beginning from the pregnancy stage of the mother. Healthy, satisfactory and balanced nutrition is essential for every body, especially for children, because nutritional habits that are made in our early ages turn out to be our lifetime habits. Dennison BA et al (2013) ,in the dietary guidelines for children and adolescents reported that infancy, childhood and adolescence periods, as being periods of rapid growth and development, are important stages for making of good healthy and satisfactory nutritional habits. ⁽¹⁴⁾

Nutrition promotes optimal growth and development in children and adolescents, better appetite control and better performance at school and work. It also reduces the risk of health concerns, such as iron-deficiency anemia, dental decay and minimizes the risk of nutrient-related chronic diseases. ⁽¹⁵⁾

2.1.2. Definition of nutrition:

WHO defines nutrition as the intake of food, considered in relation to the body's dietary needs. Good nutrition an adequate, well balanced diet combined with regular physical activity is a cornerstone of good health. ⁽¹⁶⁾

Good nutrition is essential for survival, physical growth, mental development, performance, productivity, health and well-being across the entire life-span. ⁽¹⁷⁾

2. 1.3. Nutrition and growth of basic school children:

2. 1.3.1.School age:

The term “school age” commonly refers to children between the ages of 6 and 12years. Although these years represent a time of slow physical growth, cognitive growth and development continue to proceed at rapid rates. Because of this, there are many differences among children from one year to the next. Growth and development for a school-age child occur slowly, and over a relatively long time span so children grow and develop extensively during this period.⁽⁷⁾

2. 1. 3.2. School child nutrition:

In the school years, children have to learn to eat food other than that provided at home, and usually have a midday meal at school. The principles of healthy eating should be maintained, although this may become more difficult as children are introduced to snacking on sugary and salty foods by their peers. Schools are well placed to educate about nutrition and provide well-balanced meals. The nutritional requirements of young people are influenced primarily by the spurt of growth that occurs at puberty. The peak of growth is generally between 11 and 15 years for girls and 13 and 16 years for boys. The nutrient needs of individual teenagers differ greatly, and food intake can vary enormously from day to day, so that those with deficient or excessive intakes on one day may well compensate on the next. In this period of life, several nutrients are at greater deficiency risk including iron and calcium.⁽¹⁸⁾

2. 1. 3. 3. Physical growth:

Is a typical characteristic of childhood it is also a sensitive indicator of a child’s nutritional status. Deviations in growth, especially growth restriction, but also excess fat accumulation typical of obesity, are associated with greater risk of disease both in the short and the long run. Monitoring growth is therefore an important tool for assessing the health and well-being of children

Growth is influenced by a number of semi-independent factors, but growth itself is a continuum from early fetal life through to the end of adolescence.

These factors include genetics, hormones, nutrition, illness and psychosocial factors.⁽¹⁸⁾

The physical development of the school-aged child includes changes in weight and height, as well as changes in dentition and the eruption of permanent teeth. The school-aged child's skeletal growth and changes are evident during this period.⁽⁷⁾

By 10 years of age, brain growth is complete, so fine motor coordination becomes refined. As the eye globe reaches its final shape at about this same time, an adult vision level is achieved. School-age children's annual average weight gain is approximately 3 to 5 lb (1.3 to 2.2 kg); the increase in height is 1 to 2 in (2.5 to 5 cm).⁽¹⁹⁾

The term "adolescents", as defined by the World Health Organization (WHO), includes persons aged 10–19 years. Average weight gains during puberty among females are between 15-55 lb (7-25 kg), with a mean gain of 38.5 lb (17.5 kg). Adolescent males gain an average of 20 lb (9 kg) per year during puberty. Overall, male teens gain 15-65 lb (7-30 kg) during puberty, with a mean gain of 52.2 lb (23.7 kg).⁽²⁰⁾

2. 1. 3.4. Food behavior in school age child:

Healthy eating behaviors in childhood are very important. It helps prevent malnutrition, growth retardation, and acute child nutrition problems, in addition to preventing chronic, long-term health problems such as cardiovascular diseases, type 2 diabetes, cancer, obesity, and osteoporosis .The effects of mother's nutritional knowledge on attitudes and behaviors of children about nutrition was evaluated by Yabancı N et al .He concluded that parents are effective on their children's eating behaviors and preferences. Especially, mothers are the role models of their children about eating behaviors. Therefore, it is important to determine mother's eating habits to support healthy nutrition of both child and mother. Eating behaviors of the mother are affected by some factors such as socioeconomic status, educational status, age, working position,

and knowledge level of nutrition of mother. It is assumed that nutritional knowledge level of the mother could be effective on eating behavior of their children.⁽²¹⁾

Kasparian M found that parenting style influences a child's over all diet quality and establishes food preferences. Parenting style and “food rules” for children differ by eating at home or away from home. Eating meals away from home is increasing despite associations with consumption of unhealthy foods and higher weight status.⁽²²⁾

2.2. Nutrient:

Nutrients are essential for growth and for the repair of the worn –out and aging tissue .The basic constituent for the synthesis of digestive enzyme, juices and hormones are derived from food.

The chief constituents of the food are water (63%), protein (17%), carbohydrate (1%), fats (12%) vitamins and minerals (7%).⁽²³⁾

Nutrients are organic and inorganic complexes contained in food. There are 50 different nutrients which are normally supplied through the foods we eat. Each nutrient has specific functions in the body. These may be divided into macronutrient and micronutrient.

2.2.1. Macronutrient:

These are protein, fat and carbohydrate which are often called (proximate principles) because they form the main bulk of foods.

2.2.1.1. Proteins:

Proteins are complex organic nitrogenous compounds .They are composed of carbon ,hydrogen ,oxygen ,nitrogen and sulphur in varing amounts .Some proteins also contain phosphorus and iron and occasionally other elements . Protiens are made up of amino acids.⁽²⁴⁾

a. Functions:

- a. Body building
- b. Repair and maintenance of body tissues.

- c. Maintenance of osmotic pressure.
- d. Synthesis of antibodies, plasma, hemoglobin, enzymes, hormones and coagulation factors.

b. Sources:

- a. Animal sources: protein of animal origin are found in milk, meat, egg, cheese, fish, and fowl or bird.
- b. Vegetable sources: vegetable proteins are found in pulses (legumes) ,cereals ,beans ,nuts ,oil and seeds. ⁽²⁴⁾

2.2.1.2. Fats:

Fats are nutrients in food that the body uses to build nerve tissue and hormones. The body also uses fat as fuel. Fat gives food flavor and texture, but it is also high in calories. Excess amounts of fatty foods can cause many health problems. For kids and teens, desserts and snacks (including potato chips, chocolate, cakes, doughnuts, pastries, and cookies) are a significant source of fat. Kids also get fat from whole-milk products and high-fat meats, such as bacon, hot dogs, and fatter cuts of red meat. Of course, fast-food and take out meals tend to have more fat than home cooking; and in restaurants, fried dishes are the highest in fat content. Fat also often "hides" in foods in the form of creamy, cheesy, or buttery sauces or dressings. ⁽²⁵⁾

a- Functions :

- a. Help the body absorb some vitamins (vitamins A, D, E, and K)
- b. Are the building blocks of hormones
- c. Are needed to insulate all nervous system tissues in the body
- d. Help people feel full, so they're less likely to over eat

b- Types of Fats

Three major types:

1. Unsaturated fats: Found in plant foods and fish, these fats are seen as neutral or even beneficial to heart health. The types of unsaturated fats are:

- **Monounsaturated**, found in avocados and olive, peanut, and canola oils.

- **Polyunsaturated**, found in most vegetable oils.
- **Omega-3 fatty acids**, a type of polyunsaturated fat found in oily fish like tuna and salmon.

2. Saturated fats: Found in meat and other animal products, such as butter, shortening, lard, cheese, and milk (except skim or nonfat), saturated fats are also found in palm and coconut oils, which are often used in commercial baked goods. Eating too much saturated fat can raise blood cholesterol levels and increase the risk of heart disease.

3. Trans fats: Found in margarine (especially the sticks), commercial snack foods and baked goods, and some commercially fried foods, trans fats (also called trans fatty acids) are created when vegetable oils are hydrogenated .For young kids, especially, fat and cholesterol play important roles in brain development .⁽²⁵⁾ For ages 4 to 18 years, the recommendations are about 25% to 35% of calories .⁽²⁴⁾

Fats, especially omega-3 fatty acids, are important for child’s cognitive development. It is recommended that school-age children ages 4 and older consume 25 to 35 percent of their daily calorie intake from fats, especially mono- and polyunsaturated fats found in vegetable oils, avocados, peanut butter, hummus, nuts and seeds. Foods high in omega-3 fatty acids include purified fish oils, canola oil, walnut oil, walnuts, soybeans, soybean oil, algal oil, flaxseeds, flaxseed oil and pumpkin seeds.⁽²⁶⁾

2.2 .1.3 Carbohydrates:

The scientific advisory committee on nutrition reported that carbohydrates are a major source of energy in the diet. Carbohydrates can be divided into sugars (monosaccharides and disaccharides), polyols, and oligosaccharides (malto–oligosaccharides and non- digestible oligosaccharides) and polysaccharides.(starch and non- starch polysaccharides).This classification does not allow a simple translation into nutritional effects since each class of carbohydrates has overlapping physiological properties and effects on health.

Carbohydrates can also be classified according to their digestion and absorption in the human small intestine. ⁽²⁷⁾

a- Function:

Digestible carbohydrates are used as energy fuel, for synthesis of glycoprotein and glycolipids and as a general precursor for most complex organic compound in the body.

b- Dietary sources:

The vast majority is contained in cellulose and other indigestible macromolecules in tree, shrubs, and grasses. Digestible carbohydrates in fruits, grains, tubers, stalks and marrow.

The risk is greatest if the intake of complex carbohydrates is very low . Most often the cited effects relate to increase atherosclerosis risk. Low intake associated with inadequate total energy intake causes starvation. ⁽²⁸⁾

2.2.2. Micronutrients:

These are vitamins and minerals. They are called micro nutrients because they are required in small amounts which may vary from a fraction of milli gram to several grams.

2.2.2.1. Vitamin:

a- Definition of vitamin:

Gerald F and Combs JR described vitamins as an organic compound distinct from fats, carbohydrates, and proteins. Vitamin is a natural component of foods in which it is usually present in minute amounts for normal physiological function (maintenance, growth, development, and/or production).⁽²⁹⁾ Generally it cannot be synthesized by the body and must therefore be supplied in the diet. ^(30, 31)

b- Functions

Vitamins have various functions that help to regulate metabolism, prevent chronic diseases (such as heart disease and cancer), and maintain normal appetite, mental health and immunity. ⁽³²⁾

c- Classification:

Vitamins can be classified into:

- a .Fat soluble vitamins :(A ,D ,E and K)
- b. Water soluble vitamins: (B and C).⁽²⁴⁾

2.2.2.1.1. Fat soluble vitamins:

A- Vitamin (A):

Chen CY et al did a study to compare vitamin A status in 6-13 years old children in china .They concluded that vitamin A is an essential nutrient needed in small amounts for the normal functioning of the visual system, and maintenance of cell function for growth, epithelial integrity, red blood cell production, immunity and reproduction.⁽³³⁾

Vitamin A is a generic term that refers to compounds with the biological activity of retinol. These include the provitamin A carotenoids, principally b-carotene, a-carotene, and b-cryptoxanthin, which are provided in the diet by green and yellow or orange vegetables and some fruits and preformed vitamin A, namely retinyl esters and retinol itself, present in foods of animal origin, mainly in organ meats such as liver, other meats, eggs, and dairy products. Retinoids and carotenoids are defined based on molecular structure.⁽³⁴⁾

Recommended Dietary Allowances (RDA) in age 4-8 years 400 mg/ and in 9-13years 600 mg/day.

Deficiency of vitamin A:

The World Health Organization (WHO) defines vitamin A deficiency (VAD) as tissue concentrations of vitamin A low enough to have adverse health consequences, even if there is no evidence of clinical deficiency. VAD has been recognized as a major public-health nutrition issue in developing countries.⁽³³⁾

Vitamin A deficiency is a primary cause of xerophthalmia, which is manifested as night blindness and corneal abnormalities oftening of the cornea (keratomalacia) and ulceration leading to irreversible blindness.⁽³⁴⁾

B- Vitamin (D):

The generic term vitamin D designates a group of chemically related compounds that possess anti rachitic activity. The two most prominent members of this group are vitamin D2 (ergo-calciferol) and vitamin D3 (cholecalciferol). Vitamin D2 is derived from a common plant steroid, ergosterol, and is the form that was employed for nutritional vitamin D fortification of foods from the 1940s to 1960s.

Vitamin D3 is the form of vitamin D obtained when radiant energy from the sun strikes the skin and converts the precursor 7-dehydrocholesterol. Since the body is capable of producing vitamin D3, vitamin D does not meet the classical definition of a vitamin. A more accurate description of vitamin D is that it is a prohormone; thus, vitamin D is metabolized to a biologically active form that functions as a steroid hormone. However, since vitamin D was first recognized as an essential nutrient, it has historically been classified among the lipid-soluble vitamins.

Vitamin D functions to maintain calcium homeostasis together with two peptide hormones, calcitonin and parathyroid hormone (PTH). The only roles attributed to vitamin D have been regulation of intestinal calcium absorption and maintenance of skeletal homeostasis. ^(33, 34) Vitamin D is also important for phosphorus homeostasis. ⁽³⁵⁾

Sources:

The source of vitamin D are reported by Ruker R et al are Cod-liver oil, salmon, cooked Tuna fish, sardines, canned in oil and milk .The vitamin D3 requirement of healthy child has never been precisely defined. Since vitamin D3 is produced in the skin on exposure to sunlight and can be retained in vertebrate tissues, humans may not have a requirement for vitamin D when sufficient sunlight is available .However, vitamin D3 does become an important nutritional factor in the absence of sunlight . ⁽³⁴⁾

Deficiency:

A deficiency of vitamin D results in inadequate intestinal absorption and renal.

Reabsorption of calcium and phosphate. As a consequence, serum calcium and phosphate levels fall and serum alkaline phosphates activity increases. In response to these low serum calcium levels, hyperparathyroidism occurs.⁽³⁴⁾

Vitamin D deficiency results in rickets in children. Ghaffari J et al in studying vitamin D deficiency reported that the prevalence of vitamin D deficiency in children is common in the world(between 30% and 50%).⁽³⁶⁾

C-Vitamin (E):

Vitamin E is an essential nutrient for humans. It is known to act as an antioxidant and may also work as a coenzyme (especially in muscle cell and bone metabolism). Antioxidants are essential to prevent destructive attack by oxygen on the essential unsaturated fats in cell outer membranes. Humans need very little vitamin E daily for at least four possible reasons. It is not easily excreted; it is used up very slowly while performing most of its jobs; it can be regenerated from its oxidized form by vitamin C; and the human body has at least four other antioxidants available, one or more of which can substitute for vitamin E in most of its functions. Together with these other antioxidants, vitamin E contributes to the following: protects and maintains the cell walls of red blood cells and most other tissue cells (even fragile walls of tiny structures inside cells) protects essential unsaturated fatty acids from oxidation to peroxides; and helps maintain normal muscle metabolism.⁽³⁴⁾

The body also needs vitamin E to boost its immune system so that it can fight off invading bacteria and viruses. It helps to widen blood vessels and keep blood from clotting within them. In addition, cells use vitamin E to interact with each other and to carry out many important functions.⁽³⁷⁾

Food Sources of Vitamin E:

Vitamin E is found in practically all food stuffs but is especially plentiful in vegetable oils, particularly wheat germ oil. The second richest sources of vitamin E are olives, peanut oil, chocolate, cabbage, asparagus, wheat germ, soybeans, spinach and cereals in many fruits, and in eggs, butter, cheese, cornmeal, oats, wheat and meats.⁽³⁸⁾

The Recommended Dietary Allowance of vitamin (E): age 4-8 years 7 mg/day, 9-13 years 11 mg/day.⁽³⁸⁾

Deficiency of vitamin E:

The national institute of health reported that vitamin E deficiency occurs only rarely in humans and virtually never as a result of dietary deficiencies. Vitamin E deficiency does occur as a result of genetic abnormalities in a-TTP and as a result of various fat malabsorption syndromes. It causes nerve problems due to poor conduction of electrical impulses along nerves due to changes in nerve membrane structure and function.⁽³⁸⁾ Vitamin E deficiency symptoms in humans traceable only to an inadequate diet have never been reported except in premature infants who, while in the womb, are unable to get vitamin E from their mothers. Premature infants are therefore prone toward hemolytic anemia and bleeding tendency.⁽³⁴⁾

D-Vitamin (K):

Vitamin K was identified in the early 1930s when it was shown to be essential for normal blood coagulation. Vitamin K occurs in at least two major forms vitamin K₁ and vitamin K₂.

Vitamine K₁ is found mainly in fresh green vegetables particularly dark green ones and some fruits spinach, broccoli, kale, and collards, soybean oil, red or green grapes, plums, kidney beans, yogurt, mayonnaise and margarine.
(24,39,40)

Vitamin K₂ synthesized by intestinal bacteria. The role of vitamin K is to stimulate the production and /or the release of certain coagulation factors.

In deficiency of vitamin K the prothrombin content of blood is markedly decreased and the blood clotting time is considerably prolonged. ⁽²²⁾

2.2.2.1.2. Water soluble vitamins:

a- Vitamin C (ascorbic acid):

Vitamin C has been defined as a redox system composed of L-ascorbic acid, monodehydro-L-ascorbic acid (a free radical), and oxidized ascorbate (dehydro-L-ascorbic acid). ⁽⁴¹⁾

Vitamin C is needed for the growth and repair of tissues in all parts of body. It is important for protein used to make skin, tendons, ligaments, cartilage, blood vessels and aid in the absorption of iron. ⁽⁴¹⁾ Ascorbic acid maintains metal ions in a reduced state, which allows the proper function of some mixed-function oxidases in the synthesis of important molecules. Vitamin C also plays an important role as a cofactor of hydroxylase enzymes involved in the synthesis of carnitin, and is a cofactor of dopamine- β hydroxylase in the synthesis of norepinephrine from dopamine. The activation of other neurotransmitters and hormones through α -amidation is also likely to depend on vitamin C. ⁽⁴²⁾

Vitamin C deficiency affects collagen synthesis by impeding the hydroxylation of lysine and proline residues in precursor polypeptide chains, which become unable to fold into their final triple helical structure. The accumulation of immature collagen molecules is reflected in weakness of collagen rich tissues and explains many of the symptoms of scurvy including gum bleeding, bruising, and inadequate repair of damaged tissue. ⁽⁴²⁾

b- Vitamin B1 (Thiamin):

Thiamin is a sulfur-containing member of the water-soluble B-complex family, which is essential for normal development, growth, reproduction, lactation, and physical performance. It is involved in releasing energy from macronutrients that provide energy, especially from carbohydrates. Thiamin is an essential vitamin that cannot be synthesized and must come from the diet. Thiamin is widely distributed in small amounts in foods, but it is easily lost

during the milling, heating, canning, blanching, and storage of foods. It is readily absorbed from the intestine and readily excreted through the kidneys.⁽⁴³⁾

Thiamin is found in enriched fortified and whole grain products such as bread, cereals, rice, pasta, and flour, beef liver and pork, dried milk, egg, legumes and peas, nuts and seeds, dairy products, fruits, and vegetables are not very high in thiamin, but when eaten in large amounts, they become a significant source.⁽⁴⁴⁾

Requirement: 0.5-1mg/day.⁽²⁴⁾

C- Vitamin B2 (Riboflavin):

Riboflavin, like thiamin and some other B vitamins, is essential for normal development, growth, reproduction, lactation, physical performance, and well-being. It is involved in a wide array of essential biochemical oxidation-reduction reactions, especially those that yield energy and metabolize carbohydrates, fats, and proteins. Riboflavin is widely distributed in small amounts in many foods, and milk is one important dietary source. Similar to many members of the water-soluble B-complex family of vitamins, riboflavin is easily lost from grains or vegetables during milling, heating, canning, blanching, and storage. Riboflavin is especially sensitive to light. It is readily absorbed in small amounts from the intestine and readily excreted through the kidney.⁽⁴³⁾

Sources:

Milk, milk products, egg, liver, green vegetables, meat, fish, wheat, pulses.

