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ESTADO NUTRICIONAL E CONSUMO ALIMENTAR DE CRIANÇAS MENORES DE CINCO ANOS, MULHERES GRÁVIDAS E LACTANTES APÓS O CICLONE IDAI

NUTRITIONAL STATUS AND FOOD CONSUMPTION OF CHILDREN UNDER FIVE YEARS, PREGNANT AND LACTATING WOMEN AFTER CYCLONE IDAI

ESTADO NUTRICIONAL Y EL CONSUMO DE ALIMENTOS DE LOS NIÑOS MENORES DE CINCO AÑOS, DE LAS MUJERES EMBARAZADAS Y LACTANTES TRAS EL CICLÓN IDAI

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RESUMO

Introdução: O ciclone Idai criou graves mudanças no nível de vida da população em Dombe, Moçambique
Objetivo: Avaliar o estado nutricional e caracterizar o consumo alimentar de crianças menores de cinco anos de idade e de mulheres grávidas e lactantes (MGL).
Métodos: Estudo transversal com amostra probabilística por conglomerados complementada por amostra aleatória simples. Foi avaliado o estado nutricional de crianças e MGL através da pesagem, medição da estatura e do perímetro braquial e caracterização da frequência alimentar por meio de aplicação de questionários de frequência alimentar (QFA).
Resultados: Nas crianças menores de cinco anos de idade, houve uma prevalência de desnutrição aguda grave de 2,1% e desnutrição aguda moderada, 4,1%. Em relação à desnutrição crónica grave, a prevalência foi de 19,8% e desnutrição crónica moderada, 22,1%. O baixo peso grave foi de 3,6% e o baixo peso moderado, 7,8%. A prevalência de sobrepeso foi de 7,7% e de obesidade 1,8%. Quanto às mulheres grávidas e lactantes 4,7% foram diagnosticadas com desnutrição aguda moderada. O consumo alimentar de ambas as populações em estudo é caracterizada por consumo de cereais e derivados, vegetais e peixe seco ou de rio.
Conclusão: o estado nutricional das crianças e MGL é normal, contudo foram registados casos de malnutrição. O consumo alimentar de ambas populações não é equilibrado.

Palavras-chave: crianças; desnutrição; mães grávidas e lactantes; reassentamento

ABSTRACT

Introduction: Cyclone Idai triggered severe changes in the living standards of the population in Dombe, Mozambique.
Objective: To assess the nutritional status, and characterise food consumption of children under five years of age and pregnant and lactating women (PLW).
Methods: Cross-sectional study with probabilistic sampling by conglomerates complemented by simple random sampling. The nutritional status of children and PLW was assessed by weighing, measuring height and brachial perimeter and characterising food consumption by applying food frequency questionnaires (FFQ).
Results: In children under five years of age, there was a prevalence of severe acute malnutrition of 2.1% and moderate acute malnutrition, 4.1%. Regarding severe acute malnutrition, the prevalence was 19.8% and moderate acute malnutrition, 22.1%. Severe low weight was 3.6% and moderate low weight, 7.8%. The prevalence of overweight was 7.7% and obesity 1.8%. Pregnant and lactating women were diagnosed with moderate acute malnutrition (4.7%). Food consumption in the populations is characterised by the consumption of cereals and derivatives, vegetables and dried or river fish.
Conclusion: Nutritional status of children and PLW is normal, however cases of malnutrition were observed. Food consumption of both populations is unbalanced.

Keywords: children; malnutrition; pregnant and lactating mothers; resettlement

RESUMEN

Introducción: El ciclón Idai provocó graves cambios en el nivel de vida de la población en Dombe, Mozambique.
Objetivo: evaluar el estado nutricional y caracterizar el consumo de alimentos de los niños menores de cinco años y de las mujeres embarazadas y lactantes (MEL).
Métodos: Estudio transversal con muestreo probabilístico por conglomerados complementado con un muestreo aleatorio simple. El estado nutricional de los niños y de las MEL se evaluó mediante el pesaje, la medición de la altura y el perímetro braquial y la caracterización de la frecuencia alimentaria mediante la aplicación de cuestionarios de frecuencia alimentaria (CFA).
Resultados: En los niños menores de cinco años, hubo una prevalencia de desnutrición aguda severa del 2,1% y de desnutrición aguda moderada, del 4,1%. En cuanto al retraso severo en el crecimiento, la prevalencia fue del 19,8% y el retraso moderado, del 22,1%. La insuficiencia ponderal grave era del 3,6% y la moderada, del 7,8%. La prevalencia de sobrepeso era del 7,7% y la de obesidad del 1,8%. Las mujeres embarazadas y lactantes fueron diagnosticadas con desnutrición aguda moderada (4,7%). El consumo de alimento de las poblaciones se caracteriza por el consumo de cereales y derivados, verduras y pescado seco o de río.
Conclusión: El estado nutricional de los niños y MEL es normal, sin embargo, se registraron casos de desnutrición. El consumo de alimentos de ambas poblaciones es desequilibrado.

