



## Original Article

# Update of the nutritional situation in the Republic of the Sudan

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## Abstract

**Background:** Sudan is situated in the north-eastern part of Africa. The population of the country is approximately 43 million, spread over of 1.88 million square kilometers. Although Sudan has great resources, most of the population suffer from poverty and food deficiency because the conflicts in the different parts of the country. The suffering was augmented by climatic drought and floods which resulted in food insecurity. Internal displacement population are in disadvantage regarding access to health services and are consequently more vulnerable to diseases and malnutrition. In Sudan, thirty-three percent of the population suffered from food deprivation according to national survey of 2010. The prevalence of undernourishment was 31% and 34 % percent for urban and rural populations respectively. Furthermore, based on WHO epidemiologic criteria, the prevalence of stunting and wasting are classified as profound, 38.2%, for stunting which is more than the average of the developing countries( 25%), wasting defined as low weight for height also has a higher prevalence in under-five in Sudan comparing it to the developing countries' average which are 16.8% and 8.9% respectively. Although recent national survey data are lacking, it is evident that micronutrient deficiencies are a major public health concern from the sporadic studies' findings. Not with standing these challenges, the government and the Federal Ministry of Health, move along to make progress towards nutrition and food security, some supplementation campaigns have been conducted but coverage of the population is still low. Sudan is one of the 61 countries that leading a global movement to end up malnutrition in its all forms.

**Keywords:** Sudan, deficiencies, food, micronutrient, mortality, insecurity.

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## 1 Introduction

Sudan is the third largest north eastern African country spreading over of 1.88 million square kilometers, bordering the Red Sea Central African Republic, Chad, Egypt, Eritrea, Ethiopia, Libya and South Sudan. The northern part of the country is an extension of the Sahara desert while the central part is a dry savannah area and the southern part has a tropical forest climate. Total population estimation around 43 million according to central intelligence date of the united states <sup>1</sup>. Distribution of the population shows that 33.2% live in urban setting while 8% are nomads, almost 2% of the population are internally displaced. Life expectancy at birth reached 63/67 for male/female respectively, and the annual death rate is 16.7%. The population pyramid showed that nearly 45% of total estimated population were below 15 years of age and 15% below 5 years of age, while those aged 65 years and over represent only 4% of the population. The average household size is 5-6 persons, while annual population growth rate of 2.6% and the total fertility rate is 5.9 <sup>2,3</sup>. Although the growth domestic product (GDP) grew from 9.9 billion US \$ in 1980 to 57.9 billion US \$ in 2008 but it has no accompanied human development and poverty still remains an issue. Lack of transport infrastructure is adding to the problem. The economic situation was worsen by loss of about 80% of its oil resources

and almost half of the country's revenue following separation of South Sudan state now known as Republic of South Sudan in 2011 resulting in reduction of growth rate of gross domestic products (GDP) from 7.8% in 2008 to 3.1% in 2014. The great disparities between urban and rural development leads to increasingly contribution of urban informal sector to Sudan's GDP by more than 60%, and this was evident by the concentration of investments and services in and around Khartoum state. These disparities encouraged rural-urban migration that weakens the agricultural productivity which is historically remained as the main source of income and employment in Sudan, hiring over 80% of Sudanese and making up a third of the economic sector. In the agricultural sector, the government has tried to diversify its cash crops; however, cotton and gum Arabic remain its major agricultural exports. When the problems of irrigation and transportation remain the greatest constraints to a more dynamic agricultural economy. Livestock production also has vast potential, and many animals, particularly camels and sheep, are exported to nearby countries. The country is still gifted with rich natural resources, including natural gas, gold, silver, chromite, asbestos, manganese, gypsum, mica, zinc, iron, lead, uranium, copper, kaolin, cobalt, granite, nickel, tin and aluminum. These