Requirement: 0.5-1.5mg/day.⁽²⁴⁾

D-Vitamin B3 (Niacin):

Niacin is vitamin B3 and has fundamental roles as part of reduction/oxidation coenzymes involved in energy metabolism, amino acid metabolism, and detoxification reactions for drugs and other substances.

Excess niacin is not stored in the body; therefore niacin must be ingested daily. It can come from nicotinic acid or nicotinamide. It can also come from the biological conversion of the amino acid tryptophan to nicotinic acid, but only if intake of protein is at a sufficiently high level. Thus, an individual's niacin level depends on the amount and quality of that person's dietary protein intake.⁽⁴³⁾

Vitamin B3 found in meat, poultry, fish, kidney, liver, cereal, nuts.

Requirement: 5-15 mg/day.⁽²⁴⁾

E-Vitamine B₅ (pantothenic acid):

Vitamin B5 is a water soluble vitamin that is part of the vitamin B complex group. Vitamin B5 plays an important role in metabolizing carbohydrates, fats and proteins. In addition, vitamin B5 is important for healing wounds and repairing tissues and cells.

Sources:

Animal sources include liver, kidneys, heart, fish, chicken, beef, egg yolk; milk. Grain /fruit/ vegetable sources include yeast, whole grain cereals, nuts, legumes and fruits.

Vitamin B5 deficiency:

While vitamin B5 deficiency is extremely rare because vitamin B5 exists to some extent in all foods, lack of B5 leads to various health problems. Symptoms include general fatigue, insomnia, depression, irritability, stomach pains, nausea, vomiting, headaches, and tingling sensations.⁽⁴⁵⁾

Requirement: -10 mg/day.

F-Vitamin B₆ (pyridoxine):

Vitamin B₆ (pyridoxine) exists in three forms: pyridoxine, pyridoxal and pyridoxamine. It plays an important role in the metabolism of amino acids, fat and carbohydrate.

Sources:

Milk, liver, meat, egg yolk, fish, whole grain cereals, legumes and vegetables.

Vitamin B₆ deficiency:

Pyridoxine is associated with peripheral neuritis.

Requirement: - 0.5-1.5mg/day.⁽²⁴⁾

G-Vitamin B₁₁ (Folic acid, Folate, Folacin):

Folic acid (conjugate base folate) is a B vitamin. It is also referred to as vitamin M, vitamin B₉, vitamin B (or folacin), pteroyl-L-glutamic acid, and pteroyl-L-glutamate.⁽⁴⁶⁾ Folic acid is synthetically produced, and used in fortified foods and supplements on the theory that it is converted into folate.⁽⁴⁷⁾ However, folic acid is a synthetic oxidized form, not significantly found in fresh natural foods. To be used it must be converted to tetrahydrofolate (tetrahydrofolic acid).⁽⁴⁸⁾ Folate functions as a coenzyme or co-substrate in single-carbon transfers in the synthesis of nucleic acids (DNA and RNA) and metabolism of amino acids. One of the most important folate-dependent reactions is the conversion of homocysteine to methionine in the synthesis of S-adenosyl-methionine, an important methyl donor. Another folate-dependent reaction, the methylation of deoxyuridylate to thymidylate in the formation of DNA, is required for proper cell division. An impairment of this reaction initiates a process that can lead to megaloblastic anemia, one of the hallmarks of folate deficiency.⁽⁴⁹⁾ It is especially important in aiding rapid growth, such as in infancy and pregnancy. Children and adults both require folate to produce healthy red blood cells and prevent anemia.⁽⁵⁰⁾

Sources:

Sources of folate include liver, kidney, dark green leafy vegetables, meats, fish, whole grains, fortified grains and cereals, legumes, and citrus fruits. Not all whole grain products are fortified with folate.

RDA: 4–8 years 200 mcg and 9–13 years 300 mcg.

Deficiency:

Folate deficiency affects cell growth and protein production, which can lead to impaired growth and anemia. Deficiency symptoms also include headache, sore and inflamed tongue, palpitations and diarrhea.⁽⁵¹⁾

H-Vitamin B₁₂ (Cynocobalamin):

Natural Medicine Comprehensive Database, in vitamin B₁₂ reported that it is an essential water-soluble vitamin that is commonly found in a variety of foods such as fish, shellfish, meat, and dairy products. Vitamin B₁₂ is frequently used in combination with other B vitamins in a vitamin B complex formulation. It helps maintain healthy nerve cells and red blood cells and is also needed to make DNA, the genetic material in all cells. Vitamin B₁₂ is bound to the protein in food. Hydrochloric acid in the stomach releases B₁₂ from protein during digestion. Once released, B₁₂ combines with a substance called intrinsic factor (IF) before it is absorbed into the blood stream.⁽⁵²⁾

RDA: 4-8years 1.2mcg and 9-13years 1.8mcg

Sources:

Liver, beef, braised, cereals, trout, rainbow, wild, salmon, milk, Cheese, Beef taco, cured, egg and chicken.

Deficiency:

Deficiency can result from being unable to use vitamin B₁₂. Inability to absorb vitamin B₁₂ from the intestinal tract can be caused pernicious anemia.⁽⁵³⁾

RDA: 0.9 to 1.8 micrograms.

In general, older children require more of each essential vitamin than younger kids. ⁽⁵⁴⁾

2.2.2.2. Minerals:

Definition:

Is a chemical element required as an essential nutrient to perform functions necessary for life. ^(55, 56) Minerals originate in the earth and cannot be made by living organisms. Plants get minerals from soil. Most of the minerals in a human diet come from eating plants and animals or from drinking water. ⁽⁵⁷⁾

The five major minerals in the human body are calcium, phosphorus, potassium, sodium and magnesium. ⁽⁵⁵⁾ All of the remaining elements in a human body are called "trace elements". The trace elements that have a specific biochemical function in the human body are sulfur, iron, chlorine, cobalt, Copper, zinc, manganese, molybdenum, iodine and selenium. ⁽⁵⁸⁾

There are 16 different minerals that are known to be needed in our diets. Several other minerals may be needed in very small amounts.

Minerals are grouped as macrominerals and trace minerals. Macrominerals are those found in larger quantities in the body and needed in larger amounts in the diet they include calcium, sodium, potassium, chloride phosphorus, magnesium, sulfur. Trace minerals are found in small quantities in the body and are needed in small amounts in the diet including iron, zinc, iodide, selenium, copper, fluoride, chromium, molybdenum and manganese.

Function:

Minerals work in two ways in the body they support body cells and work to regulate many body processes. ⁽⁵⁹⁾

2.2.2.2.1. Macrominerals:

A-Calcium:

Calcium is a major mineral element of the body.⁽²⁴⁾ The essentiality of calcium for growth and development.

The amount of calcium absorbed into our bones is dependent on the amount of calcium that we eat and how much Vitamin D we get. It can also be found in small amounts in foods such as fish and egg yolks. There are also many foods that are now fortified with vitamin D.⁽⁶⁰⁾

Functions:

Calcium is the most abundant mineral in the body and 99% is found in the skeleton. The skeleton not only provides a strong framework for supporting muscles and protects delicate organs and tissues, including the bone marrow, but is also jointed to allow movement, and is malleable to allow growth. Furthermore, the skeletal reserve of calcium actively supports calcium homeostasis. It is found as the free ion, bound to serum proteins and complexed to organic and inorganic acids. And calcium also play role in teeth formation also assisting in muscle contractions, nerve stimulations and regulating blood pressure.⁽⁶¹⁾

Sources:

Milk and milk products, egg, and fish but the element is also present in dark green leafy vegetables, many seeds, and other foods.^(22, 60)

Deficiency:

Calcium deficiency may play a more important role in the causation of rickets in children. Rickets, a common nutritional disorder, is usually secondary to vitamin D deficiency also may lead to osteoporosis, a degenerative bone disease that may strike older .This condition can result from years of low dietary calcium intake or poor absorption of calcium from the intestines (caused by lack of vitamin D or other factors).⁽⁶²⁾

Requirement: - 500-1000mg/day.⁽²⁴⁾

B- Magnesium:

Magnesium is the fourth most abundant cation in the body. Approximately 60% found in the body is contained within the bone with the remaining 40 % distributed between muscle and non muscular soft tissues.

Functions:

- Magnesium is an essential nutrient required for many biologic functions in the Body including more than 300 enzyme reactions. It also functions in the activation of amino acids, the syntheses of DNA, and is involved in neurotransmission and immune function
- Magnesium is necessary to prevent the calcification of soft tissue
- Accompanied by vitamin B-6 (pyridoxine), magnesium can help reduce and dissolve calcium phosphate kidney stones.

Supplementing the diet with magnesium may also prevent depression, dizziness, muscle weakness, twitching, and premenstrual syndrome (PMS).

-It promotes the absorption and assimilation of other minerals. ⁽⁶³⁾

Sources:

Cereals, pulses, nuts, green leafy vegetables.

Requirement: 200-300mg/day. ⁽²⁴⁾

Deficiency:

Symptoms of a magnesium deficiency include: confusion, insomnia, irritability, nervousness, poor digestion, rapid heartbeat, seizures, diabetes, cardiac arrhythmia, cardiovascular disease, Hypertension, asthma, chronic fatigue, chronic pain syndrome, depression and irritable bowel syndrome. ⁽⁶⁴⁾

C- Phosphorus:

Phosphorus is never found free in nature, but is widely distributed in combination with minerals. Phosphate rock, which contains the mineral apatite, an impure tricalcium phosphate, is an important source of the element. Phosphorus is most commonly found in nature in its pentavalent form in combination with oxygen as phosphate (PO_4^{3-}).

Function:

Structurally, phosphorus occurs as hydroxyapatite in calcified tissues and as phospholipids, which are a major component of most biological membranes, and as nucleotides and nucleic acid.

Other functional roles of phosphorus include:

- Buffering of acid or alkali excesses, hence helping to maintain normal pH
- Temporary storage and transfer of the energy derived from metabolic fuels by phosphorylation, and hence activation of many catalytic proteins. ⁽⁶⁵⁾

Sources: - Cereals, pulses, nuts, oil seed, protein rich food. (Biochemistry of nursing).

Requirement:-600-1000mg / day. ⁽²⁴⁾

Deficiency:

Hypophosphatemia symptoms include anorexia, anemia, muscle weakness, bone pain, rickets and osteomalacia, general debility, increased susceptibility to infection, paresthesia, ataxia, confusion, and even death. ⁽⁶⁵⁾

D-Sodium:

As the major extracellular cation, sodium is largely responsible for regulating fluid balance. It also regulates cell permeability and the movement of fluid, electrolytes, glucose, insulin, and amino acids. Sodium is pivotal in acid–base balance, nerve transmission, and muscular irritability. Although sodium plays vital roles, under normal conditions, the amount actually needed is very small, may be even less than 200 mg/day. Almost 98% of all sodium consumed is absorbed, yet humans are able to maintain homeostasis over a wide range of intakes, largely through urinary excretion.

Function:

Fluid and electrolyte balance, acid–base balance, maintains muscle irritability, regulates cell membrane permeability and nerve impulse transmission.

Deficiency:

Rare, except with chronic diarrhea or vomiting and certain renal disorders. Deficiency symptom include nausea, dizziness, muscle cramps, apathy, hypertension and edema. ⁽⁶⁶⁾

E-potassium:

Most of the body's potassium is located in the cells as the major cation of the intracellular fluid .The remainder is in the extracellular fluid, where it works to maintain fluid balance, maintain acid–base balance, transmit nerve impulses, catalyze metabolic reactions, aid in carbohydrate metabolism and protein synthesis, and control skeletal muscle contractility. Potassium is naturally present in most foods, such as fruits, vegetables, whole grains, meats, milk, and yogurt. Processed foods, such as cheeses, processed meats, breads, soups, fast foods, pastries, and sugary items, have a higher sodium-to-potassium ratio.

Function:

Fluid and electrolyte balance, acid base balance, nerve impulse transmission, catalyst for many metabolic reactions, involved in skeletal and cardiac muscle activity.

Deficiency

Muscular weakness, paralysis, anorexia, confusion (occurs with dehydration) .
⁽⁶⁶⁾

2.2.2.2.2. Trace minerals:**A-Iron:**

Iron is needed for hemoglobin synthesis, mental function and to provide immunity against diseases. ⁽⁶⁷⁾

Daily requirements for iron:

From 1 – 15 years =10 mg /day.

Dietary sources of iron:

a. Heme iron: found in red meat, beef ,lamb, liver ,kidney and oily fish.

b. Non heme iron (ferric iron salt): found in pulses, beans, cereals

Vegetables and fruit. Iron in these complexes has to be reduced to ferrous form before it can be absorbed and this requires the presence of vitamin C. ⁽⁶⁸⁾

Deficiency

Deficiency of iron leads to anemia. Iron deficiency is common particularly in women of reproductive age and children. In children, it increases susceptibility to infection and impairs learning ability. ⁽⁶⁷⁾

B- Zinc:

Zinc is an essential component of a large number (>300) of enzymes Participating in the synthesis and degradation of carbohydrates, lipids, proteins, and nucleic acids as well as in the metabolism of other micronutrients. Zinc stabilizes the molecular structure of cellular components and membranes and in this way contributes to the maintenance of cell and organ integrity. Furthermore, zinc has an essential role in polynucleotide transcription and thus in the process of genetic expression.

Zinc plays a central role in the immune system, affecting a number of aspects of cellular and humoral immunity.

Sources:

Lean red meat, whole-grain cereals, pulses, and legumes provide the highest concentrations of zinc.

Deficiency:

WHO and Food and Agriculture Organization reported that zinc deficiency in humans leads to growth retardation, delayed sexual and bone maturation, skin lesions, diarrhoea, alopecia, impaired appetite, increased

susceptibility to infections mediated via defects in the immune system, and the appearance of behavioral changes. ⁽⁶⁹⁾

C- Copper:

Copper is an essential trace element micronutrient that is required for plant, animal, and human health. ⁽⁷⁰⁾ Copper is incorporated into a variety of proteins and metalloenzymes which perform essential metabolic functions the micronutrient is necessary for the proper growth, development, and maintenance of bone, connective tissue, brain, heart, and many other body organs. Copper is involved in the formation of red blood cells, the absorption and utilization of iron, the metabolism of cholesterol and glucose, and the synthesis and release of life-sustaining proteins and enzymes. These enzymes in turn produce cellular energy and regulate nerve transmission, blood clotting, and oxygen transport.

Copper stimulates the immune system to fight infections, to repair injured tissues, and to promote healing. Copper also helps to neutralize "free-radicals", which can cause severe damage to cells. ⁽⁷⁰⁾

Function:

Helps body make hemoglobin, serves as a part of many body enzymes, helps body develop connective tissue, myelin, and melanin and helps body produce energy in the cells. ⁽⁷¹⁾

Source:

Eating a balanced diet with a range of foods from different food groups is the best way to avoid copper deficiency. Copper found in beef liver, whole grains, legumes nuts, including peanuts and pecans. Other food sources that contain copper include cereals, potatoes, peas, red meat, mushrooms and braised. ⁽⁷²⁾

Deficiency:

Rarely comes from a lack of copper, but instead from genetic problems. ⁽⁷¹⁾

D-Manganese:

Body needs manganese to produce connective tissues and bones. Manganese also supports the production of sex hormones, the regulation of blood sugar and the absorption of calcium. The proper breakdown of dietary fats and carbohydrates also requires adequate amounts of manganese. The chances of not getting enough are very low since manganese is so widely distributed in the food supply. ⁽⁷³⁾

Sources:

Pineapple, whole wheat ,tea, Seafood, Nuts, Seeds, Beans, Spinach ,fish, Whole Grains ,wheat bread Lentils Kale, boiled. ⁽⁷¹⁾

D- Iodine:

Iodine is a trace mineral and a nutrient found naturally in the body.

Function:

Iodine is needed for the cells to convert food into energy. Humans need iodine for normal thyroid function, and for the production of thyroid hormones Serves as part of thyroid hormones such as thyroxin, which regulate the rate at which body uses energy. ⁽⁷⁴⁾

Deficiency:

Yinebeb M et al in Ethiopia(2012) studied the prevalence and severity of iodine deficiency disorders among children 6-12 years .He found that it's deficiency in the diet can result in a variety of health problems such as goiter, mental and physical retardation (cretinism), congenital abnormalities, and infant and young child death. Iodine deficiency impedes children's learning ability. ⁽⁷⁵⁾ Although the most visible manifestations of iodine deficiency are goiter and cretinism, many people are affected with less severe deficiencies that are not

obvious clinically and not easy to measure but affect wellbeing and productivity. ⁽⁷⁶⁾

F-Molybdenum:

As a trace mineral, molybdenum has numerous roles in biological processes that happen regularly, although its exact functions are not well understood.

Molybdenum is necessary for the production of enzymes that support chemical reactions in the body. ⁽⁷⁷⁾

The enzymes made with molybdenum affects the nervous system, and in extreme cases may result in death. ⁽⁷¹⁾

G- Chromium:

Chromium is an essential mineral that is not made by the body and must be obtained from the diet. Chromium is important in the metabolism of fats and carbohydrates, stimulates fatty acid and cholesterol synthesis, which are important for brain function and other body processes is also important in the breakdown (metabolism) of insulin

Chromium found in beef, liver, eggs, chicken, wheat germ, apples, banana, green peppers and spinach. Chromium deficiency may be seen as impaired glucose tolerance. ⁽⁷⁸⁾

H-Selenium:

Selenium is a trace element that is naturally present in many foods, added to others, and available as a dietary supplement. Selenium, which is nutritionally essential for humans, is a constituent of more than two dozen selenoproteins that play critical roles in reproduction, thyroid hormone metabolism, DNA synthesis, and protection from oxidative damage and infection.

Found in Sea foods and organ meats are the richest food sources of selenium. Other sources include beef, tuna, egg, cereals and other grains, and dairy products.

Deficiency in humans aren't clear, but it may affect the heart muscle. ⁽⁷⁹⁾

I-Flouride:

Fluoride is a mineral that occurs naturally in all water sources, is effective in preventing and reversing the early signs of dental caries (tooth decay).

Fluoride is obtained in two forms: topical and systemic. Topical fluorides strengthen teeth already present in the mouth making them more decay-resistant. Topical fluorides include toothpastes, mouth rinses and professionally applied fluoride therapies, is found in Community water fluoridation is an extremely effective and inexpensive. Flouride deficiency cause Tooth enamel may be weak. ⁽⁸⁰⁾

2.2.3. Water:

Water is a combination of hydrogen and oxygen. It is the basis for the fluids of the body. The body is made up of 50 to 75 percent water. Water forms the basis of blood, digestive juices, urine and perspiration, and is contained in lean muscle, fat and bones. Water makes up more than two-thirds of the weight of the human body. Without water, humans would die in a few days. All the cells and organs need water to function. Water serves as a lubricant. It makes up saliva and the fluids surrounding the joints. Water regulates the body temperature through perspiration. It also helps prevent and relieve constipation by moving food through the intestines. ⁽⁸¹⁾

2.2.3.1. Importance of water

Water is needed for most body functions, including:

- Maintain the health and integrity of every cell in the body
- Keep the blood stream liquid enough to flow through blood vessels
- Help eliminate the byproducts of the body's metabolism, excess electrolytes and urea
- Regulate body temperature through sweating
- Moisten mucous membranes such as those of the lungs and mouth

- Lubricate and cushion joints
- Reduce the risk of cystitis by keeping the bladder clear of bacteria
- Aid digestion and prevent constipation
- Moisturise the skin to maintain its texture and appearance
- Carry nutrients and oxygen to cells
- Serve as a shock absorber inside the eyes, spinal cord and in the amniotic sac surrounding the fetus in pregnancy. ⁽⁸²⁾

2.2.3.2. Recommended daily fluid intake

- 4-8years: 1.2 L/day (about 5 cups)
- 9-13girls: 1.4L/day (7cups)
- 9-13boys: 1.6L/day (10 cups)

Indications for higher fluid intake

People need to increase their fluid intake when they are:

- On a high-protein diet
- On a high-fibre diet, as fluids help prevent constipation.
- Vomiting or have diarrhea.
- Physically active.
- Exposed to warm or hot conditions.