Palabras Clave: niños; desnutrición; madres embarazadas y lactantes; reasentamiento

INTRODUCTION

Central region of Mozambique was devastated by Cyclone Idai in 2019, causing a humanitarian disaster. The Cyclone was of intensity 4 on the Saffir-Simpson scale, with winds of more than 240 km/h, accompanied by heavy rainfall of 200 mm/24hours. Shortly afterwards, some districts in northern region of the country (Cabo-Delgado and Nampula) were also hit by Cyclone Kenneth (Matos & Ndapassoa, 2020). Cyclone Idai was devastating, and affected health, infrastructural, educational, economical and agricultural sectors. Cyclones Idai and Kenneth created widespread flooding, destruction of almost 780,000 hectares of agricultural crops and the displacement of tens of thousands of families in northern and central Mozambique. There was also loss of lives. Unavailability of food in acceptable quantity and quality has negative effects, particularly on children, pregnant and lactating women (PLW), as their tolerance to nutrients shortage is minimal (Chamova & Dimitrova, 2020). Number of children under five facing crisis of food insecurity was expected to rise to 200,000 in areas affected by natural disasters by February 2020 and about 38,000 children could become extremely malnourished and at risk of death in the same period (UNICEF, 2019). The aim of this study was to assess nutritional status and characterize food consumption of children under five years of age and PLW residing in resettlement centres in Dombe, Mozambique, after Cyclone Idai in 2019.

1. LITERATURE REVIEW

Food and nutritional insecurity (FNI) are public health problems. Several factors may contribute to occurrence of FNI, such as food shortages, food supply problems, insufficient food production, loss of income, poverty, rising food prices, and climate change, which currently cause floods and Cyclones. Food availability and quality are indirect indicators of FNI (Coelho et al., 2015). FNI has physical or biological consequences for individuals, such as low weight and/or nutritional deficiencies (Kepple & Segall-Corrêa, 2011). Access to food (known as food security) is not lonely sufficient. Food must be safe (known as food safety). *Food security* expresses the guarantee of access to food consumption and covers the whole set of needs for obtaining adequate nutrition for health. F*ood safety,* on the other hand, implies a guarantee of safe food in terms of collective health, i.e., products free of chemical (agrochemicals), biological (pathogenic organisms), physical agents (sand, pieces of glass, iron) or other substances which could pose a risk to health (Matos & Ndapassoa, 2020).

Most population in Mozambique rely on subsistence agriculture; other, also on informal trade. However, cyclone Idai caused total and/or partial destruction of farms and infrastructure and loss of livestock, increasing vulnerability of children under five and PLW in terms of food acquisition and health. Children undernutrition remains a serious problem in developing countries, poor food intake being one of major cause (Khamis et al., 2019). The "first 1,000 days" period of life, known as the window of opportunity, is an important stage to optimize child growth and development in order to prevent malnutrition, including wasting, underweight and stunting, as well as the negative consequences in adulthood (Ahmad et al., 2018). Undernutrition is also a major cause of anaemia. Mild forms of micronutrient malnutrition and anaemia can have negative consequences for health and development. Severe anaemia is often associated with increased maternal mortality, pre-mature birth, low birth weight, and impaired child development (Petry et al., 2019). Food intake optimizes child development, and performance. Yet, an estimated number of 250 million children under five years of age from low- and middle-resource settings (43%) will not achieve their full developmental potential due to social, economic, nutritional, and learning opportunity constraints (Villar et al., 2019).It was estimated that undernutrition is associated with 45% of child deaths. Additionally, globally in 2020, 149 million children under five were estimated to be stunted (too short for age), 45 million were estimated to be wasted (too thin for height), and 38.9 million were overweight or obese (WHO, 2021). Nutritional status of pregnant women predefines the physiological profile of the future adult. Many pathological conditions in adult are the consequence of nutritional ground of an individual in intrauterine life. Thus, occurrence of malnutrition events in pregnant women may trigger irreversible problems for the new-born (Wu et al., 2014).

Displacement of people due to natural disasters, contributes to deteriorating living conditions and food imbalance, as it triggers economical losses (Abbas Khan et al., 2019). Precariousness of living conditions may have worsened with the outbreak of the COVID-19 pandemic in December 2019, as the availability and access of water and food became increasingly unsustainable. Indeed, the State of Food Security and Nutrition in the World (SOFI) cited by UNICEF (2021) indicated that nearly one-tenth of the world population – up to 811 million people went hungry in 2020. Further, it is projected that around 660 million people may still face hunger in 2030, 30 million more people than in a scenario in which the pandemic had not occurred, due to lasting effects of COVID-19 on global food security, making the achievement of the Sustainable Development Goal for zero hunger and ending all forms of malnutrition more challenging (UNICEF, 2021).

2. METHODS

Cross-sectional study with probabilistic sampling by conglomerates complemented by simple random sampling. The nutritional status of children and PLW was assessed by weighing, measuring height and brachial perimeter and characterising food consumption by applying food frequency questionnaires (FFQ).

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2.1 Local

The study was conducted between September and December 2020 in the resettlement centres of Muwawa, Bairro Unidade, Magaro, Macocoe, Mucombe, Nhanhemba-2, Madibunhana, Tussene Shoma and Matarara, located in Dombe, Sussundenga, Manica province, central region of Mozambique.

2.2 Sample

Total number of residents in the resettlement centres is 10,688 (minimum 420 and maximum 1,938 people) grouped in 2,040 families. Children under five years of age and PLW residing in the resettlement centres are 2672 and 1779 respectively. Firstly, we calculated overall sample of the children and PLW. From this sample, we determined corresponding number of individuals in each centre resulting in: (i) 339 children under five years of age of both sexes (whose survey was answered by a caregiver) and (ii) 319 pregnant and lactating women. Conglomerate sampling technique was applied, followed by simple random sampling.