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information on the natural and economic resources resulted in poverty rate of 46.5%, per capita income of 1270 USD and Human Development Index of 0.414 <sup>4,5</sup>. The health system in Sudan is composed of the Federal and State Ministries, military medical services, police, universities, and private sector. The public health governance was distributed between federal government, states and the localities as stated in the Interim Constitution (2005) and the Local Government Act (2003). The health service delivery for the public sector are organized at three levels: primary, secondary and tertiary based on the endorsed health systems standards following a consultative process involving states. The National Nutrition Directorate (NND), established in the Primary Health Care General Directorate, is the body through which the Federal Ministry of Health ensures the provision of high quality nutrition interventions, by defining technical standards for health and nutrition work, facilitating inter-sectoral coordination, as well as monitoring the overall quality of nutrition services <sup>6</sup>. Sudan is one of the 61 countries that leading a global movement to end up malnutrition in its all forms. On 14 October 2015, the Republic of Sudan joined the Scaling Up Nutrition (SUN) Movement investment with a letter of commitment from the Federal Minister of Health. While considerable progress had been made in some areas including fortification and supplementation, more needed to be done to reduce chronic undernutrition, anemia, and low birth weight. Sudan instituted a strong mechanism for scaling up nutrition consist of establishing multi-sectoral platform (MSP) for nutrition which includes the Higher Council of Food Security and Nutrition which link states ministries of health with the National Nutrition Program Office (NNP) of the Ministry of Health. Also, formulation of National Nutrition Committee (NNC) in order to engage with stakeholders including the private sector, civil society, UN agencies, development partners and academia. In addition to that, Sudan has developed advocacy tools and a decentralization plan to districts, complemented community-level coordination structures. The reports of 2019 showed a success in bringing people together into a shared space for action by establishing of the SUN Academia and Research Network and the subsequent successful nomination of the Faculty of Medicine at the Khartoum university as a convener marks another step towards a fully inclusive Multi-Stakeholder Platform (MSP). Although the current nutrition interventions focus on the treatment of acute malnutrition there is an ongoing and gradual shift towards longer term activities, in particular the prevention of stunting. The National Multi-Sector Nutrition Plan (NMNP), including mapping of all nutrition interventions, is underway. In term of ensuring a coherent policy and legal framework, nutrition is emphasized within the current NHSS 2014-2018 as part of the basic package of Public Health Care service. Nutrition is among the core programs addressed through Maternal and Child Health Acceleration Plan. Guidelines and protocols have been developed for Community Management of Acute Malnutrition, the hospital management

of Severe Acute Malnutrition and Infant and Young Child Feeding to improve service provision <sup>7</sup>.

## 2 Dietary intake

It is important to understand dietary patterns as it plays a vital role in reducing the number of people suffering from malnutrition, overweight or obesity and micronutrient deficiencies. The global trends in dietary for all countries between 1961 and 2011 showed that the prevalence of inadequate intakes of micronutrients has improved except for sub-Saharan Africa where there's slight reduction in the intake <sup>8</sup>. In Sudan thirty three percent of the population suffered from food deprivation according to Sudan National Baseline Household Survey data. The prevalence of undernourishment was 31% and 34 % percent for urban and rural populations, respectively as shown from Sudan house hold survey in 2010 <sup>9</sup>. According to food security assessment in Sudan in 2009, the average Sudan nationals daily dietary energy consumption (DEC) was of 2180 Kcal per person. Rural and urban areas had similar daily DEC levels of 2140 and 2270 daily Kcal per person, respectively. The depth of hunger, which refers to the amount of daily dietary energy consumption per person required by the undernourished population to reach the minimum dietary energy requirement (MDER), was 344 Kcal at the national level and 343 and 344 Kcal in urban and rural areas, respectively. This amount of DEC expressed in food quantity is about 100 grams of daily food grains per person which is equivalent to about 37 kg of yearly food grain consumption per person, ignoring possible food losses after food acquisition. The percentage of food in total household consumption, food ratio (FR), was 61.4 percent at the national level, lower in urban areas, 56.4 percent, than in rural areas, 65.7 percent. The contribution of macro-nutrients (carbohydrate, fat and protein) to DEC ranked carbohydrate as the highest source of energy (65.7 percent) followed by fat (21.9 percent) and then protein (12.4 percent) <sup>10</sup>. These contributions to total energy were in line with the WHO/FAO guidelines for a balanced diet by energy-yielding macronutrients <sup>11</sup>. The food and nutrition Security Assessment in Sudan: Analysis of 2009 National Baseline Household Survey revealed that the percentage of DEC from purchases at the national level for the whole country was 80.9 percent, distributed as 91.8 percent in urban areas and 75.2 percent in rural areas. In terms of food sources for DEC from own production was 7.6 percent nationwide, 1.4 percent in the urban areas and 10.7 percent in rural. The highest contributions to DEC measured by the Coefficient of Variation (CV) of DEC from own production which was almost identical to urban and rural populations due similar income in a percentage of 31.2 and 32.2 percent respectively; however, it was higher in female than in male headed households, 35.1 and 29.6 percent, respectively <sup>10</sup>.