2.2.3.3. Risks of inadequate fluid intake:

Not drinking enough water can increase the risk of kidney stones and, urinary tract infections. It can also lower physical and mental performance, and salivary gland function, and lead to dehydration. ⁽⁸¹⁾

2.2.3.4. Sources of fluid:

Fluids include fresh water and all other liquids like milk, coffee, tea, soup, juice and even soft drinks.

Fresh water is the best drink because it does not contain kilojoules and is best for hydrating the body. ⁽⁸²⁾

Fluid balance means that the liquid in the body is regulated in such a way to maintain homeostasis .The body's intake and output of fluid in a 24-hour period is approximately the same. ⁽⁸³⁾

2.3. Nutritional problems:

2.3.1. Food allergies:

2.3.1.1. Definition:

Food allergy is defined as an adverse health effect arising from a specific immune response that occurs reproducibly following exposure to a given food. The immune reaction may be immunoglobulin (Ig)E mediated, non-IgE mediated, or mixed .

Also food allergy is defined by the Guidelines for Allergy Prevention and Response as a group of disorders distinguished by the way the body's immune system responds to specific food proteins. Children with moderate to severe eczema have about a 35 percent chance of having food protein specific IgE. Manifestations of food allergies range from mild skin reactions to life-threatening reactions. Thirty-eight percent of children with food allergies have a history of severe reaction and 30.4% of children with a food allergy are allergic to multiple foods. ⁽⁸⁴⁾

2.3.1.2. Symptoms of food allergies:

Some of the symptoms may appear quickly after the child has eaten the offending food, but other foods may cause a delayed reaction. The symptoms of food allergies include urticaria, pruritus, stomach pains and respiratory symptoms. If children with life-threatening food allergies the anaphylaxis occur. ⁽⁷⁾

2.3.1.3. Types of food allergies:

The top eight most common food allergens are: milk, eggs, and peanuts, tree nuts (such as pecans and walnuts), shellfish, fish, wheat, meat, and soy; although an individual can have an allergy to any food. The most prevalent food allergens for children are milk, eggs, and peanuts. Children will frequently

outgrow an allergy to eggs, milk, and soy. However allergies to peanuts, tree nuts, fish, and shellfish usually continue into adulthood. Not eating the foods the child is sensitive to is the only proven therapy at this time. ⁽⁸⁴⁾

Children with food allergies and their families:

A child with food allergies is challenging. Management of life threatening allergies in schools and school age child care was studied by Polk TA in 2013. He revealed that parents must ensure strict food avoidance, understand food labeling and be on a constant alert to implement an emergency medical plan at any moment. These are just some of the challenges parents of children with food allergies deal with every day. With time, support and education, parents become skilled and are well prepared to keep their children safe. Perhaps the greatest challenge parents' face is finding the balance between what is safe and what is normal when meeting the needs of their children. ⁽⁸⁵⁾

Food-allergic reactions are treated by prompt use of intramuscular epinephrine. Patients may be referred to an allergy/immunology specialist when the diagnosis is uncertain or if avoidance measures are not successful. Investigational therapies may ultimately be preventative or curative. ⁽⁸⁶⁾

2.3.2. Cow's milk allergy:

2.3.2.1. Definition:

A milk allergy is a food allergy, an adverse immune reaction to one or more of the constituents of milk from any animal (most commonly alpha S1-casein, a protein in cow's milk). ⁽⁸⁷⁾

2.3.2. 2. Symptoms of milk allergy:

Diarrhea, vomiting, colic, irritability, respiratory symptom or eczema. Children with lactose intolerance cannot digest lactose ⁽⁷⁾. It is distinct from lactose intolerance, which is nonallergic food sensitivity, and comes from a lack of production of the enzyme lactase, required to digest the predominant sugar in milk. ⁽⁸⁸⁾

The most common symptoms for both types are hives and swelling, vomiting, and wheezing, with symptoms first arising in skin, then the GI tract, and less commonly, the respiratory tract. Milk allergy can cause anaphylaxis.

2.3.2. 3. Diagnosis:

Is carried out by first doing a diagnostic elimination diet, skin prick tests, measuring IgE in blood, and conducting in-office food challenges. A double-blind, placebo-controlled food challenge is still the gold standard for the diagnosis for all food allergies, including milk allergies.

2.3.2. 4. Management:

The main treatment for milk allergy is avoiding dairy products because these proteins can be found in breast milk, nursing mothers should also have abstain from dairy products prior to weaning. Milk substitutes include soy-based formulas; hypoallergenic formulas based on partially or extensively hydrolyzed protein, and free amino acid-based formulas. Nondairy-derived, amino acid-based formulas, known as amino acid formulas or elemental formulas, are considered the gold standard in the treatment of cows'-milk allergy when the mother is unable to breastfeed. ⁽⁸⁸⁾

2.3.3. Celiac disease:

2.3.3.1. Definition:

Celiac disease, also known as celiac sprue, gluten induced enteropathy, and gluten-sensitive enteropathy, is a disorder in which the proximal small bowel mucosa is damaged as a result of dietary exposure to gluten and is the second only to cystic fibrosis as a cause of malabsorption disease in children. ⁽⁸⁹⁾

Celiac disease (CD) is an immune-mediated inflammatory disease of the upper small intestine in genetically susceptible individuals triggered by the ingestion of the storage proteins (gluten) from wheat, rye, barley, and possibly oats. Strategies like raising awareness and screening in at-risk groups have

been successful in identifying previously undiagnosed patients, but the risks and benefits of screening the general population for CD remain controversial. ^(90,63) The disease is seen in association with type 1 diabetes, thyroiditis, Turner syndrome and trisomy 21. ⁽⁹¹⁾

2.3.3.2. Signs and symptoms:

Early manifestations of celiac disease are non specific and include anorexia, irritability, weight loss, and listlessness. Classic presentation in the pediatric population begins around age 6 months to 2 years and is characterized by gastrointestinal manifestations as gluten products are introduced into the diet. As the disease begins to progress, symptoms include diarrhea and abdominal distention. The diarrhea becomes chronic and is bulky, greasy, foul-smelling, and putty colored .

2.3.3.3. Diagnosis:

The combination of clinical symptoms and serologic markers may suggest the diagnosis of celiac disease though a small bowel biopsy is essential to confirm the diagnosis and should be performed before gluten is eliminated from the diet. Laboratory tests can detect antigliadin and anti endomysial antibodies in addition to evidence of mal absorption and nutritional deficiencies. ⁽⁹⁰⁾

2.3.3.4. Management:

The treatment of celiac disease is a gluten-free diet (corn, rice, and millet are grains that are allowed in the diet). Gluten-free diet (GFD) is described by Langdon RT as the cornerstone treatment for celiac disease (CD). GFD, despite being able to reverse mucosal damage and arrest the mal absorption process, it doesn't always guarantee adequate nutritional intake. ⁽⁹²⁾

Dietary consultation is helpful as well as referral to a celiac support group. Nutritional deficiencies can occur in patients with CD due to malabsorption of nutrients from loss of small intestine absorptive capacity, pancreatic insufficiency, lack of fortification of gluten-free food products, and restrictive dietary practices. ^(90, 93)

2.3.4. Child hood obesity:

The school environment has the potential to affect national obesity prevention efforts both because of the population reach and the amount of time that students spend at school each day. Children obtain about one third of their total daily energy requirement from school lunch and should expend about 50 percent of their daily energy expenditure while at school, depending on the length of their school day. Given that schools offer numerous and diverse opportunities for young people to learn about energy balance and to make decisions about food and physical activity behaviors, it is critically important that the school environment be structured to promote healthful eating and physical activity behaviors. Further more, consistency of the messages and opportunities across the school environment is vital from the cafeteria, to the playground, to the class room, to the gymnasium. Increasingly, schools and school districts across the country are implementing innovative programs focused on improving student nutrition and increasing their physical activity levels. Parents, students, teachers, school administrators, and others play important roles in initiating these changes, and it is important to evaluate these efforts to determine whether they should be expanded, refined, or replaced and whether they should be further disseminated.⁽⁹⁴⁾ Over the past three decades the prevalence of overweight and obesity has increased substantially. Globally, an estimated 170 million children (aged < 18 years) are estimated to be overweight , and in some countries the number of overweight children has trebled since 1980 . The high prevalence of overweight and obesity has serious health consequences.⁽⁹⁵⁾ The cause for the increased rates of childhood obesity is a complex mix of environmental, genetic, medical, and bio-psychosocial factors. It is a medical condition that progresses over time to become a medical disease, one that is frustrating for both children and their families, as well as for their health care providers. It has become a condition that is difficult to prevent and disappointing to treat and yet relentless in its ability to reduce an

individual's health and quality of life, while at the same time, increasing the cost of health-care services to society. Unfortunately, to make the situation still more grave, it's a situation from which few obese children will be able to outgrow.⁽⁹⁶⁾

2.3.4.1. Definitions:

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. It is a medical condition that progresses over time to become a medical disease, one that is frustrating for both children and their families, as well as for their health care providers. Unfortunately, to make the situation still more grave, it's a situation from which few obese children will be able to outgrow.^(93, 97)

Overweight is defined according to CDC as a BMI at or above the 85th percentile and below the 95th percentile for children and teens of the same age and sex. Obesity is defined as a BMI at or above the 95th percentile for children and teens of the same age and sex.

2.3.4.2. Body mass index:

BMI is calculated by dividing a person's weight in kilograms by the square of height in meters. For children and teens, BMI is age- and sex-specific and is often referred to as BMI-for-age. A child's weight status is determined using an age- and sex-specific percentile for BMI rather than the BMI categories used for adults. This is because children's body composition varies as they age and varies between boys and girls. Therefore, BMI levels among children and teens need to be expressed relative to other children of the same age and sex.⁽⁹⁸⁾ Body mass index (BMI) is a measure used to determine childhood overweight and obesity in children and teens; it is not a diagnostic tool

Overweight and obesity are defined as follows for children aged between 5–19 years according to WHO:

- a. Over weight is BMI-for-age greater than 1 standard deviation above the WHO Growth reference median
- b. Obesity is greater than 2 standard deviations above the WHO Growth Reference median. ⁽⁹⁶⁾

Classifications of over weight and obesity in children aged 2-17 years are typically based upon the results of an individual’s Body Mass Index (BMI), which is calculated by dividing weight in kilograms by height in metres squared^(2).

$$\text{BMI} = [\text{weight (kg)}] \div [\text{height (m)}^2]$$

Where weight is measured in kilograms and height is measured in metres. Because children and youth are still growing, the criteria for classifying BMI differ from those used for adults. Two sets of criteria have commonly been used to distinguish overweight and obesity in children: The International Obesity Task Force (IOTF) criteria and the Centre for Disease Control (CDC) sex-specific BMI-for-age growth charts. While the two sets of criteria yield similar results, the IOTF reference values generally give lower estimates of obesity prevalence for young children and higher estimates of obesity prevalence for older children compared to the CDC growth charts. ⁽⁹⁹⁾

Body mass index interpretation:

BMI/percentile	Interpretation
<5th	Under weight
5th -85th	Normal
85th -95th	Over weight
>95th	Obese

⁽⁹¹⁾

BMI screening guidelines for schools was adopted by Deval L et al in 2014. ⁽¹⁰⁰⁾

2.3.4.3. Causes of obesity:

The reason increase in prevalence are unclear but are due to change in the environmental and behavior relating to diet and activity . Obesity run in families and is rarely to genetic influences. ⁽¹⁰¹⁾ One important risk factor maternal obesity during pregnancy. Also some small gestational age (SGA) new born have higher risks for abnormal postnatal weight gain and diabetes. ⁽⁹¹⁾ It is widely accepted that increase in obesity results from an imbalance between energy intake and expenditure, with an increase in positive energy balance being closely associated with the lifestyle adopted and the dietary intake preferences. However, there is increasing evidence indicating that an individual's genetic background is important in determining obesity risk.

The ecological model, as described by Davison et al., suggests that child risk factors for obesity include dietary intake, physical activity, and sedentary behavior. The impact of such risk factors is moderated by factors such as age, gender. Family characteristics parenting style, parents' lifestyles also play a role. Environmental factors such as school policies, demographics, and parents' work-related demands further influence eating and activity behaviors. ⁽¹⁰²⁾

2.3.4.3.1. Genetics:

The genetic factor accounts for less than 5% of cases of childhood obesity. Therefore, while genetics can play a role in the development of obesity, it is not the cause of the dramatic increase in childhood obesity. ⁽¹⁰²⁾

2.3.4.3.2. Fast food consumption:

Increased fast food consumption has been linked with obesity in the recent years. Many families, especially those with two parents working outside the home, opt for these places as they are often favored by their children and are both convenient and inexpensive. ⁽¹⁰³⁾ Foods served at fast food restaurants tend to contain a high number of calories with low nutritional values.

2.3.4.3.3. Snack foods:

Another factor that has been studied as a possible contributing factor of childhood obesity is the consumption of snack foods. Snack foods include foods such as chips, baked goods, and candy.

2. 3.4. 3.4. Activity level:

One of the factors that is most significantly linked to obesity is a sedentary lifestyle. Each additional hour of television per day increased the prevalence of obesity by 2%.⁽¹⁰⁴⁾ Kapil U and Bhadoria AS observed that television viewing among young children and adolescents has increased dramatically in recent years.⁽¹⁰⁵⁾ The increased amount of time spent in sedentary behaviors has decreased the amount of time spent in physical activity. Research which indicates the number of hours children spend watching TV correlates with their consumption of the most advertised goods, including sweetened cereals, sweets, sweetened beverages, and salty snacks.

2.3.4.3.5. Environmental factors

While extensive television viewing and the use of other electronic media has contributed to the sedentary lifestyles, other environmental factors have reduced the opportunities for physical activity. Opportunities to be physically active and safe environments to be active in have decreased in the recent years. The majority of children in the past walked or rode their bike to school. Erol M et al studied the factors affecting the risk of childhood obesity in Istanbul in 2002 he found that 53% of parents drove their children to school. Of these parents, 66% said they drove their children to school since their homes were too far away from the school. Other reasons parents gave for driving their children to school included no safe walking route, fear of child predators, and out of convenience for children who live in unsafe areas or who do not have access to safe, well-lit walking routes have fewer opportunities to be physically active.

(104)

2.3.4.3.6. Socio-cultural factors

Our society tends to use food as a reward, as a means to control others, and as part of socializing these uses of food can encourage the development of unhealthy relationships with food, thereby increasing the risk of developing obesity.

2.3.4.3.7. Psychological factors:

a. Depression and anxiety:

A recent review concluded that the majority of studies find a prospective relationship between eating disturbances and depression

b. Eating disorder symptoms:

Traits associated with eating disorders appear to be common in adolescent obese populations, particularly for girls. A number of studies have shown higher prevalence of eating-related pathology (i.e. Anorexia, Bulimia Nervosa, and impulse regulation) in obese children/youth. ⁽¹⁰⁶⁾

c. Emotional problems:

In one of the few studies to investigate the psychological impact of being overweight/obese in children, a review of 10 published studies over a 10-year period (1995-2005) with sample sizes greater than 50 revealed that all participants reported some level of psychosocial impact as a result of their weight status. Being younger, female, and with an increased perceived lack of control over eating seemed to heighten the psychosocial consequences. ⁽¹⁰⁷⁾

2.3.4.4. Complications of childhood obesity:

Childhood obesity can profoundly affect children's physical health, social, and emotional well-being, and self esteem. It is also associated with poor academic performance and a lower quality of life experienced by the child. Complications include:

- Psychosocial complication (Peer discrimination ,isolation, depression , eating disorder)
- Growth complication (Advance bone age, increase height, early menarche)
- Central nerves system complication (Pseudo tumercerebri)
- Respiratory complication (Obstructive sleep apnea
- Cardio vascular complication (Hypertension, ischemic heart disease, arrhythmias, sudden death.
- Orthopedic complication (Slipped capital femoral epiphysis, blount disease
- Metabolic complication (Insulin resistance, type 2diabetes mellitus, gout, hepatic statuses, poly cystic ovary disease).⁽⁹¹⁾

2.3.4.5. Prevention and management of obesity:

SM Karp and Gesell SB in their study about obesity prevention and treatment they reported that clinical trials focused on child hood overweight and obesity divided into two types prevention and treatment. In most prevention trials, focus on preventing normal weight children from becoming overweight. In contrast, treatment trials focus on weight loss and maintenance of weight loss over time following the intervention. Key outcomes for both types of trials are assessed by using one or more weight-related measure such as BMI, BMI z-score, prevalence of obesity or overweight, percent body fat, and skin fold thickness. In addition, many explore secondary or intermediate outcomes including behavior changes, such as increasing physical activity or fruit and vegetable intake or decreasing intake of sugar-sweetened beverages, many of which are also measured in different manners, and often inadequately (activity and nutrition are simple concepts but difficult to measure accurately).

A systematic review of pediatric obesity prevention trials also reports that there is moderate to strong support for school based interventions that focus on augmenting school curriculum to increase physical activity, education for children regarding healthy nutrition and activity, and improve the quality of food offered in school cafeterias to prevent the development of overweight and obesity in children and adolescents. ^(108, 109)

Theoretically, any therapeutic interventions in the child with obesity must achieve control of weight gain and reduction in body mass index (BMI) safely and effectively and should prevent the long-term complications of obesity in childhood and adulthood. ⁽¹¹⁰⁾

2.3.5. Undernutrition

Malnutrition in all its forms is closely linked, either directly or indirectly, to major causes of death and disability worldwide. The causes of malnutrition are directly related to inadequate dietary intake as well as disease, but indirectly to many factors, among others household food security, maternal and child care, health services and the environment. While most nutrition interventions are delivered through the health sector, non-health interventions can also be critical. WHO recommended that actions should target the different causes to reach sustainable change, which requires a multispectral approach. ⁽¹¹¹⁾

2.3.5.1. Definition

Under nutrition encompasses stunting, wasting, and deficiencies of essential vitamins and minerals. Under nutrition contributes to half of all deaths and 28% of stunting in children worldwide. In the developing countries, 52% and 34-62% of the school-age children are stunted and underweight, respectively.

2.3.5.2 Causes

Inadequate food intake, infections, psychosocial deprivation, the environment (lack of sanitation and hygiene), social inequality and perhaps genetics contribute to childhood malnutrition.

It was shown by Degarege D A and Animut A who did a study in under nutrition and associated risk factors among school age children that biology, economy, culture, environment and disease contribute to under nutrition. Children are most vulnerable to under nutrition due to their low dietary intake, less access to food, inequitable distribution of food within households, improper food storage and preparation, dietary taboos and infections with pathogens. Child under nutrition can be mitigated through nutritional information campaigns, broader access to maternal and child health care practices and availing affordable, diverse, and nutrient-rich food. ⁽¹¹²⁾

2.3.5.3. Complications:

Under nutrition in school age—a period of important physical and mental development—could lead to growth impairment, slower cognitive developments, and other health impairments such as high blood pressure. ⁽¹¹³⁾

2.3.6. Anemia:

2.3.6.1. Definition:

Defined as Hb below the normal range. The normal range varies with age.
1-12 years: Hb < 11 g/dl.

It is the commonest hematological disease and commonest type of anemia in infancy and childhood. It results from lack of sufficient iron needed for hemoglobin synthesis.