2.3 Data Collection Procedures and Instruments

Child caregivers and pregnant and lactating women were face-to-face surveyed by administration of survey forms, consisting of closed- and open-ended questions to collect data relating to gender and age of children, and education for pregnant and lactating women. Nutritional status was assessed by weighing, measuring height and brachial perimeter using scales, stadiometer and brachial perimeter tape, respectively (weighing scale SECA, max weight: 150 kg, Mfd. 2016), height (stadiometer, electromed Ltd, precision 0.1, max height: 210 cm), arm length and skin folds of triceps and sub scapularis (adipometer CIMA, max fold: 20 mm, Mfd. 2015). For PLW only the brachial perimeter was measured. Indicators used to assess the nutritional status were weight-for-height, height-for-age and weight-for-age. For weight-for-height indicator, the cohort points used were: SAM - Severe Acute Malnutrition (< z-score -3); MAM - Moderate Acute Malnutrition (> z-score -3 and < z-score -2); Adequate or normal weight (> z-score -2 and < z-score +2); Overweight (> z-score +2 and < z-score +3); Obesity (> z-score +3). For weight-for-age, SLW - Severe Low Weight (< z-score -3); MLW - Moderate Low Weight (> z-score -3 and < z-score -2); Adequate or normal weight (> z-score -2 and < z-score +2) and for height-for-age, SCM - Severe Chronic Malnutrition (< z-score -3); MCM - Moderate Chronic Malnutrition (> z-score-3 and < z-score -2); Age-appropriate or normal height (≥ z-score -2). For PLW, SAM: > 21cm; MAM: > or = 21cm and <23 cm. Source: WHO, 2006; adapted by (PUC Goiás, 2013).

We applied Food Frequency Questionnaire (FFQ) as an instrument to collect information regarding to food consumption of families with pregnant and lactating women and children under five years old. In addition, breastfeeding and food intake was explored from the same group. We analysed frequency of consumption of cereals and derivatives, tubers, legumes and nuts, milk and derivatives, meat and eggs, fish and shellfish, vegetables, fruits, oils and fats, sweets and salty snacks and beverages, in the last three months to the date of study. Frequency of consumption was categorized as: once a day, 2 or more times a day, once a week, 2 to 4 times a week, 5 to 6 times a week, 1 to 3 times a month and never.

2.4 Inclusion Criteria and Ethics

To be children under five years of age and pregnant or lactating women or child caregiver, residing in the resettlement centres in the Dombe, Mozambique.

The study had approval from Bioethics Committee of Lúrio University with registration no 31.1/Feb/CBISUL/20 and all ethical procedures were observed based on the World Medical Association Helsinki Declaration of Ethics, Principles for Medical Research Involving Human Subjects, 2013.

2.5 Statistical Analysis

The data were treated using descriptive and inferential statistics. Frequencies were calculated using the statistical package *Jamovi* version 1.2.27, and tables were constructed using MS Excel. The confidence level set was 95% and a cut-off value of 0.05 for the p-value. Shapiro-Wilk normality tests for weight, height and brachial perimeter, *t-test* for independent samples, ANOVA and chi-square were performed.

3. RESULTS

54.9% (n=186) children under five years of age are female and 45.1% (n=153) are male. Their age ranged from 6 to 59 months. The average height of children is 78.5 cm (minimum 54.8 and maximum 109 cm) and weight is 10.7 kg (minimum 5.9 and maximum 19.1 kg). The mean of brachial perimeter is 15 cm (minimum 10.5 and maximum 20.5 cm). Shapiro-Wilk normality test indicated that the values of height and brachial perimeter do not follow a normal distribution ($p<0.05$), while the values of weight of same children follow a normal distribution ($p>0.05$).

A total of 319 pregnant and lactating women (PLW) aged 16 to 46 years old (mean 26.5) were included. Of them, 53.3% (n=170) have primary education, 38.6% (n=123) have no education, 6.3% (n=20) have basic education, while only 1.9% (n=6) have medium education. Yet, many of the women could not read or write.

Nutritional Status of Children Under Five Using the *Weight-for-height* Indicator

We used *weight-for-height* indicator to evaluate acute malnutrition, overweight and obesity. The diagnosis indicated that most children (84.4%, n=286) are eutrophic or normal. However, 2.1% (n=7) children were diagnosed with severe acute malnutrition (SAM) and 4.1% (n=14) moderate acute malnutrition (MAM). On the other hand, 7.7% (n=26) is overweight and 1.8% (n=6) obese (Table 1).

Chi-square test showed statistically significant relationship between gender and prevalence of acute malnutrition in children under five years of age (p>0.05). Female had relatively greater tendency to develop cases of acute malnutrition. As for the degree of severity by gender, SAM was recorded only on female (100%, n=7). For MAM, it was also female who presented higher prevalence (57.1%, n=8) when compared to male (42.9%, n=6). Additionally, females presented higher prevalence of overweight 65.4% (n=17), while for males it was 34.6% (n=9). Regarding to obesity both genders presented equal prevalence (50% each). ANOVA test showed that there is a correlation between acute malnutrition and brachial perimeter of children under five years old (p>0.05), indicating that this measure was viable for the evaluation of acute malnutrition. We, then, test whether or not there is a correlation between low weight and acute malnutrition in children, and no correlation was found between the two variables (p<0.05).

Table 1 - Diagnosis of children in the resettlements based on the indicator "Weight-for-height".