### 3 Micronutrient deficiencies

The deficiencies of essential micronutrients are outlined below.

#### 3.1 Iron deficiency

Few data is available on iron deficiency in Sudan. The prevalence of anemia, during the crisis affected population in Darfur, was 55% according to emergency food security and nutrition assessment in 2005<sup>12</sup>. The prevalence is almost the same in pregnant women as extracted in meta-analysis in 2018 of 16 cross-sectional studies included a total of 15,688 that showed a pooled prevalence of anemia of 53.0% (95%, CI = 45.9–60.1)<sup>13</sup>.

#### 3.2 Vitamin-A deficiency

Although vitamin A deficiency (VAD) is estimated to be endemic in many countries, few data on its prevalence is available for many regions of Sudan. According to WHO latest statistics survey in 6 states showed a prevalence of exophthalmia of 3.20 % as of 1996 children under five years<sup>14</sup>. The prevalence of Vitamin A deficiency reached 44% in children and 22% in mothers as shown in nutrition country profile of the year 2000<sup>12</sup>.

#### 3.3 Vitamin D deficiency

A recent cross-sectional study, conducted by Husain *et al.* in 2019 in health centers in Khartoum, Sudan, showed that 82.6% of women were deficient of vitamin D. This may signify that sunshine alone is not sufficient source for vitamin D in the tropics<sup>15</sup>.

#### 3.4 Zinc deficiency

Zinc deficiency, particularly in developing countries is highly frequent, where the dominant diet depends on cereals and it is low in protein. The deficiency of zinc can have a negative health impacts, affecting many body systems<sup>16</sup>, and is an essential nutrient for growth; it reduces mental capacity; and increase the prevalence of maternal, neonatal and child complications<sup>17</sup>. A case control study was conducted by Abass *et al.* in 2014 in Medani Hospital in Sudan revealed that the maternal zinc level, was lower in LBW newborns than in those with normal weight<sup>18</sup>.

#### 3.5 Iodine deficiency

Although there is no national recent survey data about micronutrient deficiencies in Sudan, it is evident that they resemble a major public health problem; especially in children and pregnant women, as evident by sporadic studies in different parts in the country. Deficiencies of iodine and iron if not treated, both will result in significant adverse and serious health problems; during fetal stage or early infancy, can cause motor and mental retardation<sup>19</sup>. The Federal Ministry of Health in 1999 declared that 22% of Sudanese population have iodine deficiency, the number of children born with iodine

deficiency each year are 242,400, among them, the cretins are estimated to be 7,000, and those who will suffer from severe mental retardation are 24,000. The neonates, who will grow up with mild degree of intellectual deficit, are estimated to be 210,000. Among each ten children of school-going age, two children may suffer from iodine deficiency, most of them do not have visible signs and symptoms like goiter<sup>20</sup>.