2.3.6.2. Causes:

Anemia results from one or more of the following mechanisms:

- Inadequate production of red blood cells by the bone marrow
- Increased destruction of red blood cells (RBCs)
- Increased blood loss from the body UN common causes in children. ⁽¹¹⁴⁾

2.3.6.3. Management:

Most children management involves dietary advice and supplementation with oral iron. ⁽¹¹⁴⁾ Iron given in oral dose: 6mg /kg/day. Parenteral iron is used

in rare cases of intolerance to or mal absorption of iron .Packed RBCs transfusion is given in severe cases.

The stimulanious addition of vitamin C enhance the absorption of iron. ⁽⁶⁷⁾

3. Material & Methods:

3.1. Study design:

Descriptive cross-sectional community based study.

3.2. Study area and setting :

The study was carried out in Shendi town which is located in the River Nile State. It is bounded by Khartoum state to the south, Elddamer locality to the north, River Nile to the west and Kasala state to the east. The total area of the city is about 72Km². It is situated on the main River Nile. The main plants are cash crops. Goats and camels are owned by both by the few nomadic 'Rashaida' and the settled farmer's .Culturally the population of Shendi is a mixture of various cultures in Sudan. Many tribes are present but the predominant tribe is Galieen. The total population of Shendi 'Locality' is estimated about 55,516 (2007). Growth Rate: 2.3%, Male 48.7%, Female % 51.3%. The average family size is 6 members. About 60% of the population is rated as 'poor'. The literacy rate is high in the towns and village. Basic governmental education consists of (30) primary governmental schools in addition to the private schools.

The study conducted in governmental (public) primary schools which include Ahemed Molah boys , Alesteglal boys, Alshmalia boys, Hee Alshohada boys, Alsalam boys, Altadreeb girls, Algonobea girls, Ahmed Biumeer girls, Somia Bent Alkhaeat girls and Alsalam girls

3.3. Study duration:

October 2015 to April 2018.

3.4. Study population:

Mothers living in Shendi town who have children in public basic schools and their children. The total number of students is 11440 distributed in 30 public schools.

3.5. Sample size and sample selection:

The sample size was calculated using the equation

$$\text{Sample size (n)} = \frac{Z^2 / pq}{d^2}$$

- (n) = the sample size
- Z = the standard normal deviation, usually set at 1.96, which corresponds to the level of the 95% confidence level
- P = the proportion of target population
- d = absolute precision required on either side of the proportion
- q = 1.0-P

N= 500

3.6. Sample selection:

- Multi stage stratified sample representing different residential areas.
- Stage 1: selection of 10 primary schools from 30 schools by lottery. Total number of students 3672(2013) (54.8%) boys and 1659 (45.2%) girls).
- Stage 2: selection of the number of students from schools.
- Stage 3: student selection from the class list representing the age groups and the 8 grades in the school.

3.7. Age determination and age groups:

- The age was determined from school records which depends on birth certificate
- Age divided into 9 age groups starting from 6-6.99 to age group 14-14.99 years.

3.8. Inclusion criteria:

- Mothers of children in public basic schools aged (6-14years)
- Mothers and their children who were willing to participate.
- Children who are healthy

3.9. Exclusion criteria:

- Children with chronic diseases.
- Children with physical deformity.
- Refusal of parents.
- Private basic schools.

3.10. Research tools:

3.10.1. Structured questionnaire sheet:

A structured questionnaire sheet included:

Part I : Demographic characteristics of the study group :age ,education level , the presence of the mother, mother's occupation ,income , number of rooms , , electricity source, number of school-age children in the family and academic performance of child in school.

Part II: Nutrition of the school children: Number and component of meals, common types of food tackled by the child.

Part III: Mother's knowledge about Nutrition: Nutrition, essential food components, importance of nutrients, vitamins, water and obesity.

3.10.2. Scales for weight and height measurement

3.10.3. CDC growth charts (BMI) for comparison

3.11. Scoring system:

To evaluate the knowledge of mothers, the following scoring system was used. The knowledge was estimated as good, fair or poor. The score of three to four points (75-100%) is rated as good. The score of two points the knowledge is fair (50%) and the score of one point or zero (0-25%) the knowledge is poor.

3.12. Data collection technique:

▪ The objectives of the study were explained to the head masters and teachers.

- The questionnaire was completed by the parents after explanation of the objectives and their consent.
- The measuring equipments were calibrated periodically.
- All measurements were done by the researcher

3.13. Nutritional assessment technique:

3.13.1. Height:

Height was measured using health scale stadiometer .It measures up to 200 cm. Standing height was measured to the nearest 0.1cm.Child standing without shoes, erect and looking straight so that the inferior orbital margin and the tragus of the ear fall in a horizontal plane parallel to the ground. Then the measurements recorded.

3.13. 2. Weight:

Weight was measured using bath room scale (measuring up to180kg) and house hold scale (measuring up to 130kg). The children were instructed to stand on the scale with light clothing, without foot wear and with feet apart and looking straight. The weighing machine was placed on a firm and flat ground. Weight was recorded to the nearest (0.5kg) .The scale was calibrated to the zero before taking every measurements and then the measurement recorded

3.13. 3. Body mass index:

Body mass index was calculated according to the equation.

$$\text{Body mass index} = \left(\frac{\text{Wiegth (kg)}}{\text{Height (m)}} \right)^2$$

Then the body mass index compared to CDC growth charts.

3.14. Data entry and statistical analysis:

The data was entered in the computer and analyzed using SPSS (statistical package for social science) version (22).Then the results presented in from of

tables and figures. Chi-square test(X^2) was used for statistical significance (95% confidence level).

3.15. Ethical considerations:

The study was approved by ethical committee of research in the faculty of post graduate studies and scientific research. Before conducting the study, ethical approval was obtained from the head manager of schools and written permission was taken from mothers. The purpose of study was explained to them and assured them that the data collected from the questionnaire will remain confidential and not allowed for any person to identify it.

Result:

4.1. Characteristics of the study group:

Table (1) showed that (40%) of studied mothers age range between (26-35) years, (42%) between (36-45) years and (7.4%) above 45 years. Their educational level in (35.2%) was secondary level, (6.4%) illiterate and (3.6%) post graduate. Regarding presence of the mothers with the family near all (95.2%) were present. Also this table illustrated that (78.8%) of studied mothers were housewives and (15%) were employed. About the number of family members (44.6%) were 6-8 members and (43%) were 2-5members.

The family income is shown in Figure (1) near to three quarters (71.4%) had average income while (21%) had high income.

Table (1): Characteristics of the study group (age, educational level, presence of mother ,mother occupation and family members)

Age	Frequency	Percent
15-25 years	53	10.6%
26-35 years	200	40%
36-45 years	210	42%
Above 45 years	37	7.4%
Total	500	100%
Educational level		
Illiterate	32	6.4%
Khalwa	20	4%
Primary	150	30%
Secondary	176	35.2%
University	104	20.8%
Post graduate	18	3.6%
Total	500	100%
Presence of the mother		
Present	476	95.2%
Divorced	17	3.4%
Died	7	1.4%
Total	500	100%
Mother's occupation		
Housewife	394	78.8%
Skill labourer	22	4.4%
Employed	75	15%
Specialist	9	1.8%
Total	500	100%
Family members		
2-5	215	43%
6-8	223	44.6%
More than 8	62	12.4%
Total	500	100%

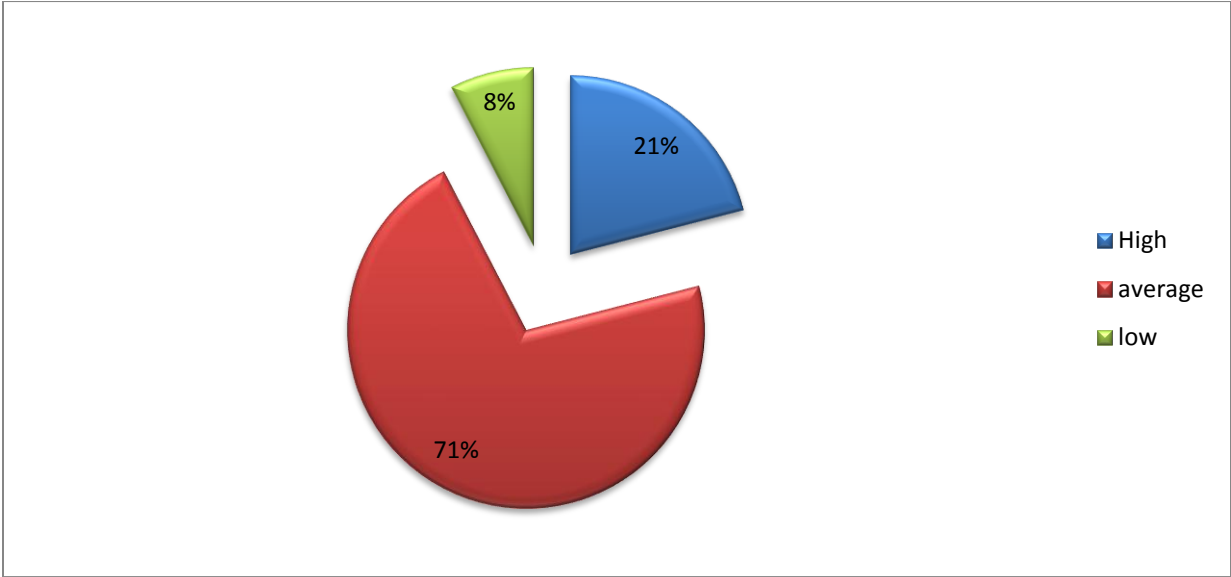


Figure (1): Family income

4.2. Characteristics of the study group according to home properties

Figure (2) showed that (61.8%) had (1-2) rooms and (3.4%) more than 5 rooms in home. Table (2) revealed that the relation between number of rooms and number of family members was significant (P-value 0.0003).

Table (3) clarified that the source of water was in (92.4%) piped in and (5.8%) piped out home. Also near to all (95.6%) had electricity supply and (67%) their toilet type is pit Latrin. Accessories found in home TV and refrigerator in (83.2%), screen (18.8%), deepfreeze (1.8%).

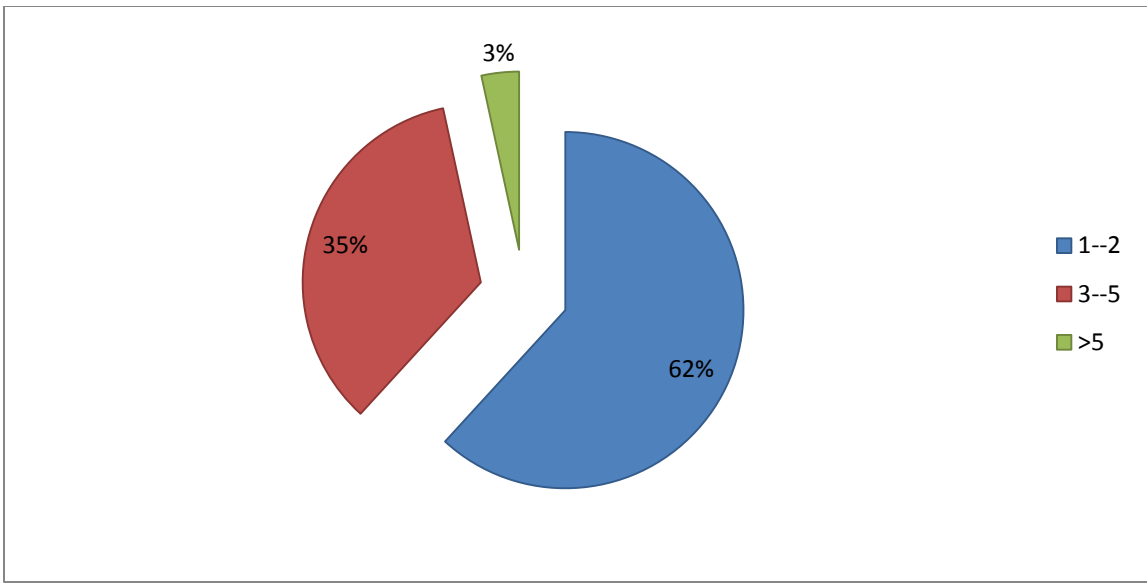


Figure (2): Number of rooms in home

Table (2): Relation between number of family members and number of rooms

Number of rooms	Number of family members							
	2-5		6-6		>8		Total	
	F	P	F	P	F	P	F	P
1-2	153	30.6%	118	23.6%	38	7.6%	309	61.8%
3-5	57	11.4%	96	19.2%	21	4.2%	174	34.8%
>5	5	1.0%	9	1.8%	3	0.6%	17	3.4%
Total	215	43%	223	44.6%	62	12.4%	500	100%

P-value = 0.003

Table (3): Home properties

Water source	Frequency	Percent
Piped in house	462	92.4%
Piped out home	29	5.8%
Borehole	8	1.6%
Others	1	2%
Total	500	100%
Electricity supply		
Present	478	95.6%
Not present	22	4.4%
Total	500	100%
Toilet type		
Pit lartin	335	67%
General hole	25	5%
Siphon	126	25.2%
not found	14	2.8%
Total	500	100%
Accessories		
Screen	74	18.8%
TV& refrigerator	416	83.2%
Deepfreeze	9	1.8%
Computer	0	0%
Motor	1	0.2%
Total	500	100%

4.3. Characteristic of study group according to their children.

Table (4) revealed that (69%) of studied mother's have 1-3 children, (47.2%) in the age group (9-11) years. . The academic performance in (60%) was excellent. The majority (54%) were males as shown in figure (3) .

Table (5) showed that there was significant association between the educational level of mothers and the academic performance of their children (P - Value 0.000)

The schools included in this study are showed in Table (6). These schools represent different social classes and the selected number was proportionate to the number of students in the school.

Table (4): Characteristic of study group according to their children (Number of school-age children , age and Academic performance)

Number of school-age children	Frequency	Percent
1-3	345	69%
4-6	133	26.6%
More than 6	22	4.4%
Total	500	100%
Child's age		
6-8years	158	31.6%
9-11years	236	47.2%
12-15years	106	21.2%
Total	500	100%
Academic performance of children in school		
Excellent	300	60%
Very good	184	36.8%
Weak	16	3.2%
Total	500	100%

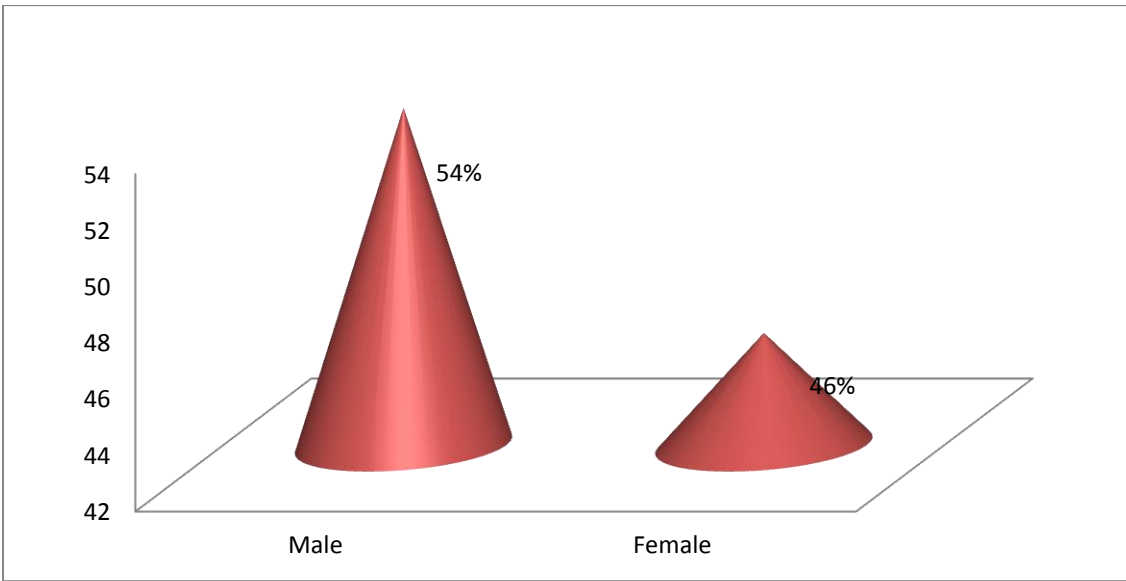


Figure (3): Child's sex

Table (5): Relation between mother’s educational level and academic performance of their children

Academic performance of children	Mother’s educational Level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Excellent	21	4.2%	14	2.8%	61	12.2%	114	22.8%	76	15.2%	14	2.8%
Average	6	1.2%	5	1.0%	82	16.4%	60	12.0%	27	5.4%	4	0.8%
Weak	5	1.0%	1	0.2%	7	1.4%	2	0.4%	1	0.2%	0	0.0%
Total	32	6.4%	20	4.0%	150	30.0%	176	35.2%	104	20.8%	18	3.6%

P. value = 0.000

Table (6): Schools included in the study and number of students

Schools	No of children	Percentage	Sample size
Ahemed Molah boys	382	10.4%	52
Alesteglal boys	310	8.4%	42
Alshmalia boys	476	13%	65
Hee Alshohada boys	330	8.9%	45
Alsalam boys	515	14%	70
Altadreeb girls	298	8.1%	41
Algonobea girls	155	4.2%	21
Ahmed Biumeer girls	373	10.1%	51
Somia Bent Alkhaeat girls	301	8.1%	41
Alsalam girls	532	8.1%	41
Total	3672	100%	500

4.3. 1.Characteristic of study group according to their child diet

Preparation of breakfast from home is shown in Figure (4) .Near half (49.2%) of mothers always prepare it.

Table (7) revealed that (48.9%) of prepared meal contains both macro and micro nutrients. While (52.7%) of studied mothers said that the type of food taken by children from canteen (buffet) was sandwiches and (29.1%) biscuits and chocolate. Regarding most common type of food during the day was vegetables in (49.2%) and meat in (25.4%).

Figure (5) showed that about two third (67%) of them take two meals in the day.