	Resettlement								
Weight-for-height	**Bairro Unidade**	**Macocoe**	**Madibunhana**	**Magaro**	**Matarara**	**Mucombe**	**Muwawa**	**Nhanhemba 2**	**Tussene Shoma**
SAM (p=0.05)	0	0	2.3% (n=1)	2.2% (n=1)	4.5% (n=1)	0	0	1.8% (n=1)	5.9% (n=3)
MAM (p=0.05)	0	0	2.3% (n=1)	15.6% (n=7)	0	0	4.2% (n=2)	3.6% (n=2)	3.9% (n=2)
Normal (p=0.05)	80.5% (n=33)	89.5% (n=17)	88.6% (n=39)	66.7% (n=30)	95.5% (n=21)	100% (n=14)	87.5% (n=42)	87.3% (n=48)	82.4% (n=42)
Overweight (p=0.05)	19.5% (n=8)	0	4.5% (n=2)	13.3%(n=6)	0	0	8.3% (n=4)	5.5% (n=3)	5.9% (n=3)
Obesity (p=0.05)	0	10.5% (n=2)	2.3% (n=1)	2.2% (n=1)	0	0	0	1.8% (n=1)	1.9% (n=1)

SAM – Severe acute malnutrition (< z-score -3); MAM – Moderate acute malnutrition (> z-score -3 e < z-score -2); Eutrophic or Normal (> z-score -2 e < z-score +2); Overweight (> z-score +2 e < z-score +3); Obesity (> z-score +3). Fonte: OMS, 2006; adapted from (PUC Goiás, 2013).

Nutritional Status of Children Under Five Using the Weight-for-Age Indicator

Weight-for-age indicator showed that most children have appropriate weight for their age. However, severe low weight (SLW) was diagnosed (3.6%; n=12) and moderate low weight (MLW), 7.8% (n=26) (Table 2). Females presented the highest rates of MLW with 65.4% (n=17) compared to 34.6% (n=9) for males, and for SLW with 75% (n=9) compared to 25% (n=3) males.

Table 2 - Diagnosis of children in the resettlements based on the indicator "Weight-for-age".

	Resettlement								
Weight-for-age	**Bairro Unidade**	**Macocoe**	**Madibunhana**	**Magaro**	**Matarara**	**Mucombe**	**Muwawa**	**Nhanhemba 2**	**Tussene Shoma**
SLW (p=0.05)	2.4% (n=1)	0	4.5% (n=2)	4.4% (n=2)	0	0	4.2% (n=2)	3.6% (n=2)	5.9% (n=3)
MLW (p=0.05)	7.3% (n=3)	0	0	20% (n=9)	9.1% (n=2)	0	14.6% (n=7)	1.8% (n=1)	7.8% (n=4)
Normal (p=0.05)	90.2% (n=37)	100% (n=19)	95.5% (n=42)	64.4% (n=29)	90.9% (n=20)	100% (n=14)	81.3% (n=39)	94.5% (n=52)	86.3% (n=44)

SLW– Severe low weight (< z-score -3); MLW – moderate low weight (> z-score -3 e < z-score -2); Normal (> z-score -2 e < z-score +2). Source: WHO, 2006; adapted from (PUC Goiás, 2013).

Nutritional Status of Children Under Five Using the *Stature-for-Age* Indicator

Although most of the children had ideal stature in relation to their age (84.4%, n=286) cases of chronic malnutrition were also

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diagnosed (n=142). As for the degree of severity, prevalence of severe chronic malnutrition (SCM) was 19.8% (n=67) and that of moderate chronic malnutrition (MCM), 22.1% (n=75), indicating that the children are below ideal stature for their age (Table 3). Statistically significant association was found between gender and the development of chronic malnutrition in children (p>0.05). Female had a higher rate of chronic malnutrition. Regarding the degree of severity, it was also the females who presented the highest prevalence of SCM (56.7%, n=38) and (43.3%, n=29) for males. Number of cases of MCM, showed no difference between male and female.

Table 3: Diagnosis of children in the resettlements based on the indicator "Stature-age".

Stature-Age				Resettlement					
SCM (p=0.05)	36.6% (n=15)	10.5% (n=2)	11.4% (n=5)	31.1% (n=14)	13.6% (n=3)	21.2% (n=3)	27.1% (n=13)	7.3% (n=4)	15.7% (n=8)
MCM (p=0.05)	21.9% (n=9)	15.8% (n=3)	13.6% (n=6)	31.1% (n=14)	18.2% (n=4)	7.1% (n=1)	33.3% (n=16)	16.4% (n=9)	25.5% (n=13)
Normal (p=0.05)	41.5% (n=17)	73.7% (n=14)	75% (n=33)	35.6% (n=16)	68.2% (n=15)	71% (n=10)	39.6% (n=19)	76.4% (n=42)	58.2% (n=30)

SCM - Severe Chronic Malnutrition (< z-score -3); MCM - Moderate Chronic Malnutrition (> z-score -3 and < z-score -2); Adequate height for age or normal (≥ z-score -2). Source: WHO, 2006; adapted by (PUC Goiás, 2013).

Nutritional status of pregnant and lactating women

Brachial perimeter was measured for pregnant and lactating women, and 4.7% was diagnosed with moderate acute malnutrition. [SAM: > 21cm; MAM: > or = 21cm and <23 cm].

Breastfeeding habits for Children Under Five Years Old

Almost all respondents (99.7%, n=338) reported that the first food given to the baby was breast milk. Only one respondent also mentioned water. By the time of study, 43.7% (n=148) respondents reported that their children were not taking breast milk. Others (56.3%, n=191) fed them cow's milk. Relating to children's age, the majority (92.1%, n=176) were in the interval from 6 to 23 months of age and of those who did not take milk, 89.9% (n=133) pointed that the babies were between 24 and 59 months of age. For those who answered "no breast milk", they were asked at how many months the child had stopped taking milk. About 127 respondents (86.4%) stated that they had weaned from 13 months of age (Table 4).