**Table 1:** Prevalence of Iron, Iodine Vitamin A, and Zinc deficiencies in Sudan

Micronutrients deficiency	Prevalence (%)
Iron deficiency anemia	85
Iodine deficiency disorders	22
Vitamin A deficiency in children	27.8
Zinc deficiency	7.4
Vitamin D deficiency	82.6

Data source for iron deficiency anemia from WFP Sudan 2005<sup>12</sup>, iodine deficiency from Zimmermann *et al.* (2004)<sup>19</sup>, Vitamin A deficiency from WHO 2000<sup>14</sup>, and Vitamin D deficiency from Husain *et al.* 2019<sup>15</sup>.

### 4 NCDs

The most prevalent non-communicable diseases in Sudan include, hypertension, ischemic heart disease, cancers, diabetes mellitus, asthma, renal disease, general injuries and road traffic accidents, injuries and mental health disorders. These selected diseases accounted for 41% of all deaths in 2005<sup>21</sup>. Cardiovascular disease (CVD) is one of the major causes of mortality, disability and morbidity. In Sudan, the tetrad of hypertension, rheumatic heart disease, ischemic heart disease, and cardiomyopathy constitute the majority of CVD in a percentage of around 80% of cases. The Sudan House Hold Survey conducted in 2010 showed a prevalence of 2.5% self-reported heart disease. Hypertension had a prevalence of 20.1% in this survey<sup>9</sup>. In 2016, the step wise survey used to measure the risk factors of non-communicable diseases NCDs, showed that 20.4% , 28.3% and 10% of Sudanese population suffer from hypertension, overweight or obesity respectively with the percentage being much higher in women (35.6%) than men (22.6%). Overall (17%) of urban respondents were obese as compared to (6.2%) of rural participants with the prevalence being significantly higher (25.0%) among urban females compared with rural females (8.6%) which indicates a higher risk of NCDs and their complications.

The biochemical measurements showed overall prevalence of impaired fasting glycaemia of 3.4% while the prevalence of raised fasting blood glucose was 6%. Furthermore, there was a marked difference between urban (8.7%) and rural (4.4%) and the difference was more marked when comparing urban females (11.2%) to rural ones (4.7%). To complete the picture of metabolic syndrome among Sudanese population, the mean total blood raised cholesterol, including those currently on medication was 13.8% and the percentage CVD risk for aged 40-69 years with a 10-year  $\geq 30\%$ , or with existing CVD was 3.5%<sup>22</sup>.

A Five-year Survey of Cancer Prevalence in Sudan extracted from Radiation and Isotope Centre in Khartoum (RICK) which covers approximately 80% of patients with cancer in Sudan for the period 2009-2013, showed that the cancer prevalence rate per year was 5,000-7,000 among adults and 300-400 among children, with an increasing tendency for adults. Male: female ratios were 1:1.18 for adults and 1.46:1 for children<sup>23</sup>. The WHO statistics from global cancer observatory for 2018 showed 5-year prevalence of 43 520 computed using sex, site- and age-specific incidence to 1-3- and 5-year prevalence ratios for the period (2000-2009), and scaled using Human Development Index (HDI) ratios. Breast cancer was the most common cancer with 5677 cases accounted for (36.6%) followed by Leukemia 1 808 (7%), Non-Hodgkin lymphoma 1 675 (6.5%) and Colorectal cancer 1 398 (5.4%) Oesophagus 1 132 (4.4%)<sup>23</sup>. The percentage of women aged 30-49 years who have ever had a screening test for cervical cancer according to STEP 2016 was 1.7%<sup>24</sup>.