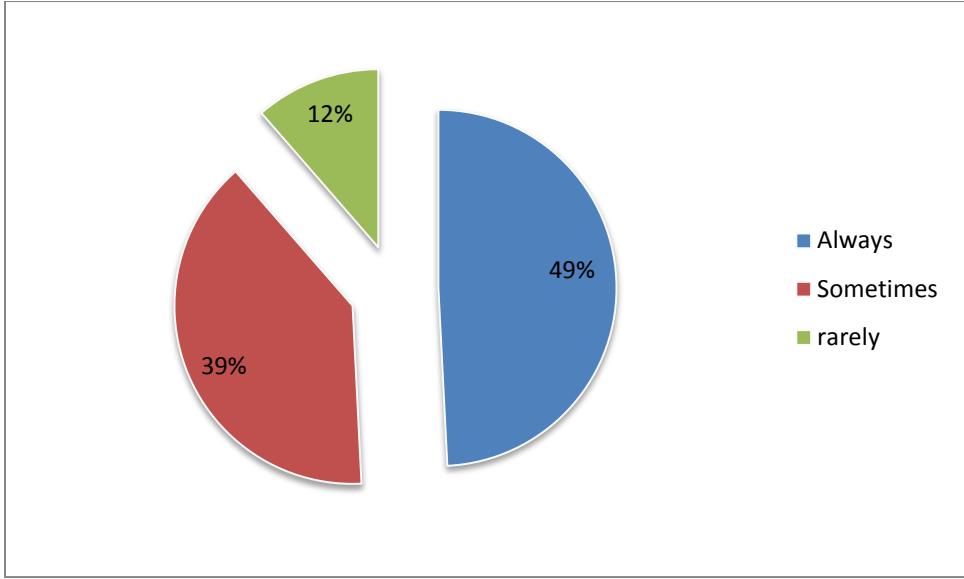


Figure (4): Preparation of breakfast at home

Table (7): Breakfast component and common type of food during the day

Breakfast component from home	Frequency	Percent
Specific element of nutrients	100	40.7%
Macro and micro nutrients	120	48.9%
Juices in addition to nutrients	15	6%
Proteins only	11	4.4 %
Total	246	100%
Breakfast component from canteen (buffet)		
Sandwiches	134	52.7%
Fresh juices	19	7.5 %
Drinks	5	2%
Biscuits and chocolate	74	29.1%
Chips and sweets	22	8.7%
Total	254	100%
Common type of food during a day		
Vegetables	246	49.2%
Fruit	23	4.6%
Meat	127	25.4%
Starches	60	12%
Milk and Cheese	44	8.8%
Total	500	100%

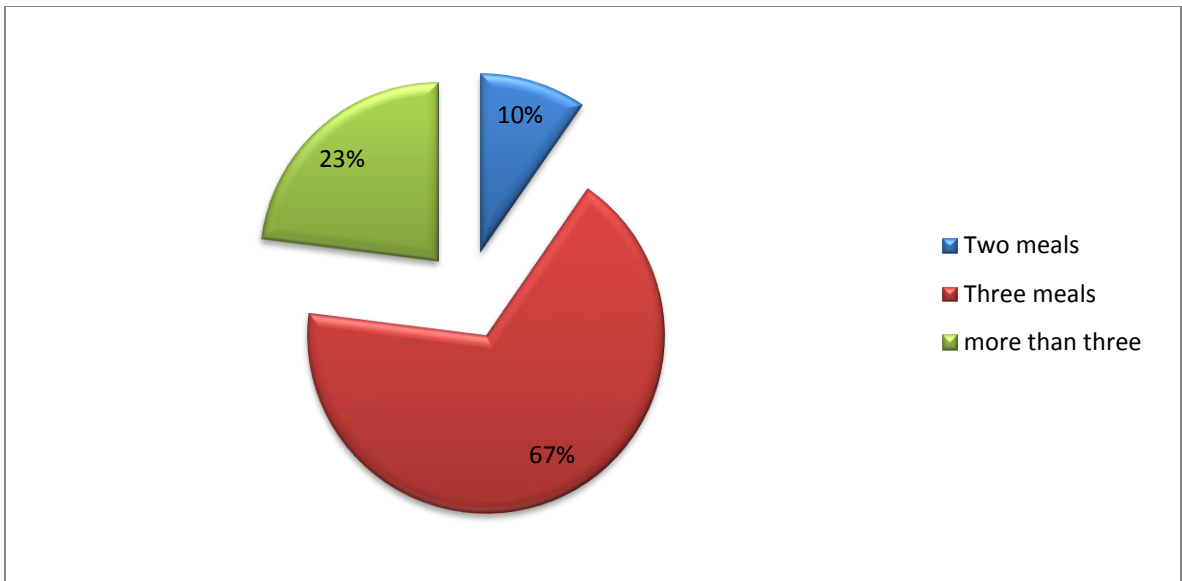


Figure (5): Number of meals during the day

4.3.2. Characteristic of study group according to their child illnesses and food allergies

The presence of illnesses and allergies to food is shown in table (8).

Near one third (31.8%) of studied children had dental caries ,(21.4%) anemia,(3%) obesity ,(1%) diabetes .While (84.6%) not having allergy to any type of food , (0.6%) had an allergy to wheat ,(4.2%) allergy to milk ,(5.2%) allergy to egg plant and (1.8%) allergy to fish.

Table (8): Presence of illnesses and allergy to certain type of food

Illnesses	Frequency	Percent
No suffering from any diseases	218	43.6%
Dental caries	159	31.8%
Anemia	107	21.4%
Diabetes	1	0.2%
Obesity	15	3%
Total	500	100%
Food allergy		
Not found	423	84.6%
Allergy to wheat	3	0.6%
Allergy to milk	21	4.2%
Allergy to eggplant	26	5.2%
Allergy to fish	9	1.8%
Allergy to other	18	3.6%
Total	500	100%

4.4. Mother's knowledge about nutrition and food component

Figure (6) showed that quarter (25.8%) of studied mothers their source of knowledge about nutrition was from educational programs, while (28.2%) from the doctors.

Table (9) clarified the knowledge of mothers about definition of nutrition was poor only (9.2%) had good knowledge. Also the knowledge about essential food components was poor in (80%) and (4.2%) had fair knowledge. Regarding the importance of nutrients only (10.2%) had good knowledge.

Relation between mother's knowledge about definition of nutrition and their level of education is shown in table (10), there was no significant association (P. value 0.09).

Table (11) showed the relation between mother's knowledge about essential food components and their level of educational, with no significant association (P- Value 0.072).

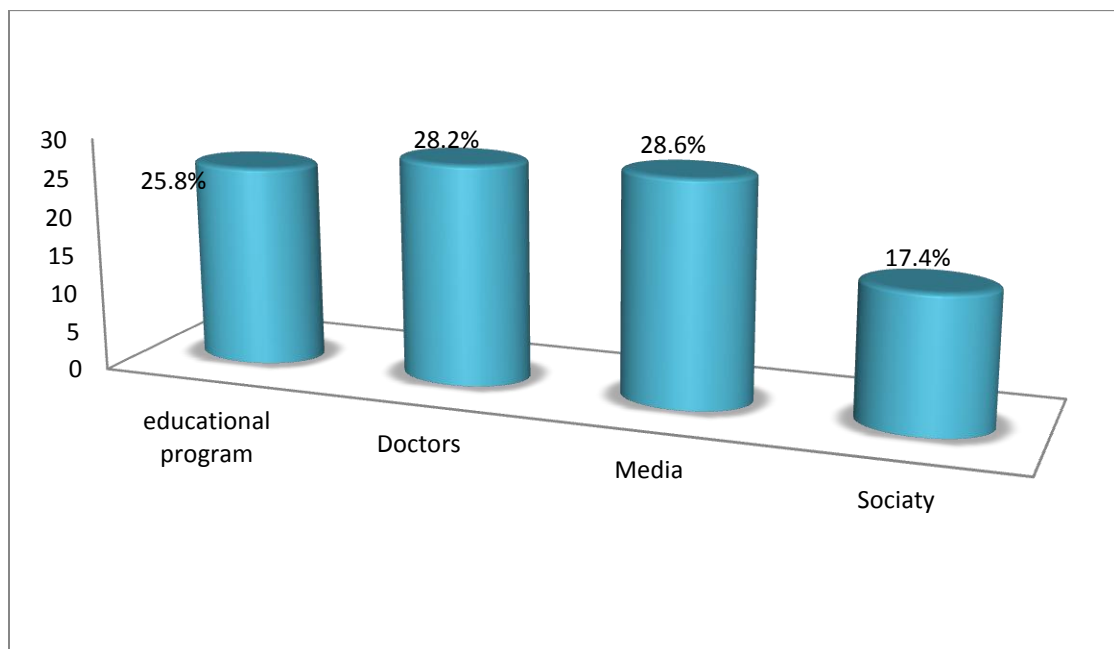


Figure (6): Source of mother's knowledge about nutrition

Table (9): Mother's knowledge about nutrition

Knowledge about Nutrition	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Definition of nutrition	46	9.2%	34	6.2%	420	84.6%	500	100%
Essential food components	79	15.8%	21	4.2%	400	80%	500	100%
Importance of nutrients	51	10.2%	26	5.2%	423	84.6%	500	100%

Table (10): Relation between mother’s educational level and their knowledge about definition of nutrition

Nutrition definition	Educational level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Good	4	0.8%	0	0.0%	12	2.4%	14	2.8%	13	2.6%	3	0.6%
Fair	0	0.0%	1	0.2%	10	2.0%	8	1.6%	13	2.6%	2	0.4%
Poor	28	5.6%	19	3.8%	128	25.6%	154	30.8%	78	15.6%	13	2.6%
Total	32	6.4%	20	4.0%	150	30.0%	176	35.2%	104	20.8%	18	3.6%

P. value = 0.09

Table (11) Relation between mother’s educational level and their knowledge about essential food component

Essential food components are					Educational level							
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Good	4	0.8%	1	0.2%	18	3.6%	24	4.8%	27	5.4%	5	1.0%
Fair	0	0.0%	1	0.2%	8	1.6%	7	1.4%	5	1.0%	0	0.0%
Poor	28	5.6%	18	3.6%	124	24.8%	145	29.0%	72	14.4%	18	3.6%
Total	79	15.8%	21	4.2%	400	80.0%	79	15.8%	21	4.2%	500	100.0%

P- Value = 0.072

4.4.1. Mother's Knowledge about macro nutrients

Table (12) illustrated the knowledge of mothers about macronutrients, (11.2%) of them had good knowledge about component of protein, minority (2.8%) had good knowledge about protein deficiency .Also this table clarified that (4.6%) of studied mothers had good knowledge about fat and (5.2%) had fair knowledge. Regarding carbohydrates (3.8%) had good knowledge and (6.2%) fair knowledge.

Knowledge about daily nutritional needs is shown in table (13). For protein estimated as small piece of meat in (22%) one egg in (19%).Also (46.4%) of them estimated nutritional needs for fruits and vegetables by taking them once or twice a day,(14%) half a cup of juice or a piece of fruit .Daily need for carbohydrate estimated by (34.2%) of mothers by slice of bread taken 4 times daily.

Table (14) showed the relation between mother's knowledge about daily needs for fruits and vegetables and their family income. There was significant association (P-value 0.00). Also the relation between educational level of mothers and knowledge about protein components was statistically significant (P. value 0.003) as shown in table (15).

Figure (7) illustrated mother's knowledge about consumption of milk per day, only (1.4) had good knowledge.

Table (12): Mothers knowledge about macronutrient

Knowledge about macronutrient	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Knowledge about protein components	56	11.2%	35	7%	409	81.8%	500	100%
Knowledge about protein deficiency	14	2.8%	23	4.6%	463	92.6%	500	100%
Knowledge about fats	23	4.6%	26	5.2%	451	90.2%	500	100%
Knowledge about carbohydrates	19	3.8%	31	6.2%	450	90%	500	100%
Knowledge about carbohydrate deficiency	180	36%	10	2%	310	62%	500	100%

Table (13): Mother's knowledge about daily nutritional needs (protein, fruits and vegetables, CHO)

Daily protein needs	Frequency	Percent
Small piece of meat	110	22%
One egg	95	19%
Three-quarters of a cup of cooked beans	59	11.8%
One cup of milk	178	35.6%
I don't know	58	11.6%
Total	500	100%
Daily fruits and vegetables needs		
Taken once or twice a day	232	46.4%
Half a cup of juice or a piece of fruit	70	14%
One third cup of cooked vegetables	46	9.2%
Didn't know	152	30.4%
Total	500	100%
Daily carbohydrates needs		
Slice of bread take 4 times daily	171	34.2%
Half a cup of rice	36	7.2%
Half a cup of juice	38	7.6%
Didn't know	255	51%
Total	500	100%

Table (14) : Relation between family income and mother's knowledge about daily need for fruits and vegetables

Daily needs for fruits and vegetables	Family income					
	High		Average		Low	
	No	%	No	%	No	%
Taken once or twice a day	62	12.4%	162	32.4%	8	1.6%
Half a cup of juice or a piece of fruit	16	3.2%	51	10.2%	3	0.6%
One-third cup of cooked vegetables	4	0.8%	34	6.8%	8	1.6%
I don't know	23	4.6%	110	22.0%	19	3.8%
Total	152	30.4%	70	14.0%	46	9.2%

P-value = 0.00

Table (15) : Relation between mother's educational level and knowledge about protein components

Knowledge about Protein components	Educational level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Good	2	0.4%	2	0.4%	10	2.0%	16	3.2%	21	4.2%	5	1.0%
Fair	1	0.2%	1	0.2%	18	3.6%	8	1.6%	7	1.4%	0	00.0%
Poor	29	5.8%	17	3.4%	122	24.4%	152	30.4%	76	15.2%	13	2.6%
Total	32	6.2%	20	4.0%	150	30.0%	176	35.2%	104	20.8%	18	3.6%

P. value = 0.003

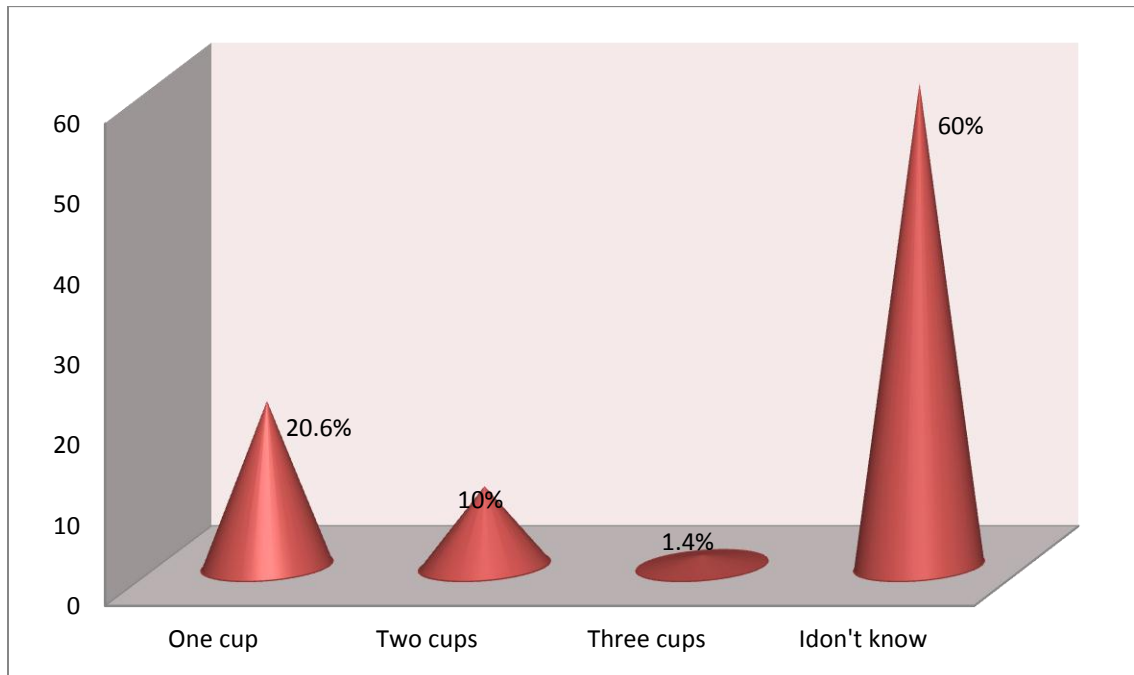


Figure (7): Mother's knowledge of about amount of milk per day

4.4.2. Mother's knowledge about micro nutrients

4.4.2. 1. Vitamins

Table (16) clarified that only (10%) of studied group had good knowledge about definition of vitamin. Also majority (91%) of them had poor knowledge about vitamin deficiency. Regarding vitamin A only (4.8%) had good knowledge ,minority (5.6%) of studied mother's had good knowledge about source of vitamin A ,while (2.6%) of them had good knowledge about deficiency of vitamin A . Also this table showed that only (3.4%) had good knowledge about vitamin D. (2.2%) of them had good knowledge about deficiency of vitamin D, and (3.6%) had fair knowledge.

The relation between mother's level of education and knowledge about vitamins is shown in table (17) with significant statistical association (p-value= 0.02).

Figure (8) illustrated that (4.4%) of studied mother's had good knowledge about source of vitamin C and (5%) had fair knowledge.

Table (16): Mother's knowledge about vitamins

Mother's knowledge about vitamins	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Knowledge about Vitamins	51	10.2%	15	3%	434	86.8%	500	100%
Knowledge about complications of vitamin deficiency	32	6.4%	11	2.2%	457	91.4%	500	100%
Knowledge about Vitamin A	24	4.8%	19	3.8%	457	91.4%	500	100%
Knowledge about source of vitamin A	28	5.6%	18	3.6%	454	90.8%	500	100%
Knowledge about complication of vitamin A	13	2.6%	14	2.8%	473	94.6%	500	100%
Knowledge about Vitamin D	17	3.4%	27	5.4%	456	91.2%	500	100%
Knowledge about Deficiency of vitamin D cause	11	2.2%	18	3.6%	471	94.2%	500	100%

Table (17): Relation between mother's level of education and knowledge about vitamin

Knowledge about definition of Vitamin	Educational level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Good	2	0.4%	0	0.0%	7	1.4%	20	4.0%	18	3.6%	4	0.8%
Fair	0	0.0%	1	0.2%	6	1.2%	3	0.6%	5	1.0%	0	0.0%
Poor	30	6.0%	19	3.8%	137	27.4%	153	30.6%	81	16.2%	14	2.8%
Total	32	6.4%	20	4.0%	150	30.0%	176	35.2%	104	20.8%	18	3.6%

P. value = 0.02

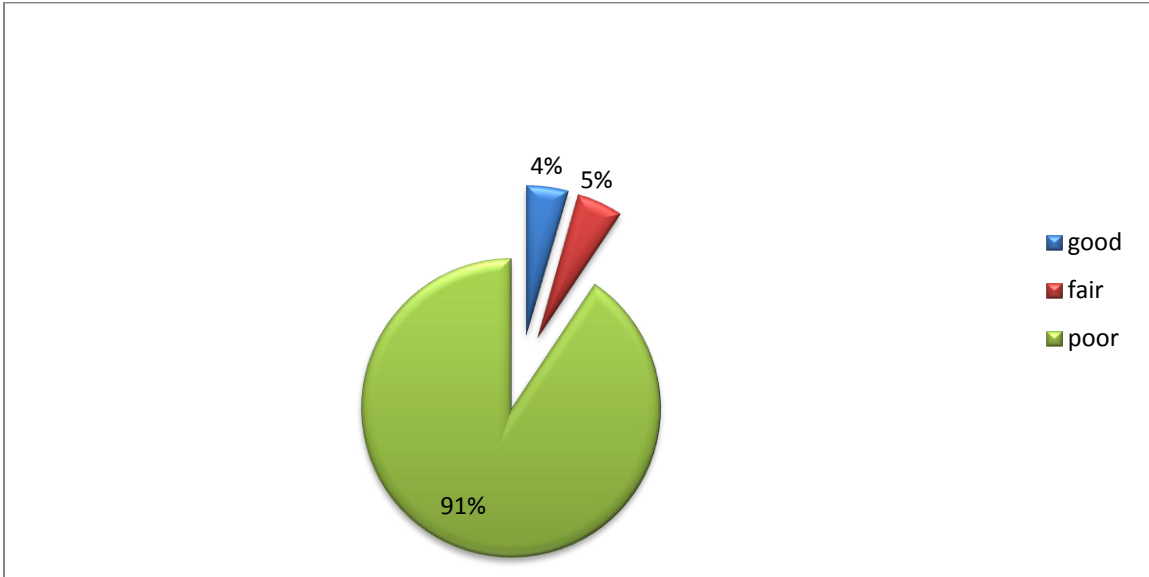


Figure (8): Mother's Knowledge about source of vitamin C

4.4.2.2. Mother's Knowledge about selected minerals (calcium and iron).

Table (18) showed that only (16%) of studied mothers had good knowledge about calcium and (10.6%) had good knowledge about iron. Regarding iron deficiency majority of them (89.4%) had poor knowledge while (6.4%) had fair knowledge.

Table (18): Mother's knowledge about selected minerals (calcium and iron)

Mother's knowledge about minerals	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Knowledge about calcium	32	16.4%	31	6.2%	387	77.4%	500	100%
Knowledge about iron	53	10.6%	34	6.8%	413	82.6%	500	100%
Knowledge about iron deficiency	21	4.2%	32	6.4%	447	89.4%	500	100%

4.5. Mother's Knowledge about water

Table (19) clarified that (22.4%) of studied mothers had good knowledge about importance of water and (6.8%) had fair knowledge. Also this table showed that (21%) of them had good knowledge about indication of more water intake and only (16%) of mothers had good knowledge about complications of inadequate fluid intake.

The relation between mother's level of education and knowledge about indications of increased fluid intake is shown in table (20), with significant statistical association (P-value =0.002) .