Table 4 - Breastfeeding of children under five years of age

Does the child drink breast milk?	Yes	No
	56.3% (n=191)	43.7% (n=148)
If answered "no" how long did you stop breastfeeding?	n	%
13+ months	127	86.4
7-12 months	18	12.2
3-6 months	3	2

Mothers' knowledge About Good Breastfeeding and Regular Feeding Practices

We sought to explore knowledge on the benefits of exclusive breastfeeding in the first six months of life. The data indicated that most of participants knew about the nutritional role of breast milk (63,7%; n=216), but did not know its protective role (77.9%, n=244). More than half respondents 56.6% (n=192) gave liquids at six months of age, but one of the respondents referred she gave other liquids on the very first day of life. Regarding to porridge consumption, 72.6% (n=246), said they started at the sixth month of age and only two (0.6%) said at twelve months. Most caregivers (49.0%, n=166) provide three meals a day to their children. Other 26.0% (n=88) provide two meals, while 13.3% (n=45) provide only one meal (Table 5) showing an incomplete feeding pattern (Table 5). In the last 24 hours of data collection, mothers or caregivers did not include fruit, bean soup (321, n=94.4%) or vegetable soup (95.3%, n=323) in the children's food.

We explored whether or not there are foods they consider to be good for children. Of the respondents, 285 (84.1%) answered affirmatively, and as example they mentioned rice, beans, breast milk, sweet potato, fruit, yam, cassava, *xima*, bread, fish, while the remaining 54 (15.9%) said there were no such food stuff. In turn, in relation to foods that should not be consumed, 308 (90.9%) respondents stated that there are not.

Table 5 - Children's first consumption of liquid, porridge and number of meals per day

First consumption of liquids	Frequency	First consumption of porridge by children	Frequency	Number of meals per day	Frequency
Do not know	1 (0.3%)	N/A	1 (0.3%)	1	45 (13.3%)
One day	1 (0.3%)	No food	2 (0.6%)	2	88 (25.9%)
14 days	1 (0.3%)	2 months	3 (0.9%)	3	166 (48.9%)
1 month	4 (1.2%)	3 months	14 (4.1%)	More than 3	39 (11.5%)
2 months	17 (5%)	4 months	18 (5.3%)	N/A	1 (0.3%)
3 months	57 (16.8%)	5 months	11 (3.2%)		
4 months	32 (9.4%)	6 months	246 (72.6%)		
5 months	25 (7.4%)	7 months	26 (7.7%)		
6 months	192 (56.7%)	8 months	12 (5.3%)		
7 months	8 (2.4%)	9 months	2 (0.6%)		
8 months	1 (0.3%)	12 months	2 (0.6%)		

N/A – not applicable

Women's perception of food intake during pregnancy and lactation

Most PLW (93.4%, n=298) said there are no foods bad for pregnant individuals. We also found that another portion (72.7%, n=232) did not have enough knowledge about healthy foods to be consumed during pregnancy. Furthermore, there are widespread principles such as, when consuming certain foods, *the foetus may slip or the baby be born sick; or it may cause early uterine contractions*. Finally, the majority (83.1%, n=265) also pointed the existence of feeding practices to promote health after childbirth and improve lactation. These practices included the ingestion of certain foods such as drinking tea with milk, *maheu,* consumption of *cocoa* and fruits, fresh and dried fish. Other practices such as boiling water to drink, performing less strenuous work and intensifying personal hygiene, administering porridge, going to the healer were also mentioned. In case of lactation failure, women have resorted to formula feeding (69.8%, n=220) and hospital in addition to formula milk (15.3%, n= 48). Only a small proportion (4.4%, n=14) referred to go exclusively to the hospital. There are also 7 (4.4%) respondents who don't know what to do in case of lactation problems.

Food Consumption Frequency of the Population in Resettlement Centres

Food frequency questionnaire (FFQ) was applied to families with pregnant and lactating women and children under five. We analysed frequency of food consumption three months prior to data collection. We used the parameters: *once a day, 2 or more times a day, 1 time a week, 2 to 4 times a week, 5 to 6 times a week, 1 to 3 times a month and never* to classify frequency of consumption of cereals and derivatives, tubers, legumes and nuts, milk and derivatives, meat and eggs, fish and shellfish, vegetables, fruits, oils and fats, sweets and salty snacks and beverages. We classified consumption as low, moderate or high if consumption of particular food item, based on the consumption average of approximately 50%, giving to its nutritional importance, and conjugating with the parameters we have fixed and number of food item in a certain group.

For the group of cereals and derivatives, data indicated that maize (70.5%, n=225) and maize flour (70.2%, n=224) were most consumed during the period in reference. The remaining items in this group were consumed with less or moderate frequency. Before Cyclone Idai frequency of maize and maize flour consumption was the same for 82.1% (n=262) respondents. Among tubers, only sweet potato was consumed moderately with a tendency to high (48.3%, n=154) and before the Cyclone frequency of consumption was the same for 59.6% (n=190) respondents. Legumes and nuts are not consumed very frequently. In this group, the most consumed food item was butter beans (41.4%, n=132). Compared to the period before Cyclone, frequency of consumption was the same for 33.2% (n=106).

Frequency of consumption of milk and its derivatives was much lower in the population. For instance, the highest frequency of condensed milk was 16% (n=51), cow's milk 4.1% *(n=13),* powdered milk 21% (n=67). Cheese and yogurt were almost not consumed neither before nor after Cyclone (below 2%). Consumption of meat and eggs, in general, was low with goat meat being the most consumed (35.4%, n=113). Frequency was similar to the period before the Cyclone for 70.8% (n=226). Consumption of chicken egg was moderate. About 32% (n=103) stated they consumed once a week, 29.8% (n=95) two or more times a week and before Cyclone Idai, frequency was the same for 44.5% (n=142) respondents. Freshwater fish was the most consumed food in the group of fish and crustaceans, with frequency of 40.1% (n= 128). Equal frequency was seen for 52.4% (n=167) respondents before Cyclone.