**Table 2:** Prevalence of CVD, Obesity/overweight, Diabetes, Cancers, Metabolic syndrome in Sudan

Prevalence of	Percentage (%)
Self-reported heart disease	2.5
Hypertension	20.4
Overweight	28.3
Obese	10
Urban Obese	17
Rural Obese	8.6
Impaired Fasting Glycaemia	3.4
Raised fasting blood glucose	6
The mean total blood raised cholesterol, including those currently on medication	13.8
CVD risk for aged 40-69 years with a 10-year $\geq 30\%$ , or with existing CVD	3.5
5-year prevalence of cancer	43 520

Data source from SHHS Survey Second Round 2010<sup>9</sup>, Sudan WHO Stepwise report 2016<sup>22</sup>, SAEED *et al.* 2020<sup>23</sup> and WHO Cervical cancer fact sheet for countries 2020<sup>24</sup>.

## 5 Special focus on infant and children under 5 years

Sudan is a third world country with high numbers of infants and children under five morbidity and mortality. Under nutrition is one of the Sudan most crucial, but least tackled health problem. Children health suffers from a lack of population awareness about the outcomes of and solutions to under nutrition. According to the United Nations Children's Fund (UNICEF) reports in 2004 key demographic indicators under five mortality rates in Sudan is 60.5 per 1000 live births, and infant mortality rate is 42 per 1000 live births. However, UNICEF statistics have shown dramatic decline in less than five mortality rates since the year 1990. The causes of death for children under five according to WHO are; pneumonia, prematurity, birth asphyxia, infections, congenital anomalies, diarrhea, injuries and others. Low birth weight rate is increasing in Sudan with prevalence of 31%

according to UNICEF 2004 and this can cause adverse impact on both the short and the long term<sup>25,26</sup>.

Children with low birth weight have increasing chance of perinatal mortality and morbidity. Furthermore, the cognitive function, the development and growth are all affected, and there is an increasing risk to develop different chronic diseases later in life. Stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median. In Sudan, the stunting of under-five prevalence is 38.2%, this is more than the average of the developing countries which is 25% Wasting which is low weight for height also has a higher prevalence in under-five in Sudan comparing it with the developing countries' average which are 16.8% and 8.9% respectively as of 2020 edition<sup>27</sup>.

Under-nutrition is a main danger to the children under-five in Sudan. Recently, Sudan have more malnourished children than 30 years ago, due to a rise in the prevalence in the past 20 years from 20 to 32 per cent underweight, and from 32 to 35 per cent according to UNICEF 2014 statistics. Communicable diseases constitute a significant reason for both morbidity and mortality in Sudan and the country continues to be susceptible to measles, meningitis, acute watery diarrhea and most recently chikungunya and dengue fever<sup>26</sup>.

The newborn and child health indicators are still far away from reaching the goals for 2030. Forty percent of total child mortality is related to neonatal causes. The fact that 30 per cent of the population in Sudan live more than 5 kilometers away from a primary health care service, causing the coverage with full primary health care service to be remarkably low, where only 24 per cent of health institutes provide a comprehensive service of primary health care<sup>26</sup>.

**Table 3:** Prevalence of low birth weight, stunting, wasting and underweight in Sudan

Prevalence of	Percentage (%)
Low birth weight	31
Stunting	38.2
wasting	16.8
Under-weight	35

Data source for this table from UNICEF 2004<sup>25</sup>. Low birthweight: country, regional and global estimates and UNICEF/WHO/The World Bank Group joint child malnutrition estimates: levels and trends in child malnutrition: key findings of the 2020<sup>26</sup>.

## 6 Exclusive breastfeeding practice versus early complementary feeding

The WHO recommends early initiation of exclusive breastfeeding up to six months and continuing breast feeding plus complementary feeding up to two years. In countries with low-income and underused resources such as Sudan, the children of two years and less are vulnerable to high morbidity and