Table (19): Mother's knowledge about water

Knowledge about water	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Importance of water	112	22.4%	34	6.8%	354	70.8%	500	100%
Indication of more water intake	107	21.4%	26	5.2%	367	73.4%	500	100%
Complications of inadequate fluid intake	84	16.8%	42	8.4%	374	74.8%	500	100%

Table (20) :Relation between mother's level of education and knowledge about inadequate fluid intake

Inadequate fluid intake	Educational level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Good	2	0.4%	2	0.4%	17	3.4%	34	6.8%	22	4.4%	7	1.4%
Fair	1	0.2%	2	0.4%	12	2.4%	9	1.8%	15	3.0%	3	0.6%
Poor	29	5.8%	16	3.2%	121	24.2%	133	26.6%	67	13.4%	8	1.6%
Total	32	6.4%	20	4.0%	150	30.0%	176	35.2%	104	20.8%	18	3.6%

P-value = 0.002

4.6. Mother's knowledge about obesity

Table (21) Showed that (78.8%) of studied mothers had poor knowledge about definition and causes of obesity, while (6%) had fair knowledge about reduction of obesity and (16.8%) of them had good knowledge about prevention and treatment of obesity.

The relation between mother's level of education and knowledge about causes and contributing factors for obesity is shown in table (22) .There was significant statistical association (P-value 0.007).

Figure (9) showed that more than half (59.8%) of studied group had good knowledge about complications of obesity.

Table (21): Mother’s knowledge about obesity

Knowledge about obesity	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Definition of obesity	70	14%	36	7%	394	78.8%	500	100%
Causes of obesity	72	14.4%	36	7%	392	78.4%	500	100%
Reduction of obesity	49	9.8%	30	6%	421	84.2%	500	100%
Complications of obesity	299	59.8%	16	3.2%	185	37%	500	100%
Prevention and treatment of obesity	84	16.8%	49	9.8%	367	73.4%	500	100%

Table (22): Relation between educational level of mother's and knowledge about causes and contributing factors of obesity

Causes and contributing factors of obesity	Educational level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Good	3	0.6%	3	0.6%	13	2.6%	23	4.6%	23	4.6%	7	1.4%
Fair	0	0.0%	1	0.2%	9	1.8%	15	3.0%	9	1.8%	2	0.4%
Poor	29	5.8%	16	3.2%	128	25.6%	138	27.6%	72	14.4%	9	1.8%
Total	32	6.4%	20	4.0%	150	30.0%	176	35.2%	104	20.8%	18	3.6%

P-value = 0.007

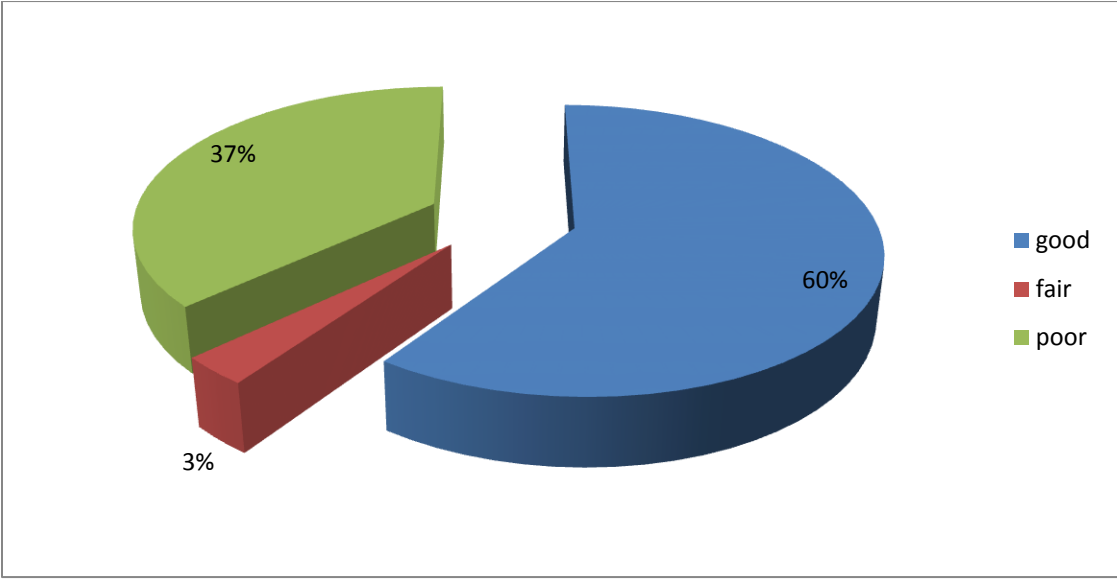


Figure (9): Mother's knowledge about complications of obesity

4.7. Mother's knowledge about food behavior

Table (23) showed that majority (83.8%) of studied mothers had poor knowledge about food behavior while , (4%) had fair knowledge .About issues related to abnormal food behavior only (8.2%) had fair knowledge regarding treatment of abnormal food behavior and.

Table (24) showed significant association between the age of the mothers and their knowledge about food behavior (P-value = 0.02).

Table (23): Mother's knowledge about food behavior

Knowledge about food behavior	Good		Fair		Poor		Total	
	F	P	F	P	F	P	F	P
Knowledge about food behavior	43	8.6%	38	7.6%	419	83.8%	500	100%
Knowledge about issue related to abnormal food behavior	66	13.2%	20	4%	414	82.8%	500	100%
Knowledge about treatment of abnormal food behavior	92	18.4%	41	8.2%	367	73.4%	500	100%

Table (24) :Relation between mother's age and knowledge about food behavior

Knowledge about food behavior	Age of mothers							
	15-25		26-35		36-45		>45	
	No	%	No	%	No	%	No	%
Good	5	1%	20	4%	16	3.2%	2	0.4%
Fair	8	1.6%	10	2%	13	2.6%	7	1.4%
Poor	40	8%	170	34%	181	36.2%	28	5.6%
Total	53	10.6%	200	40%	210	42%	37	7.4%

P- Value= 0.02

4.8. Assessment of nutritional status using BMI according to CDC

In this study 500 children were included from governmental basic schools. Their age range between (6 – 14) years with age classification into 9 groups for nutritional assessment as shown in table (25). About (16%) of males and females were in the age groups (13-13.99), (10-10.99) years respectively.

Table (27) showed that the overall prevalence of underweight in the studied children was (85%). The prevalence of underweight was more among boys compared to girls (44.6% vs 40.4%). Among the boys underweight was seen more common in the age group 8 – 8.99 years and among girls in 10-10.99 years. Only (12.6%) of studied children had normal weight, (1.6%) overweight and (0.6%) were obese children.

BMI for boys and girls is shown in figure (11) and (12).

Table (28) showed the relation between mother's educational level and nutritional status of their children with no statistical significant association (P-value= 0.3). Also relation between sex of studied children and their nutritional status had no statistical significance (p- value 0.149) as shown in table (29).

Table (25):Age of studied children

Age	Male		Female	
	F	P	F	P
6 - 6.99 years	13	4.8%	15	6.5%
7 - 7.99 years	19	7%	23	10%
8 - 8.99 years	37	13.7%	25	10.8%
9- 9.99 years	39	14.4%	16	6.9%
10 - 10.99 years	36	13.3%	37	16%
11 - 11.99 years	33	12.2%	33	14.3%
12 - 12.99 years	35	12.9%	32	13.9%
13 - 13.99 years	40	14.8%	33	14.3%
14 - 14.99 years	18	6.7%	16	6.9%
Total	270	100%	230	100%

Table (26) : Nutritional status distribution according to sex and age.

Gender	6years	7years	8years	9years	10years	11years	12years	13years	14years	Total
Under weight										
M	13 (4.8%)	19 (7%)	36 (7.2%)	34 (6.8%)	27 (5.4%)	25 (5%)	27 (5.4%)	30 (6%)	12 (2.4%)	223 44.6%
F	15 (3%)	20 (4%)	25 (5%)	16 (3.2%)	34 (6.8%)	32 (6.4%)	28 (5.6%)	19 (7%)	13 (4.8%)	202 40.4%
Total	28 (5.6%)	39 (7.8%)	61 (12.2%)	50 (10%)	61 (12.2%)	57 (11.4%)	55 (11%)	49 (9.8%)	25 (5%)	425 (85%)
Normal										
M	-	-	-	4 (0.8%)	8 (1.6%)	8 (1.6%)	7 (1.4%)	6 (1.2%)	4 (0.8%)	37 (7.4%)
F	-	3 (0.6%)	-	-	3 (0.6%)	1 (0.2%)	4 (0.8%)	12 (2.4%)	3 (0.6%)	26 (5.2%)
Total	-	3 (0.6%)	-	4(0.8%)	11 (2.2%)	9 (1.8%)	11 (2.2%)	18 (3.6%)	7 (1.4%)	63 (12.6%)
Over weight										
M	-	-	1 (0.2%)	1 (0.2%)	1 (0.2%)	-	-	2 (0.4%)	2 (0.4%)	7 (1.4%)
F	-	-	-	-	-	-	-	2 (0.4%)	-	2 (0.4%)
Total	-	-	1 (0.2%)	1 (0.2%)	1 (0.2%)	-	-	4 (0.8%)	2 (0.4%)	9 (1.8%)
Obese										
M	-	-	-	-	-	-	1 (0.2%)	2 (0.4%)	-	3 (0.6%)
F	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	1 (0.2%)	2 (0.4%)	-	3 (0.6%)

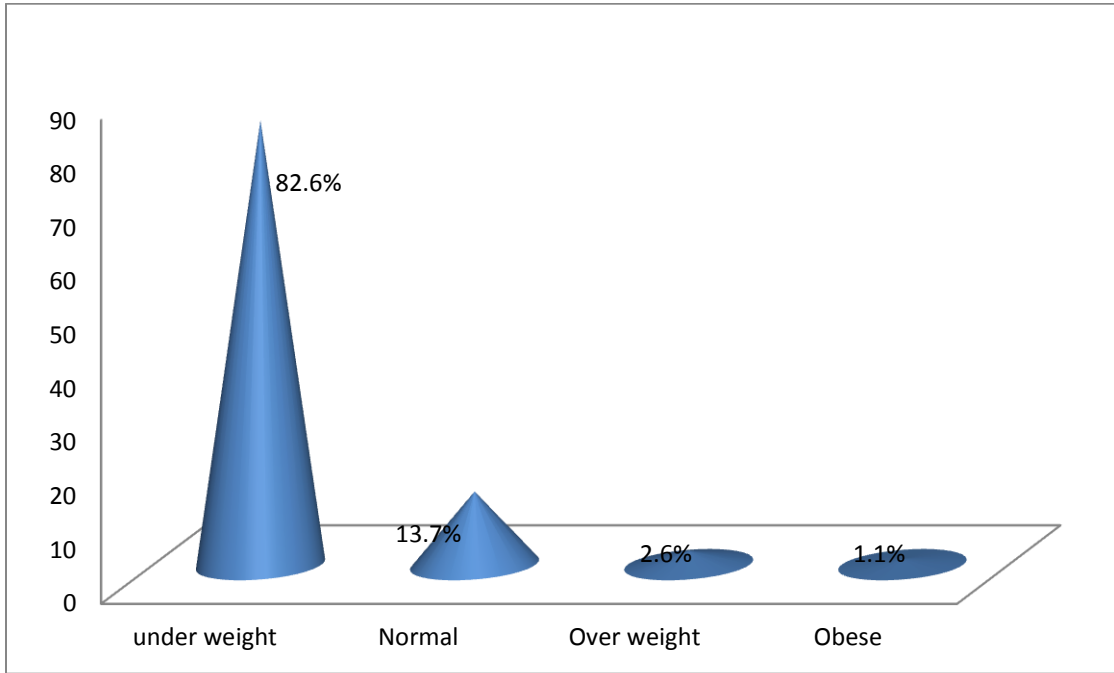


Figure (10) : Nutritional status for boys .

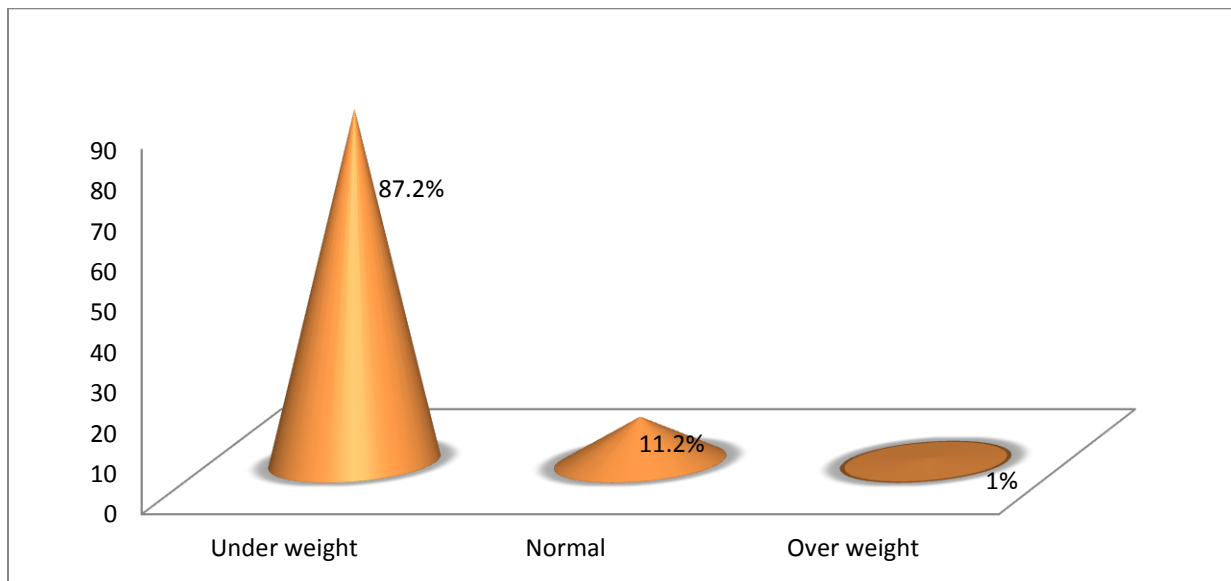


Figure (11): Nutritional status for girls.

Table (27): Relation between educational level of mothers and their children nutritional status

Nutritional status	Educational level											
	Illiterate		Khalwa		Primary		Secondary		University		Post graduate	
	No	%	No	%	No	%	No	%	No	%	No	%
Under weight	23	4.6%	16	3.2%	131	26.2%	145	29%	95	19%	15	3%
Normal	7	1.4%	3	0.6%	17	3.4%	25	5%	8	1.6%	3	0.6%
Over weight	2	0.4%	1	0.2%	1	0.2%	5	1%	0	0%	0	0%
Obese	0	0%	0	0%	1	0.2%	1	0.2%	1	0.2%	0	0%
Total	32	6.4%	20	4%	150	30%	176	35.2%	104	20.8%	18	3.6%

P-Value = 0.3

Table (28): Relation between sex of studied children and nutritional status

Nutritional status	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Under weight	225	45.0%	200	40%
Normal	37	7.4%	26	5.2%
Over weight	7	1.4%	2	0.4%
Obese	3	0.6%	0	0%
Total	270	54%	230	46%

P- Value = 0.149

Discussion:

Good nutrition is essential for optimal health and disease prevention. Educating a child early in life about the importance of healthy eating habits can play a role in safe guarding the child against future disease.

Mothers' perfect nutrition knowledge plays an important role in their children health. School aged children continue to need healthy foods and nutritious snacks. They have a consistent but slow rate of growth and usually eat four to five times a day (including snacks). Many food habits, likes, and dislikes are established during this time. Family, friends, and the media (especially TV) influence their food choices and eating habits. ⁽¹¹⁴⁾

The study consisted of 500 mothers of whom (42%) were in the age group (36-46) years .Gichana B M found that (54%) their age between (15-45) years ⁽¹¹⁵⁾. The educational level of studied mothers in (30%) was primary level similar to what stated by Gichana B M in assessing mothers knowledge about nutrition in Nairobi as (33.9%) had completed primary school. ⁽¹¹⁵⁾ This level of education may indicate that poor county mothers do not get enough opportunity to educate themselves at different stages of education.

Regarding presence of the mothers with the family near all (95.2%) were present with family and (3.4%) were divorced , this corresponds to Rady HE et al as (95.6%) of the mothers were present with family and 3.6% were divorced. ⁽¹¹⁶⁾ Majority of them (78.8%) were housewives while only (15%), (1.8%) were employed and specialist respectively. This finding was comparable to what found by Sasikala P et al in India as(74.87%) of mothers were unemployed. ⁽¹¹⁷⁾ The number of family members was 6-8 in (44.6%), Joshi et al found similar frequency (46%) for (3-5) members. ⁽¹¹⁸⁾ The income reflecting the socio

economic characteristic was average in (71.6%), in contrast to El-Nemer F et al who found that (51.7%) were in middle class. ⁽¹¹⁹⁾

Regarding home properties and services (61.8%) had 1-2 rooms , (3.4%) above 5 rooms ,but Opini R in studying nutritional status and associated factors in Kenya stated that (2.3%) of studied families had 6 rooms. ⁽¹²⁰⁾ There was statistical significant association between the number of family members and number of rooms (P-value= 0.0003) . Majority (92.4%) had piped water to their houses but Feleke B E 2016 in Addis Ababa found only (61.5%) their sources of water from pipe in house. ⁽¹²¹⁾And Acham H et al (2012 in Uganda found the source of water from borehole in (7.6%). ⁽¹²²⁾The dominant type of latrin was pit latrin (67%). Almost all (95.6%) have electricity. Many accessories were found mainly TV& refrigerator.

The number of children in schools was 1-3 in (69%), while less than half (47.2%) of them their age between 9-11 years and the majority (54%) were males .The academic performance of these children at school was good in (60%). There was significant association between the educational level of mothers and academic performance of their children (P – Value = 0.000).

The study estimated that almost half (49.2%) of studied mothers prepare breakfast for their children at home compared to (38.8%) reported by Julie RM et al in his study about beliefs of primary food preparers in families with young children who sometimes prepare meal in house. ⁽¹²³⁾ With respect to meal components (42.6%) of studied mothers said that it contains macro and micro nutrients and (31.8%) contains juices. Specific Element of macronutrients was protein in (5.4%).Type of food tackled from buffet majority (67.9%) was sandwiches, while (14.8%) tackle biscuits and chocolate.

Regarding most common type of food during the day in almost half (49.2%) it was vegetables . Two third (67.4%) of children have three meals per day and (23%) had more than three meals imposed per day . However other study by Yeasmin S et al found that (58%) had 3-4 meals and (16%) 5-6 meals per day. ⁽¹²⁴⁾This variation may be due to family income and availability of food.

Inadequate nutrition is associated with many illnesses and problems, commonly found include food allergies, iron deficiency anemia, malnutrition, diabetes, dental caries and vitamin deficiency. The result of the present study illustrated that more than thirty (31.8%) of children were suffering from dental caries and (21.4%) had anemia .Our finding coincide with what found by Srivastava A et al ,who found children suffering from dental caries were(17%) and(33%) had anemia. ⁽¹²⁵⁾ Food allergy was reported in only (15. 4%) those allergies include (0.6%) to wheat ,(4.2%) to milk in addition to some allergies . This finding consistent with Choi Y et al in their study. They stated that (2.3%) of children had allergy to wheat, (7%) to milk, (5.8%) egg plant and (2.6%) to fish. ⁽¹²⁶⁾

Nutrition is the most important factor in protecting and developing human health, beginning from the pregnancy stage of the mother. ⁽¹⁴⁾The source of knowledge about nutrition was mainly (56.8%) from the doctors and media. Peterson A et al in South Africa found that nutritional information to the participant in order were from the clinic sister , family television, radio and community groups. ⁽¹²⁷⁾ Mothers knowledge about definition of nutrition and essential food component was inadequate only (9.2%) , (15%) respectively had good knowledge . Mothers level of education didn't affect their knowledge about nutrition (P-value = 0.09, P- Value 0.072) . Regarding the importance of nutrients only (10.2%) had good knowledge. This showed that most studied mothers had minimal knowledge about importance of nutrients and their function in the body.