Consumption of vegetables, in general, was low. The most consumed vegetables were tomato and onion (53.9%, n=172, similar frequency for both). Similarly, before Cyclone Idai the frequency of tomato and onion consumption was the same for 67.7% (n=216) participants. On the other hand, consumption of potato and cabbage leaves was low tending to moderate (36.1%, n=114).

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Overall consumption of fruits was also low. Only mangoes were the most consumed (93%, n=296) by the respondents. Similar frequency was observed for 84.6% (n=270) before Cyclone Idai.
Consumption of fats and oils was also low, except for vegetable oil. Consumption of vegetable oil was higher, as most participants (91.8%, n=293) reported consuming it two or more times a day. This scenario was different from that before Cyclone Idai, where frequency was lower for 74.6% (n=238). Regarding to pumpkin seeds, the consumption was much lower as 89% (n=284) said they never consumed.
Consumption of sweets and salty snacks was generally low. Sugar and cake were consumed by 31.7% (n=101), while consumption of savoury snacks was higher. Consumption of fried dumplings was relatively higher as most of women (38.2%, n=122) consumed once a week, 24.1% (n=77) two or more times a day. Before Cyclone Idai the frequencies were the same for 56.7% (n=181). Consumption of *snacks* (e.g., *filos, doritos*) was moderate as of those who consumed, 33.5% (n=107) did once a week and 10.7% (n=34) two to four times a week. Frequencies are similar with those in the period before Cyclone Idai for 71.8% (n=229). Regarding to beverages, consumption of this group was generally moderate. For instancy, consumption of soft drinks was low as 154 respondents (48.3%) consumed once a week, 41 (12.9%) two to four times a week. Frequencies before Cyclone Idai were the same for 62.7% (n=97) respondents. Alcoholic beverages were not frequently consumed by pregnant and lactating women (less than 6%). Equal frequencies were recorded before Cyclone Idai for 96.9% (n=309) (Table 6).

Table 6 - Food consumption by each food group in families with pregnant and lactating women and children under five before and after Cyclone Idai.

Food group	Food representative	Food consumption after Idai (%)	Food consumption before Idai (%)
Cereals and derivatives	Corn	70,5%, n=225	Equal for 82,1% (n=262) Hihg for 6,6% (n=21) Low for 11,3% (n=36)
	Corn flower	70,2%, n=224	Similar as for corn
Tubers	Sweet potato	48,3%, n=154	Equal for 59,6% (n=190) Low for 30,7% (n=98) High for 9,7% (n=31)
Lugumes and nuts	Butter beans	41,4%, n=132	Equal for 33,2% (n=106) Low for 62,4% (n=199) High for 14 (4,4%)
Milk and dairy products	Cow's milk and powdered milk	16% (n=51), leite de vaca 4,1% (n=13), leite em pó 21% (n=67)	No relevant variation
Meat and eggs		35,4%, n=113	Equal for 70,8% (n=226) Low for 16,6% (n=53) High for 12,5% (n=40)
	Hen egg	32%, n=103	Equal for 44,5% (n=142) Low for 43,6% (n=139) High for 11,9% (n=38)
Fish and crustacean	Freshwater fish	40,1%, n= 128	Equal for 52,4% (n=167) Low for 43,6% (139) High for 4,1% (n=13)
Horticultural products	Tomatoes and onion	53,9%, n=172	Equal for 67,7% (n=216) Low for 27,9% (n=89) High for 4,4% (n=14)
Fruits	Mango	93%, n=296	Equal for 84,6% (n=270) Low for 6,6% (n=21) High for 8,8% (n=28)
Fats and oils	Vegetable oil	91,8%, n=293	Equal for 21,3 % (n=68) Low for 74,6% (n=238) High for 4,1% (n=13)
Sweets and savouries	Sugar and cakes	31,7%, n=101	No relevant variations
	Savouries	38,2%, n=122	No relevant variations
	Fried dumplings	38,2%, n=122	Equal for 56,7% (n=181) Low for 39,2% (n=125) High for 4,1% (n=13)
Beverages	Soft drink	48,3%, n=154	Equal for 62,7% (n=97) Low for 32% (n=102) High for 5,3% (n=17)
	Alcoholic beverages	3,4%, n=11	Equal for 96,9% (n=309) low for 96,9% (n=309) High for 1,3% (n=4)

4. DISCUSSION

We sought to assess nutritional status and characterize food consumption of populations residing in resettlements in Dombe, Mozambique. Mobility of populations due to Cyclone has increased population's vulnerability due to (1) inability to regularly practice subsistence activities and (2) economic imbalance. These factors affected food security and quality of life, as the practice of agriculture and other profitable activities were affected and economic disparities arose causing shortage of food access, particularly for children and women. Similarly, Silva and Lage (Silva & Lage, 2020) describe in a study that low income has affected women's food consumption, and triggered dietary monotony.