mortality<sup>27,28</sup>. They are vulnerable to malnutrition, respiratory tract infections and otitis media. It was documented by a study conducted in 2015 that the high rates of malnutrition among children in Khartoum resulted from not being breastfed or from early weaning<sup>29</sup>. Among the intervention methods, the WHO recommends exclusive breastfeeding to reduce neonatal mortality rates, in addition to prevent the morbidities, on the other hand, introducing early complementary feeding can be a direct cause of diseases as it exposes the infants to contamination from the utensils, water, or hands. This early complementary feeding can affect the infant's health by depriving them from the natural immunity in the breast milk causing gastrointestinal and respiratory infections. Furthermore, infants are at risk of developing food allergies, childhood cancer, cardiovascular diseases, diabetes and obesity later in life<sup>30</sup>. It should be noticed that several factors have significant impact on delaying exclusive breastfeeding practice such as; pre-lacteal feeding, low socio-economic status, the level of education and age of the mother at marriage, mother's occupation, the mode of delivery, the maturity and the size of infant, etc.<sup>31</sup>.

**Table 4: Prevalence and Practices of Exclusive breastfeeding and early complementary feeding in Sudan**

Age of Exclusive breastfeeding	Percentage of children (%)
<b>0-1 month</b>	25.6
<b>2-3 months</b>	18.5
<b>4-5 months</b>	6.0
<b>&lt;4 months</b>	21.4
<b>&lt;6 months</b>	15.6
<b>Timely complementary feeding</b>	
6-9 months	46.6
<b>Continued breastfeeding</b>	
12-15 months (1 year)	83.5
20-23 months (2 years)	40.4

Data source for this table from Sudan Central Bureau of Statistics Multiple indicator cluster Survey 2014<sup>32</sup> and Abdel-Rahman 2020<sup>34</sup>.

In 2014, according to the World Bank development indicators in Sudan the average of exclusive breastfeeding for under 6 months was 54.6 %. Optimal early feeding practice was delivered to 50% of Sudanese infants only, with recognizable diversity between different regions in the country. This is due to multiple factors related to socioeconomic status, and factors related to the mothers and children themselves. A national survey conducted in 2000, with the objective of describing the infant and young child feeding practices among infants under four months of age, revealed about fifth of the infants were exclusively breastfed. The proportion decreased to 16% for infants under six months. Less than fifty percent received complementary food in addition to breastmilk was found in infant between 6 and 9 months<sup>32</sup>. In most cases, infants and young children receive complementary foods only once or twice a day. Basic cereal boiled in water or porridges with water of uncertain quality<sup>33</sup>. Eighty-four percent of the children approximately continued to be breastfed till age of 12-15 months and 40% till age of 20-23 months<sup>32</sup>. The median duration of breastfeeding among children

under three years, was 19 months in 1990. While breastfeeding is a fairly common practice in Sudan, progress still needs to be made to promote exclusive breastfeeding up to 6 months and to encourage timely supplementation of breast milk with nutritious food at 6-9 months<sup>34</sup>.

## 7 Food insecurity

Food insecurity situation in Sudan has been the result of several inter-related factors which collectively resulted in what has been known as a "complex emergency". The key among these causes is the conflict and civil insecurity and the subsequent displacement of the population, climatic variability resulting in recurrent droughts and floods, inadequate investment in small-holder farming, inadequate rural infrastructure and weak rural markets<sup>35</sup>. These causes in addition Limited access to basic public services, has resulted in more than three million people requiring humanitarian assistance every year. The national strategy for development excludes food security policy catalysts and fundamentally hinders the achievement of sustainable national food security. Thus, there is a need to streamline food security agendas in the country's development endeavors<sup>36</sup>. Food insecurity combines with elevated food prices and worsening economic conditions resulted in high levels of vulnerability in Sudan, where approximately 6.2 million people in need of food security and livelihoods assistance and 3.3 million people in need of nutrition assistance, according to the country's Humanitarian Response Plan (HRP)<sup>37</sup>. Overall, 13 million Sudanese were considered food to be food deprived in 2009. Malnutrition rates in children are also alarmingly high with half a million children suffering from Severe Acute Malnutrition (SAM) while close to two million are annually stunted. Sudan's Human Development Index is low (at 0.414 in 2012) and it ranks 171 out of 185 countries<sup>38</sup>. Over 30 percent of food insecure people were concentrated in the Darfur region, Blue Nile, North Kordofan, Kassala and Gadarif also had high levels of food insecurity – between 13 and 19 percent of their population is in Crisis<sup>39</sup>. The first nationally representative household consumption survey conducted in Sudan provides estimates for the various dimensions of poverty show that total incidence of poverty in Northern Sudan is 46.5% and 26.5% urban poverty incidence rates. High regional disparity in poverty levels are evident as Northern Darfur (69.4% ), Southern Kordofan(60%) , and Red Sea State (57.7%) are among the highest poverty ridden areas and Kassala (36.3%), River Nile States (32.2%) and Khartoum (26%) have to lowest levels of poverty<sup>40</sup>.