Regarding knowledge of studied mothers about macronutrient it was observed that they have poor knowledge in all of them. Majority of them had poor knowledge about components and deficiency of protein (81.8%), (92.6%) respectively. There was statistical relation between the mother's knowledge about protein components and their educational level (P. value = 0.003). The knowledge about fat and carbohydrate was also poor in (90.2%) and (90%) respectively. Kigaru DM et al estimated better knowledge than our study he found that (21%) were aware about carbohydrate as a food group that gives body the best energy. ⁽¹²⁸⁾

Adequate coverage of daily nutritional needs is important for health and growth. Daily needs for fruits and vegetables were estimated by the mothers to be taken once or twice a day in (46.4%) in contrast to study done in Bahrain by Gharib N et al who stated that (11.8%) take 5-7times for vegetables, (35%) fruit per week. ⁽¹²⁹⁾ There was significant statistical relation between the mother's knowledge about daily needs for fruits and vegetables and their family income (P-value = 0.00). The result showed that about one third (34.2%) of studied mothers said that daily need for carbohydrate slice of bread taken 4 times daily. Similar study done in Omani (2011), the estimated amount in (31%) slice of bread taken 3-5 times per day. ⁽¹³⁰⁾

In relation to consumption of milk per day only (1.4%) of studied mother's had good knowledge ,(20.6%) said one cup , this corresponding with study done in Kenya by Kigaru et al 2015 who reported that (11.9%) take 4-7 times per week. ⁽¹²⁸⁾

The study clarified that (10%) of studied group had good knowledge about definition of vitamin and vitamin deficiency .There was statistical significant relation between mother's knowledge about vitamin and their level of education (p-value = 0.02).

Vitamin A deficiency is a major health problem in many countries especially countries in Africa and south East Asia. It is the leading cause of preventable blindness and increases the risk of disease and death from severe infections. ⁽¹³¹⁾ Adequate knowledge is important for adequate supply. In this study only (4.8%) , (5.6%) , (2.6%) had good knowledge about vitamin A , sources of vitamin A and vitamin A deficiency. Jemberu Y et al studied the consumption of vitamin A among children in Ethiopia he found vitamin A rich foods, either from plant or animal sources, was only(28.8%). Plant source vitamin A rich foods were consumed by (18.8%). This was higher than the proportion of children who consumed vitamin A rich foods from animal origin (11.9%). ⁽¹³²⁾ While near to all (94.6%) had poor knowledge about deficiency of vitamin . In Khirasara village, Rajkot in India symptoms of deficiency known by the mothers were (23%) night blindness, (9.5%) infection and (4%) dry skin. ⁽¹³³⁾

Vitamin D not only was essential for bone health but also was a hormone mediating a wide range of homeostatic function. ⁽¹³⁴⁾ Majority (91.2%) of studied mothers had poor knowledge regarding vitamin D similar estimated knowledge about vitamin C was found (94.2%).

Regarding minerals only (16%) of study group had good knowledge about calcium, which is lower knowledge than what was described by Suttle NF. ⁽⁵⁵⁾ About iron (10.6%) had good knowledge about it and majority of them (89.4%) had poor knowledge regarding its deficiency Better knowledge about iron was reported by Rezae OM who found majority of mothers (82%) attained good knowledge about source of iron. ⁽¹³⁵⁾

Knowledge about water as general was inadequate in spite of it's importance. The fair knowledge about importance of water, indication of more water intake and inadequate water intake were (6.8%),(26%)and (8.4%)

respectively. There was statistical significant relation between the mother's knowledge about causes of inadequate fluid intake, increase fluid intake and their level of education (P-value 0.002 and 0.035) respectively. Obesity is increasing health problem, related to unbalanced nutrition due to increase in popularity of fast food and soft drinks .The study indicated that more than three quarters (78.8%) of study group had poor knowledge about definition and causes of obesity . Compared to C.A. Danford et al in 2015 who reported better knowledge .Causes identified by mothers were types or quantities of food eaten (90.9%), parenting behaviors (44.9%) , lack of activity (42.3%) genetics, slow metabolism or medical issues (24.5%), stress or emotion (5.2%) and limited access to resources (3.5%).⁽¹³⁶⁾ The mothers need to have knowledge about reducing risk of obesity but only (9.8%) had good knowledge .The education level of mothers affected their knowledge about causes and contributing factors of obesity (P-value = 0.007) . Minority (16.8%) of them had good knowledge about prevention and treatment of obesity. This was supported by Samudre M et al in 2016 as only (17.3%) of mothers know the effective prevention of obesity.⁽¹³⁷⁾ Although their knowledge about complication of obesity was good in more than half (59.8%) of them.⁽⁹¹⁾

Regarding food behavior and hence it's treatment (83.8%),(73.4%) respectively had poor knowledge . There was statistical significant association between the age of mothers and their knowledge about food behavior (P-value = 0.373).

Growth is better indicator for nutrition and health. Of this sample of children (54.8%) were boys , near prevalence of boys was reported by Shivaprakash N (52.5%).⁽¹³⁸⁾ Underweight constitutes a major problem .A high prevalence of underweight (85%) was found in studied children .This was corresponding to the prevalence found by Joshi et al (85.45 %).⁽¹¹⁸⁾ The

prevalence of underweight was more among boys compared to girls (44.6% vs 40.4%), but with no statistical significant difference (p- value =0.149). Among the boys underweight was seen more commonly in the age group (8-8.99) years and among girls in the age group (10-10.99) years.

Obesity was found in only (0.6%) in boys and girls over weight in (1.4%),(0.4%) boys and girls respectively and only (12.6%) with normal weight . Lower prevalence of underweight (28.9%) was found in India by Chajhlana SP et al , overweight was (9.2%) and obesity prevalence was (4.4%).⁽¹³⁹⁾ Also Hasan I et al found the prevalence of malnutrition in school children was (52%).⁽¹⁴⁰⁾The prevalence of malnutrition among boys was (53.85%) and among girls was (49.25%).⁽¹²⁸⁾ There was no relation between mother's educational level and nutritional status of their children (P-value -0.3).

Recommendations

Based on the study findings, the following recommendations were forwarded to Ministry of Health and Ministry of Education to improve the nutritional and health status of school children:

- The Ministry of Health together with Ministry of Education should strengthen nutritional education to ensure that the parents should cope with early nutritional status monitoring both at home and at health facility.

- Mothers of school aged children should be educated about the importance of balanced diet. Consumption of foods like cereals, pulses, green leafy vegetables, fats and oil, milk and milk products, fruits etc., should be promoted.

- A regular health check up should be organized by school authority in coordination with teachers and parents.

- Health education should be given to the children and parents about nutritional deficiencies.

- Some teachers in each school should be trained to identify the common symptoms of nutritional deficiencies, excess and take necessary actions.

- School curriculum apart from the regular academic educational activities should include specific educational items about nutrition.

- Improvement of home hygiene and health services.

- Similar studies should be done in other public/private primary schools to ensure that proper nutritional assessment are given to all school going children in my country and proper intervention to improve nutritional status.

- To offer a free breakfast meal for children who cannot afford to buy.

Conclusion:

Based on finding of the result the study concluded that:

- In general studied mother's had poor knowledge about nutrition which affected the nutritional status of their children.

- The source of knowledge about nutrition was mainly from doctors, media and educational programs.

- Only (49.2%) of children take break fast from home.

- Number of meals was three in (23%), while (10%) had just two meals.

- Knowledge of studied mothers about macronutrient as general is poor. The estimated good knowledge about carbohydrates (3.8%), proteins (11.2%) and fats (4.6 %).

- Knowledge about daily needs of nutrient was poor.

- (10%) of studied mothers had good knowledge about vitamins and vitamin deficiency.

- Regarding minerals only (16%) of studied group had good knowledge about calcium.

- Knowledge about indications of increased fluid intake and the complications of inadequate fluid intake was poor.

- Knowledge about correct food behavior was insufficient in spite of significant association between mother's age and knowledge about food behavior.

- Knowledge about obesity was inadequate but knowledge about its complications was good in (59%).

- Undernutrition among studied students was public health problem. The present study highlights the prevalence of under nutrition (85%), normal weight (12.6%), over weight (1.8%) and (0.6%) obese children.

- There was significant relation between educational level of mothers and their knowledge about protein component, definition of vitamin, inadequate fluid intake and causes of obesity.
- The educational level didn't affect mothers knowledge about definition of nutrition ,essential food components and food behavior
- There was no sex difference in nutritional status of studied children.

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Appendix (1)

جامعة شندي

كلية الدراسات العليا والبحث العلمي

استبيان حول تقييم معرفة الأمهات عن التغذية و الحالة التغذوية للأطفال في سن المدرسة بمدينة
شندي

الجزء الأول: (البيانات الشخصية)

الأم:

1. العمر:

- () أ- 15-25 سنة
() ب- 26-35 سنة
() ج- 36-45 سنة
() د- فوق 45 سنة

2. المستوى التعليمي :

- () أ- امي
() ب- خلوة
() ج- ابتدائي
() د- ثانوي
() هـ- جامعي
() و- فوق الجامعي

3. وجود الام :-

- () أ- مع الطفل في الأسرة
() ب- منفصلة
() ج- متوفية

4. عمل الأم :

- () أ- ربة منزل
() ب- عاملة حرفية
() ج- موظفة حكومية
() د- تخصصية

5. الدخل للأسرة :

- () أ- ميسور
() ب- وسط
() ج- معسر

6. عدد أفراد الأسرة :

- () أ- 2-5
() ب- 6-8
() ج- أكثر من 8

البيئة السكنية (خصائص المنزل):

1- عدد الغرف:

- () أ- 1-2
() ب- 3-5
() ج- اكثر من 5

2- مصدر المياه:

- ()
()
()
()

- أ- ماسورة داخل المنزل
ب- ماسورة خارج المنزل
ج- بئر عام
د- أخرى

3- مصدر الكهرباء:

- ()
()

- أ- موجودة
ب- غير موجودة

4- المقتنيات:

- ()
()
()
()
()

- أ- شاشة
ب- تلفزيون وثلاجة
ج- فريزر
د- حاسوب
و- موتور

5- نوع المراحيض

- ()
()
()
()

- أ- حفرة داخل المنزل
ب- حفرة عامة
ج- سايفون
د- لا يوجد

الأطفال :-

6- عدد الأطفال في سن المدرسة :

- ()
()
()

أ- 1-3

ب- 4-6

ج- أكثر من 6

7- عمر الطفل:

- ()
()
()

أ - 6-8 سنة

ب- 9- 11 سنة

ج- 12-15 سنة

8- نوع الطفل:

- ()
()

أ - ذكر

ب- انثى

9- الأداء الأكاديمي للطفل بالمدرسة:

- ()
()
()

أ- ممتاز

ب- متوسط

ج - ضعيف

الجزء الثاني : (غذاء الطفل المدرج بالمدرسة)

1. إعداد وجبة الإفطار لطفلك في المنزل :

- ()
()
()

أ- دائماً

ب- أحياناً

ج- نادراً

2. مكونات الوجبة التي تقومين بإعدادها من المنزل لطفلك :

- أ- تحتوي الوجبة علي عنصر معين من المغذيات ()
ب- تحتوي علي المغذيات الكبرى والصغرى ()
ج- تحتوي علي عناصر بالإضافة للمغذيات ()
د- تحتوي علي البروتينات فقط ()

3. الأصناف التي يتناولها طفلك من مقصف (البوفيه) المدرسة؟

- أ - ساندويشات ()
ب- عصيرات طازجة ()
ج- مشروبات غازية ()
د- بسكويت وشكولاتة ()
هـ- شيبس وحلويات ()

4. عدد الوجبات المفروضة في اليوم :

- أ- وجبتين ()
ب- ثلاثة وجبات ()
ج- أكثر من ثلاثة ()

5. ماهي أكثر انواع الغذاء التي يتناولها طفلك :-

- ا-خضروات ()
ب- فواكه ()
ج- لحوم ()
د- نشويات ()
هـ- حليب وجبن ()

8. الأمراض التغذوية المصاحبة لطفلك

- أ- تسوس الأسنان ()
ب- فقر الدم (الأنيميا) ()
ج- مرض السكر ()
د- السمنة ()
و-أخري ()

9. وجود حساسية تجاه نوع معين من الطعام:

- أ- لاتوجد ()
ب- ضد القمح ()
ج- ضد اللبن ()
د- ضد الأسود ()
هـ- ضد الأسماك ()
و- توجد حساسية ضد اخري ()

الجزء الثالث : (معرفة الأم عن التغذية ومكونات الغذاء)

التغذية :

1. مصدر معرفتك بالتغذية من:

- أ- البرامج التعليمية ()
ب- الطبيب ()
ج- وسائل الإعلام ()
د- المجتمع ()

2. التغذية هي :

- () أ- العامل الأكثر أهمية في حماية وتطوير صحة الإنسان
() ب- تبدأ من مرحلة الحمل للأم
() ج- تؤثر على نمو وتطور الطفل
() د- لا اعرف

3. مكونات الغذاء الاساسية هي :

- () ا- البروتين
() ب- الدهون
() ج- الكربوهيدرات
() د- الفايتمينات والمعادن
() و- لا أعرف

4. اهمية المغذيات هي:

- () أ. مهمة للنمو
() ب. تساعد علي بناء انسجة الجسم
() ج - كل نوع من المغذيات لديه وظيفة محددة في الجسم
() د-لا أعرف

5. مكونات البروتين هي:

- () ا- الحليب والجبن
() ب.اللحوم والطيور
() ج. البقوليات
() د. الاسماك
() و- لا أعرف

6. الإحتياجات اليومية للبروتينات :

- () أ- قطعة لحم صغيرة
() ب- بيضة واحدة
() ج- ثلاثة ارباع كوب من البقوليات المطبوخة
() د-كوب واحد من اللبن
() ه- لا أعرف

7. يؤخذ اللبن :

- () أ - كوب واحد يوميا
() ب- كوبان يوميا
() ج- ثلاثة أكواب يوميا
() د- 2-3 أكواب في اليوم
() و- لا أعرف

8. نقص البروتين يؤدي الي :-

- () أ. سوء التغذية
() ب. فقر الدم
() ج. المناعة المنخفضة
() د. لا اعرف

9. الدهون هي:-

- () أ- تساعد الجسم على امتصاص بعض المواد
() ب- تعطي الطعام النكهة والملمس
() ج- يعطي الاحساس بالشبع
() د- لا أعرف

10. الكاربوهيدرات هي:
 أ- مصدر رئيسي للطاقة ()
 ب تعطي الاحساس بالشبع ()
 ج- موجودة في الحبوب والنشويات ()
 د- لا اعرف ()
11. الإحتياجات الغذائية اليومية للكاربوهيدرات :-
 أ- شريحة خبز تؤخذ 4 مرات يوميا ()
 ب- نصف كوب ارز ()
 ج- نصف كوب عصير ()
 د- لا أعرف ()
12. يسبب نقص الكاربوهيدرات :
 أ- الاحساس بالجوع ()
 ب-إنخفاض السكر ()
 ج- هزال او ضعف العضلات ()
 د- لا اعرف ()
13. الفيتامينات هي:
 أ- مهمة للجسم ()
 ب- مهمه للوقاية من الأمراض ()
 ج- الحفاظ على الشهية الطبيعية والصحة العقلية ()
 د- توجد في الخضروات والفواكه ()
 و- لأ أعرف ()
14. نقص الفيتامينات يسبب :-
 أ- فقدان الشهية ()
 ب- الشعور بالتعب ()
 ج- الأنيميا ()
 د- لأعرف ()
15. الفواكه والخضروات :
 أ- تؤخذ مرة لي مرتان في اليوم ()
 ب- تمثل الوجبة نصف كوب عصير أو حبة فاكهة ()
 ج- تمثل ثلث كوب خضروات مطبوخة ()
 د- لأعرف ()
16. فيتامين (أ) هو:
 أ- مهم لنمو وتطور الخلايا ()
 ب- يمنع مشاكل العيون ()
 ج- الحفاظ على صحة الجلد ()
 د- لا أعرف ()
17. يوجد فيتامين (أ) في :
 أ- الخضروات والفواكه ()
 ب- الكبد ()
 ج- اللحوم، والبيض، ومنتجات الألبان ()
 د- لا أعرف ()

18. يسبب نقص فيتامين (أ):-

- ()
- ()
- ()
- ()

- أ- العمى الليلي
- ب- عدم قدرة الجسم علي مكافحة العدوي
- ج- ضعف نمو العظام
- د- لا اعرف

19. فيتامين (د) هو:

- ()
- ()
- ()
- ()

- أ- مهم للعظام
- ب- يوجد اشعة الشمس
- ج- زيت كبد الحوت
- د- لا اعرف

20. نقص فيتامين (د) :-

- ()
- ()
- ()
- ()

- أ- نقصه يسبب الكساح (لين العظام)
- ب- كسور العظام
- ج- زيادة بوزن الجسم
- د- لا اعرف

21. يوجد فيتامين (سي) في :-

- ()
- ()
- ()
- ()

- أ- الخضروات الخضراء
- ب- الطماطم
- ج- البرتقال
- د- لأعرف

22. الكالسيوم هو:-

- ()
- ()
- ()
- ()
- ()

- أ- من اهم العناصر المعدنية للجسم
- ب- يوجد في الهيكل العظمي.
- ج- يوجد في الحليب ومنتجاته، والبيض والخضروات
- د- نقصه قد يؤدي إلى هشاشة العظام
- هـ- لأعرف

23. الحديد هو :-

- ()
- ()
- ()
- ()
- ()

- أ- مهم في تصنيع الهيموقلوبين
- ب- يوجد في اللحوم الحمراء
- ج- يوجد في الخضروات
- د- يوجد في الاسماك
- هـ- لا اعرف

24. نقص الحديد يؤدي إلى ..

- ()
- ()
- ()
- ()

- أ- الانيميا
- ب- تشقق في زوايا الفم
- ج- ضيق في التنفس
- د- لا اعرف

الماء :

25. الماء :

- أ- الماء ضروري بالنسبة لمعظم وظائف الجسم ()
ب- جسم الإنسان يمكن أن يستمر أيام فقط بدون ماء ()
ج- الموصى بها يوميا للأطفال في سن المدرسة 1.5 / لتر6 كبايات ()
د- تشمل السوائل المياه العذبة وجميع السوائل الأخرى مثل الحليب، القهوة، الشاي والعصير . ()
و- لا أعرف ()

26. يحتاج الطفل إلى تناول كمية أكبر من السوائل في حالة :-

- أ- اكل كمية كبيرة من البروتين والالياف ()
ب- القيء أو الإسهال ()
ج- النشاطات الجسدية ()
د- الطقس الحار ()
هـ- لا أعرف ()

27. يسبب عدم كفاية تناول السوائل :-

- أ- حصى الكلى ()
ب- التهابات المسالك البولية ()
ج- الجفاف ()
د- انخفاض الأداء البدني والعقلي ()
و- لا أعرف ()

السمنة :

28. السمنة هي :-

- أ- زيادة في وزن الجسم ()
ب- مرض يتصف بزيادة الدهون ()
ج- هي احد الاسباب التي تؤدي الي الوفاة ()
د- البينة المدرسية لديها القدرة على التأثير في السمنة ()

29. الأسباب والعوامل المساعدة للسمنة :-

- أ- وراثية ()
ب- تناول الكثير من الدهون بالاضافة للوجبات السريعة ()
ج- الأمراض ()
د- الادوية ()
هـ- الجلوس الطويل في مشاهدة التلفاز ()
و- البدانة في مرحلة الصغر ()
ز- لا أعرف ()

30. للتقليل من خطر السمنة :

- أ- عدم تشجيع الطفل علي ترك الوجبات الثلاثة الرئيسية ()
ب- تقديم كميات أقل من الطعام ()
ج- مضغ الطعام ببطء ()
د- ممارسة الرياضة ()
هـ- لا أعرف ()

31. مضاعفات السمنة هي:

- أ- أمراض القلب ()
ب- مرض السكري ()
ج- ضعف الأداء الأكاديمي ()
د- كل ما ذكر صحيح ()

32. الوقاية والمعالجة من السمنة :-

- ()
()
()
()
()

- أ- زيادة الفواكه و الخضروات وتقليل كمية الدهون
ب- زيادة النشاط البدني
ج- تقليل الزمن الذي يقضيه الطفل أمام الشاشة
د- الأدوية والعمليات الجراحية
هـ- لا أعرف

33. السلوك الغذائي :-

- ()
()
()
()
()

- أ- يتأثر بالعادات والتقاليد
ب- يتأثر الطفل بسلوك الوالدين
ج- يدعم النمو الطبيعي والوزن
د- يمنع تسوس الأسنان
هـ- لا أعرف

34. الامور التي تتعلق بالسلوك الغذائي الغير السوي في سن المدرسة :-

- ()
()
()
()
()
()

- أ- عدم تناول وجبة الافطار
ب- اصابة الطفل بالسمنة
ج- تسوس الاسنان
د- الانيميا
هـ- النحافة
و- لا أعرف

35. لعلاج السلوك الغذائي الغير سوي :-

- ()
()
()
()
()

- أ- تناول وجبة الإفطار
ب- التشجيع علي ممارسة الرياضة
ج- استبدال الحلوي والشبس بالخضر والفاكهة
د- عدم توجيه تعليقات سلبية للطفل تتعلق بوزنه
و- لا أعرف

القياسات :-

1. الوزن:.....
2. الطول:.....
3. مؤشر كتلة الجسم.....