In this study, acute and chronic malnutrition, overweight and obesity were diagnosed in children. Although it is not yet possible to relate these pathological conditions with prior malnutrition events in the same children, literatures stresses that there is a recovery mechanism which the body of an undernourished individual triggers. In certain cases, children with malnutrition tend to be obese or overweight afterwards (El et al., 2006). Here, we found a prevalence of severe acute malnutrition of 2.1% and of moderate acute malnutrition, 4.1% in children. In a study analysing children aged 6 - 59 months in rural Mozambique, a prevalence of 5.11% for acute malnutrition was found using a Standardized Monitoring and Assessment for Relief and Transition (SMART) nutrition survey and 3.58% in a Rapid Nutrition Assessment (RNA) survey (Zaba et al., 2021). Mozambique, just as other countries, is struggling with the issue of food transition and double burden of "malnutrition–obesity", which translates into the paradox of increasing cases of undernourishment and overweight. In fact, while hunger kills more people every year than malaria, tuberculosis and HIV-AIDS combined (45% of infant deaths are related to malnutrition), ironically obesity is rising everywhere at an accelerating pace (Larrosa-haro & Caro-sabido, 2021).

We noticed poor knowledge of the importance and priority of daily meals, as considerable number of mothers or caregivers give their children incomplete meals. Number of meals is an important factor to ensure children regular growth and development. Skipping meals is associated to undernutrition, anaemia (Petry et al., 2019), and with weight gain (Silva et al., 2017). Incorrect eating behaviours may be related to low level of education of PLW or care givers as well as food shortage, in line with Chamova and Dimitrova (Chamova & Dimitrova, 2020). Apart from food shortage, nutritional disorders found in this study may be associated to cultural issues. Mohseni and Aryankhesal (Mohseni & Aryankhesal, 2020) working also with children under five, concluded that most nutritional problems occur because of inappropriate consumerism associated with cultural habits and prevalence of food-related myths. Women in the resettlement centres wean their children before the recommended period by the WHO, which may contribute to early introduction of new food items. It is recommended that introduction of new foods should be at six months of age (Carneiro et al., 2015), and only exceptionally at four or five months, followed by appropriate care in their handling to prevent infection in infants (Silva et al., 2019), cited as one of causes of secondary malnutrition. In line with what was found in this study, the AVASAN report (SETSAN, 2019) points out that individuals mostly affected by malnutrition are aged 6-59 months. Non-compliance with exclusive and non-exclusive breastfeeding may also be related to poor health education of women subjects of this study. A similar study carried out by Lima and co-workers (Lima et al., 2018) pointed to mothers' lack of knowledge about the importance of breastfeeding as one of the factors for early weaning.

Populations in resettlement centres have unbalanced food consumption characterized by consumption of cereals and derivatives, fish, legumes and snacks. They consume with very low frequency fruits, horticultural products and milk. Likewise, a study carried out in the peri-urban area of Nampula indicated that population's food consumption consists of cereals and tubers, and a reasonable intake of minerals (37%) obtained from vegetables, but food is poor of fruit (Zano, 2017). Unbalanced food consumption is the cause of occurrence of nutritional disorders in children and pregnant women (Petry, 2019). The severity of nutritional problems is proportional to the magnitude of food availability. As hunger have increased in 2020 under the shadow of COVID-19, being Africa most affected continent (21%) [WHO, FAO, UNICEF, IFAD, WFP (2021)], urgent actions are needed to tackle the 2030 Sustainable Development Goal towards zero hunger, though still challenging.

CONCLUSION

Overall nutritional status of children under five years of age is normal. However, some were diagnosed with chronic malnutrition, acute malnutrition and low weight for age. There are also cases of overweight and obesity. Pregnant and lactating women were also diagnosed with acute malnutrition. Food consumption in the population is predominantly made up of cereals, legumes, fish, tubers and derivatives, and other food items are consumed with less or moderate frequency. Easily raised or purchased foodstuff were most consumed in population. Finally, a comparison of the two moments (before and after cyclone) revealed that food quality and quantity tended to decrease with cyclone Idai.

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DOI: https://doi.org/10.29352/mill0218.25631

REFERENCES

Abbas Khan, K., Zaman, K., Shoukry, A. M., Sharkawy, A., Gani, S., Sasmoko, Ahmad, J., Khan, A., & Hishan, S. S. (2019). Natural disasters and economic losses: controlling external migration, energy and environmental resources, water demand, and financial development for global prosperity. Environmental Science and Pollution Research, 14287–14299. https://doi.org/10.1007/s11356-019-04755-5.

Ahmad, A., Madanijah, S., Dwiriani, C. M., & Kolopaking, R. (2018). Complementary feeding practices and nutritional status of children 6-23 months old: Formative study in Aceh, Indonesia. Nutrition Research and Practice, *12*(6), 512–520. https://doi.org/10.4162/nrp.2018.12.6.512.

Chamova, R., & Dimitrova, T. (2020). Background: Maintaining a core temperature of 37.0 C is important for autoimmunity but reports in recent years show a declining. European Journal of Public Health, 601-602.

Coelho, S. E. dos A. C., Vianna, R. P. de T., Segall-Correa, A. M., Perez-Escamilla, R., & Gubert, M. B. (2015). Food insecurity among Brazilian adolescents: A validation study of the Short Food Insecurity Scale. Revista de Nutrição, *28*(4), 385-395. https://doi.org/10.1590/1415-52732015000400005.

Contreras, M., JJ, C. M., Gómez, C., Vivó, G., Martin de Pablos, J. L., Rodríguez, G., ... & Domínguez, R. (2000). Treatment compliance in arterial hypertension. A 2-year intervention trial through health education. Atencion Primaria, *26*(1), 5-10.

El, P., Metabólico, S., Obesidad, Y. L. A., Felisbino-mendes, M. S., Pimenta, A. M., & Gazzinelli, A. (2006). São Fatores De Risco Para a Síndrome Metabólica E a Obesidade? Are Postnatal Nutritional Insult Indicators Risk Factors. Statistics, *10*(1), 7–11.