The main challenges to achieve food security include improvement of the nutrition status of the Sudanese population which is considered as a key component of the essential health care package with a special focus on maternal, child and at-risk populations in the national policies and strategies<sup>41</sup>. This entitles improving access to food by reducing poverty levels especially in rural areas where 57% of the population are estimated to be at to

be under the poverty line <sup>40</sup>. Although it is known that that agriculture accounts for 31% of Sudan's total GDP and the centrality of agricultural activities to the livelihoods of over 40% of its population, but the domestic supply and stability of major staple grains (sorghum, millet and wheat) are insufficient in the face of a rapidly expanding population, to overcome this deficit a coordination between areas of surplus and areas of grain deficit is greatly needed <sup>40</sup>.

**Table 5: Food insecurity situation in Sudan**

Food in Security Item	Number of population suffering (million)
Food deprived population	13
people in need of food security	6.2
people in need of nutrition assistance	3.3

Data source for this table from US AID FOOD ASSISTANCE FACT SHEET – SUDAN 2020 <sup>37</sup> and SHHS Nutritional area 2010 <sup>9</sup>.

## 8 Conclusion

Malnutrition is a major issue in Sudan, although the dietary intake contributions to total energy were in line with the guidelines. The increased prevalence rates are due to the lack of proper quality and quantity of food, low socioeconomic status and the lack of knowledge on feeding practices. There are other factors such as the limited access to resources which compounded with conflicts in many parts of the country augmented by climatic drought and floods and, poor infrastructure, infectious diseases which are considered to be a major health problem across the country.

There is a clear evidence that micronutrient deficiencies are a major public health issue and they are widespread with dangerous health consequences, although recent survey data are lacking. The non-communicable disease statistics in Sudan was not comprehensive, especially in cancer registry and surveys. Sudan is still struggling with high numbers of infants and children under five morbidity and mortality which are still far away from reaching the goals for 2030.

Notwithstanding these challenges, the government and the Federal Ministry of Health, move along to make progress towards nutrition and food security, some supplementation campaigns have been conducted but coverage of the population is still low.

## 9 Recommendations

One of the priorities for the Federal Government of Sudan should be improving the health and nutrition status. Stopping of tribes' conflicts, improving infrastructures, transport, and raising of health awareness should take priority in the government agendas in order to combat the adverse effects of malnutrition, micronutrients deficiencies, communicable and non-communicable diseases. Health intervention, in terms of health education, leading to modifying behaviors, and that can be achieved through efficient collaboration with the

governmental and nongovernmental agencies to enhance the child health status, are still required.

Health education about breastfeeding promotion should also be improved. Encouraging the working mothers to breastfeed according to the WHO/UNICEF guidelines and providing appropriate facilities in the workplaces. Most of the national hospitals that take care of mothers and babies should adopt the baby Friendly Hospital Initiative. Starting to teach future mothers from an early age about correct breastfeeding and complementary feeding practices and their importance, should be in the schools and at community level.

In addition to Improving health services to ensure availability and accessibility of primary and essential health care for all citizens to reach the goal of health for all and ensure equality mainly through focusing on vulnerable groups.

The limitations of the current review depend solely on secondary data which might provide incomplete information, in addition to some references were old due to limited access of the whole range of data.

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