Appendix (II)

Questionnaire about assessment of mother's knowledge about nutrition and nutritional status of basic school children in Shendi town

Part I: (Socio demographic data for the mothers and their children):

1. Age:numbering

- a. 15-25 ()
- b. 26-35 ()
- c. 36-45 ()
- d. Above 45 ()

2. Educational level:

- a. Illiterate ()
- b. Khalwa ()
- c. primary ()
- d. Secondary ()
- e. university ()
- f. post graduate ()

The presence of the mother

- a. Present withfamily ()
- b. Divorced ()
- c. Died ()

3. Mother 's occupation :

- a. Housewife ()
- b. Handicraft ()
- c. Agovernmental employee ()
- d. Specialist ()

4. Family income:

- a. High ()
- b. Average ()
- c. Low ()

5. Number of family members:

- a. 2-5 ()
- b. 6-8 ()
- c. More than 8 ()

Residential environment (Home properties):

1. Number of rooms:

- a. 1-2 ()
- b. 3-5 ()
- c. More than 5 ()

2. Water source:

- a. Piped in house ()
- b. Piped outside the home ()
- c. Borehole ()
- d. Others ()

3. Electricity supply:

- a. Present ()
- b. Not present ()

4. Amenities (accessories):

- a. Screen ()
- b. TV & refrigerator ()
- c. Deep freeze ()
- d. Computer ()
- e. Motor ()

5. Toilet type

- a. Pitlatrin ()
- b. General hole ()
- c. Syphon ()
- d. Not found ()

Children:

6. Number of school-age children:

- a. 1-3 ()
- b. 4-6 ()
- c. more than 6 ()

7. Child's age:

- a. 6-8 years ()
- b. 9-11 years ()
- c. 12-15 years ()

8. Child sex :

- a. Male ()
- b. Female ()

9. Academic performance of the child at school:

- a. Excellent ()
- b. Average ()
- c. Weak ()

Part II: (child's diet at school)

1. Takig breakfast from home:

- a. Always ()
- b. Sometimes ()
- c. Rarely ()

2. Meal component form home :

- a. A meal containing a particular element of the nutrients ()
- b. Contain nutrients major and minor ()
- c. Containing juices in addition to nutrients ()
- d. Containing proteins only ()

3. Breakfast tackled from canteen (buffet) in school

- a. Sandwiches ()
- b. Fresh juices ()
- c. Drinks ()
- d. Biscuits and chocolate ()
- e. Chips and sweets ()

4. Number of meals imposed per day:

- a. Two meals ()
- b. Three meals ()
- c. More than three ()

5. The most common type of food tackled during the day:

- a. Vegetables ()
- b. Fruit ()
- c. Meat ()
- d. Starches ()
- e. Milk and Cheese ()

1. The presence of associated nutritional problem or illness

- a. Not present ()
- b. Dental caries ()
- c. Anemia ()
- d. Diabetes mellitus ()
- e. Obesity ()

2. Presence of an allergy to a particular type of food:

- a. Not found ()
- b. Allergy to wheat ()
- c. Allergy to milk ()
- d. Allergy to eggplant ()
- e. Allergy to fish ()
- f. Allergy to others ()

Part III: Mother's knowledge about nutrition and food components

Nutrition:

1. The source of knowledge about nutrition from:

- a. Educational programs ()
- b. Doctors ()
- c. Media ()
- d. Society ()

2. Nutrition is:

- a. The most important factor in the protection and development of human health ()
- b. Starts from pregnancy ()
- c. Affects the growth and development of the child ()
- d. I don't know ()

3. Essential food components are:

- a. Protein ()
- b. Fat ()
- c. Carbohydrate ()
- d. Vitamin s and minerals ()
- e. I don't know ()

4. Mother's knowledge about importance of nutrients:

- a. For growth ()
- b. Helps build body tissue ()
- c. Has a specific function in the body ()
- d. I don't know ()

5. Protein components are:

- a. Milk and cheese ()
- b. Meat and birds ()
- c. Legumes ()
- d. Fish ()
- e. Other ()

6. Daily nutritional needs for protein

- a. Small piece of meat ()
- b. One egg ()
- c. Three-quarters of a cup of cooked beans ()
- d. One cup of milk ()
- e. I don't know ()

7. Amount of milk taken:

- a. one cup per day ()
- b. two cups per day(250ml) ()
- c. three cups a day ()
- d. 2-3 cups per week ()
- e. I don't know ()

8. Protein deficiency leads to:

- a. Malnutrition ()
- b. Anemia ()
- c. Low immunity ()
- d. I don't know ()

9. Fats:

- a. Help the body to absorb some of the material ()
- b. Gives food flavor and texture ()
- c. To gives a sense of filling fullness ()
- d. I don't know ()

10. Carbohydrates:

- a. Main source of energy ()
- b. Give a sense of fullness ()
- c. Present in grains and starches ()
- d. I don't know ()

11. Daily nutritional needs for Carbohydrates

- a. Slice of bread take 4 times daily ()
- b. Half a cup of rice ()
- c. Half a cup of juice ()
- d. I don't know ()

12. Deficiency of carbohydrates lead to:

- a. Sense of hunger ()
- b. Muscle wasting ()
- c. Hypoglycemia ()
- d. I don't know ()

13. Vitamins are:

- a. Important for the body health ()
- b. Needed for disease prevention ()
- c. Maintain the normal appetite and mental health ()
- d. Found in fruits and vegetables ()
- e. I don't know ()

14. Vitamin deficiency leads to:

- a. Loss of appetite ()
- b. Feeling tired ()
- c. Anemia ()
- d. I don't know ()

15. Fruits and vegetables:

- a. Taken once or twice a day ()
- b. Represent the meal half a cup of juice or a piece of fruit ()
- c. Represent one-third cup of cooked vegetables ()
- d. I don't know ()

16. Vitamin A:

- a. Important for growth and development of cells ()
- b. Prevent eye problems ()
- c. Maintain healthy skin ()
- d. I don't know ()

17. Vitamin A found in:

- a. Vegetables and fruits ()
- b. Liver ()
- c. Meat, eggs, and dairy products ()
- d. I don't know ()

18. Deficiency of vitamin A leads to:

- a. Night blindness ()
- b. Inability of the body to against infection ()
- c. Bone growth ()
- d. I don't know ()

19. Vitamin D:

- a. Important for bone ()
- b. Formed by exposure to sunlight ()
- c. Found in cod liver oil ()
- d. I don't know ()

20. Deficiency of vitamin D lead to:

- a. Deficiency causes a rickets (osteomalacia) ()
- b. Bone fractures ()
- c. Increased body weight ()
- d. I don't know ()

21. Vitamin C found in:

- a. Green vegetables ()
- b. Tomatoes ()
- c. Orange ()
- d. I don't know ()

22. Calcium:

- a. Is one of the most important minerals for the body ()
- b. Is found in the skeleton. ()
- c. Is found in milk and milk products, eggs and vegetables ()
- d. It's deficiency can lead to bone softening ()
- e. I don't know ()

23. Iron is: -

- a. Important in the synthesis of hemoglobin ()
- b. Found in red meat ()
- c. Found in vegetables ()
- d. Found in fish ()
- e. I don't know ()

24. Iron deficiency leads to

- a. Anemia ()
- b. Angular stomatitis ()
- c. Shortness of breath ()
- d. I don't know ()

Water:

25. Water:

- a. Water is essential for most body functions ()
- b. The human body can go only days without water ()
- c. The recommended daily requirement for school-age children 1.5 / liters (6cups) ()
- d. Include liquid fresh water and all other liquids such as milk, coffee, tea, juice and even soft drinks. ()
- e. I don't know ()

26. Indication of increase water intake

- a. Eaingt large amount of protein and fiber ()
- b. Hot weather ()
- c. Vomiting or diarrhea ()
- d. Physical activity ()
- e. I don't know ()

27. Inadequate fluid intake leads to:

- a. Kidney stones ()
- b. Urinary tract infections ()
- c. Dehydration ()
- d. Reduced physical and mental performance ()
- e. I don't know ()

Obesity:

28. Obesity is:

- a. Increase in body weight ()
- b. Adisease characterized by an increase of fat ()
- c. A cause of death ()
- d. School environment play a role in obesity ()
- e. I don't know ()

29. Causes and contributing factors for obesity:

- a. Genetic ()
- b. Eating a lot of fat in additional to fast food ()
- c. Diseases ()
- d. Drugs ()
- e. Prolonged stay in watching TV ()
- f. I don't know ()

30. To reduce the risk of obesity occurrence:

- a. Not to encourage the child to leave the three main meals ()
- b. Provide less amounts of food ()
- c. Chew food slowly ()
- d. Exercise ()
- e. I don't know ()

31. Complications of obesity are:

- a. Heart disease ()
- b. Diabetes ()
- c. Poor academic performance ()
- d. All the above ()

32. Prevention and treatment of obesity by: -

- a. Increasing fruits and vegetables and reduce the amount of fat()
- b. Increasing physical activity ()
- c. Reducing the time spent by the child in front of the screen ()
- d. Drugs and surgeries ()
- e. I don't know ()

33. Food behavior:

- a. Is affected by the customs and traditions ()
- b. Child's behavior is influenced by parents ()
- c. Good behavior supports normal growth and weight ()
- d. Good behavior prevent tooth decay ()
- e. I don't know ()

34. Issues related to abnormal food behavior in school age:

- a. Not eating breakfast ()
- b. Child obesity ()
- c. Tooth decay ()
- d. Anemia ()
- e. Thinnest ()
- f. I don't know ()

35. For the treatment of abnormal food behavior: -

- a. Tackling breakfast ()
- b. Encourage the practice of sport ()
- c. Replace the candy, chips by vegetables and fruit ()
- d. Not to bring the child's negative comments regarding his weight ()
- e. I don't know ()

Nutrition status for children:

1-Weightkg

2-Heightcm

3-BMI.....

بسم الله الرحمن الرحيم

جامعة شندي

كلية علوم التمريض

كلية الدراسات العليا والبحث العلمي

استبيان حول تقييم معرفة الأمهات عن التغذية و الحالة التغذوية للأطفال في سن المدرسة
بمدينة شندي

السيد | ولي أمر التلميذ

المحترم

السلام عليكم ورحمة الله تعالى وبركاته

تقوم طالبة الدكتوراة شيرين عبدالفتاح محمد علوب بإجراء دراسة عن تقييم معرفة
الأمهات عن الحالة التغذوية للأطفال في سن المدرسة وتتضم الدراسة ملء الإستبيان وقياس
الوزن والطول للطالب .

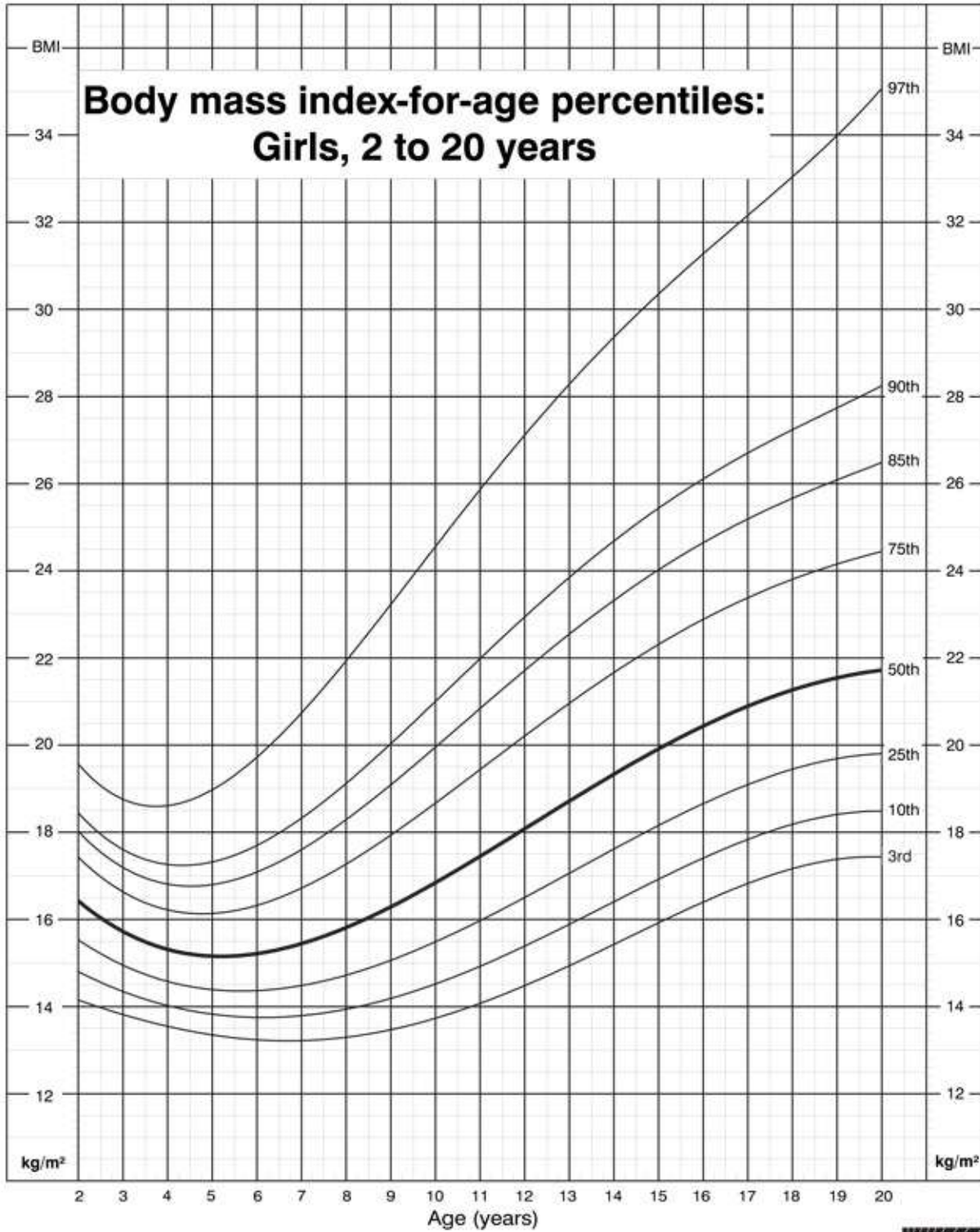
في حالة الموافقة علي ادراج ابنكم/ابنتكم الرجاء التوقيع و ملء الإستبيان

التوقيع

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Appendix (IV)

CDC Growth Charts: United States



Published May 30, 2000.

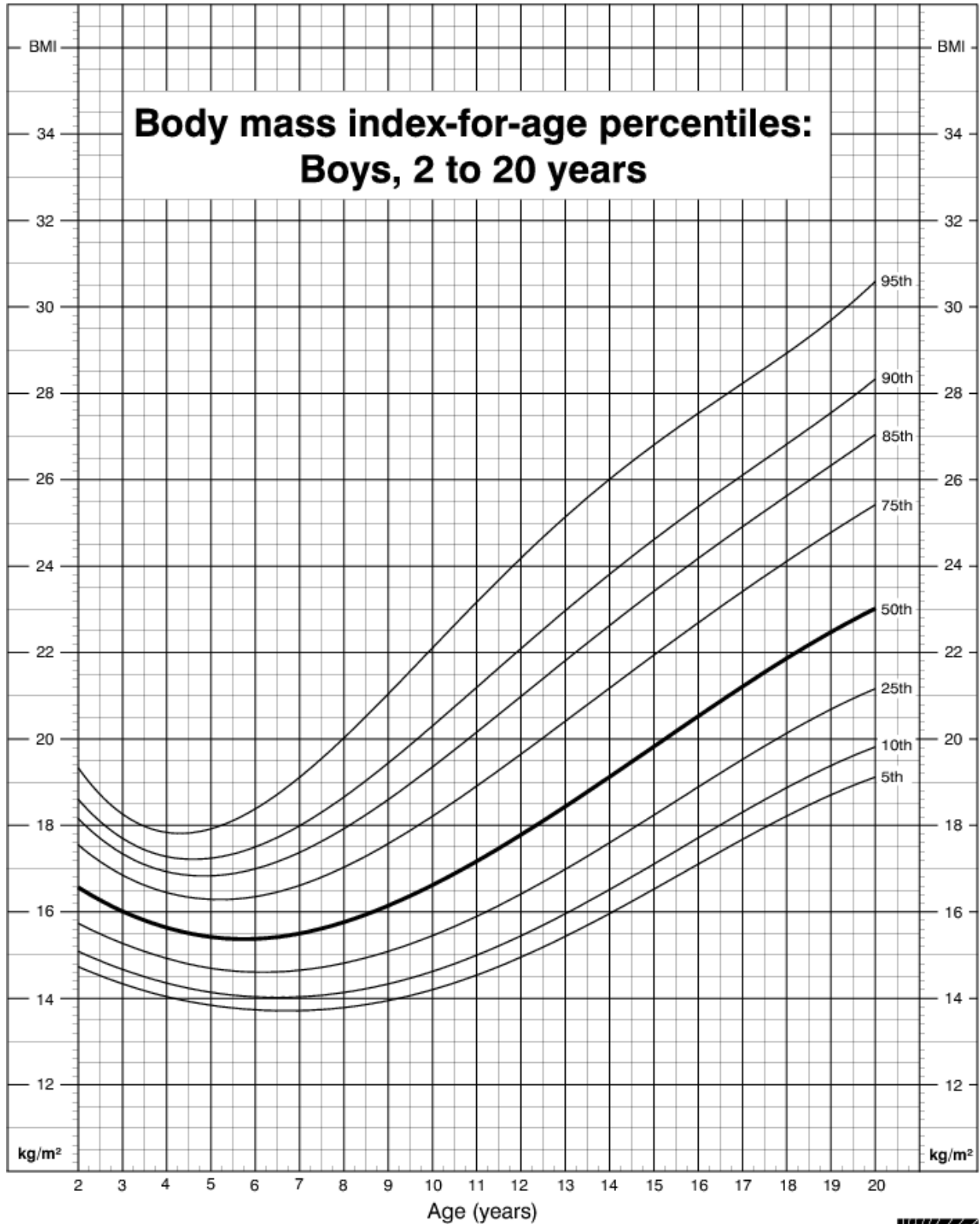
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).



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Appendix (III)

CDC Growth Charts: United States



Published May 30, 2000.

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