Carneiro, G. C. S., Morais, L. F A., Moura, T. H. M., Javorski, M., & Leal, L. P. (2015). Growth of infants assisted in nursing appointments in childcare. Revista Gaúcha de Enfermagem [online], *36*(1). p. 35-42. https://doi.org/10.1590/1983-1447.2015.01.45703>. ISSN 1983-1447. https://doi.org/10.1590/1983-1447.2015.01.45703.

Kepple, A. W., & Segall-Corrêa, A. M. (2011). Conceptualizing and measuring food and nutrition security. Ciência e Saude Coletiva, *16*(1), 187-199. https://doi.org/10.1590/s1413-81232011000100022.

Khamis, A. G., Mwanri, A. W., Ntwenya, J. E., & Kreppel, K. (2019). The influence of dietary diversity on the nutritional status of children between 6 and 23 months of age in Tanzania. BMC Pediatrics, *19*(1), 1–9. https://doi.org/10.1186/s12887-019-1897-5.

Larrosa-haro, A., & Caro-sabido, E. A. (2021). Secondary Malnutrition and Nutritional Intervention in Cholestatic Liver Diseases in Infants. 8(November). https://doi.org/10.3389/fnut.2021.716613.

Lima, A. P. C., Nascimento, D. D. S., & Martins, M. M. F. (2018). The practice of breastfeeding and the factors leading to early weaning: an integrative review. Journal of Health & Biological Sciences, *6*(2), 189. https://doi.org/10.12662/2317-3076jhbs.v6i2.1633.p189-196.2018.

Matos, P. A., & Ndapassoa, A. M. (2020). O Ciclone Idai E Os Desafios Da Ajuda Humanitária Em Moçambique. Veredas Do Direito: Direito Ambiental e Desenvolvimento Sustentável, *17*(38), 167–188. https://doi.org/10.18623/rvd.v17i38.1819.

Mohseni, M., & Aryankhesal, A. (2020). Developing a model for prevention of malnutrition among children under 5 years old. BMC Health Services Research, *20*(1), 1-9.

Petry, N., Jallow, B., Sawo, Y., Darboe, M. K., Barrow, S., Sarr, A., Ceesay, P. O., Fofana, M. N., Prentice, A. M., Wegmüller, R., Rohner, F., Phall, M. C., & Wirth, J. P. (2019). Micronutrient deficiencies, nutritional status and the determinants of anaemia in children 0-59 months of age and non-pregnant women of reproductive age in The Gambia. Nutrients, *11*(10), 1–20. https://doi.org/10.3390/nu11102275.

S/n. Apostila de avaliação nutricional. (2013). Tese (doutorado). Curso de Nutrição. PUC Goiânia.

SETSAN. (2019). *Relatório da Avaliação Pos-choque da Insegurança Alimentar e Nutricional Aguda de Abril – Maio de 2019* (p. 20). https://fscluster.org/sites/default/files/documents/relatorio_de_avasan_junho2019_01_julho_resumido.pdf. Retrieved on 03 may 2022.

Silva, A. M. L., da Silva Monteiro, G. R. S., Tavares, A. N. da S., & da Silva Pedrosa, Z. V. R. (2019). The early food introduction and the risk of allergies: A review of the literature. Enfermeria Global, *18*(2), 470-511. https://doi.org/10.6018/eglobal.18.2.345231.

Silva, M. A., & Lage, A. C. (2020). Programa de Pós-Graduação em Educação Universidade do Estado do Pará. *Revista Cocar* . V . 14 N . 28 Jan/ Apr/ 2020 p. 644-663 ISSN: 2237-0315 " Publish or perish ": academic productivism and teacher illness 1 " Publish or perish ": academic pr. Cocar Journal, *14*(28), 644-663.

UNICEF (2020). Mozambique: Children living in storm-affected areas face worsening food insecurity and nutrition crisis six months after Cyclone Idai. 2019. https://www.unicef.org/press-releases/mozambique-children-living-storm-affected-areas-face-worsening-food-insecurity-and. retrieved on 30 april 2022. UNICEF. The State of Food Security and Nutrition in the World 2021..

https://data.unicef.org/resources/sofi-2021/. Retrieved on 30 April 2022.

Villar, J., Fernandes, M., Purwar, M., Staines-Urias, E., Di Nicola, P., Cheikh Ismail, L., Ochieng, R., Barros, F., Albernaz, E., Victora, C., Kunnawar, N., Temple, S., Giuliani, F., Sandells, T., Carvalho, M., Ohuma, E., Jaffer, Y., Noble, A., Gravett, M., & Kennedy, S. (2019). Neurodevelopmental milestones and associated behaviours are similar among healthy children across diverse geographical locations. Nature Communications, *10*(1), 1–10. https://doi.org/10.1038/s41467-018-07983-4.

WHO, FAO, UNICEF, IFAD, WFP (2022). The State of Food Security and Nutrition in the World: Food security and nutrition in the world. (2021). https://www.fao.org/3/cb5409en/cb5409en.pdf.

Wu, Y., Ding, Y., Tanaka, Y., & Zhang, W. (2014). Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention. International Journal of Medical Sciences, *11*(11), 1185-1200. https://doi.org/10.7150/ijms.10001.

Zaba, T., Buene, D., Famba, E., & Joyeux, M. (2021). Factors associated with acute malnutrition among children 6-59 months in rural Mozambique. Maternal and Child Nutrition, *17*(1), 1-8. https://doi.org/10.1111/mcn.130.

Zano, F. C. (2017). Urban Food Security in Mozambique. Segur. Aliment. Nutr., *24*(2), 180-191. DOI: https://doi.org/10.20396/san.v24i2.8648431.