MORBI-MORTALITY IN ANKA ITFC-ANKA GENERAL HOSPITAL-ZAMFARA STATE/ NIGERIA 2017-2022.

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Abstract

Zamfara most difficult state to access primary healthcare in Nigeria. This study was retrospective and analytic. All patient admitted to the ITFC ward of the AGH-Zamfara State (2021-2022) were included (n=7226), sampling was exhaustive. Globally, mortality in ITFC is higher than the standard (It is more than 10%). Mortality within ITFC is very high in 2022 compared to 2021.The proportion of patients discharged with anemia was higher in 2022 (August-November) than in the same period last year (2021). Proportion of malaria comorbidity is high in the period of 2022. It should also be pointed out that the co-morbidity of malnutrition with malaria, measles, TB and sepsis has an impact on mortality. AGH-ITFC has higher mortality rate than others facilities, due to a number of extrinsic factors (insecurity, poverty, traditional drug use, late consultation and long distances) and intrinsic factors (shortage of essential drugs, inexperienced staff…)

Key-words: *Morbi-mortality, Zamfara*

LA MORBI-MORTALITÉ DANS L'UNTI DE L'HÔPITAL GÉNÉRAL D'ANKA DANS L'ÉTAT DE ZAMFARA AU NIGÉRIA 2017-2022

Résumé

Zamfara est l'État le plus difficile d'accès aux soins de santé primaires au Nigeria. Cette étude était rétrospective et analytique. Tous les patients admis dans le service UNTI de l'AGH de l'État de Zamfara (2021-2022) ont été inclus (n=7226), l'échantillonnage était exhaustif. Globalement, la mortalité en UNTU est plus élevée que la norme (elle est supérieure à 10%). La proportion de patients sortis avec une anémie était plus élevée en 2022 (août-novembre) qu'à la même période l'année dernière (2021). La proportion de comorbidité liée au paludisme est élevée en 2022. La comorbidité de la malnutrition avec le paludisme, la rougeole, la tuberculose et la septicémie a un impact sur la mortalité. AGH-UNTI a un taux de mortalité plus élevé que les autres structures, en raison d'un certain nombre de facteurs extrinsèques (insécurité, pauvreté, utilisation de médicaments traditionnels, consultations tardives et longues distances) et intrinsèques (pénurie de médicaments essentiels, personnel inexpérimenté,...).

Mots-clés : *Morbi-mortalité, Zamfara*

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I. INTRODUCTION

About 25 to 35 million under-five children have severe acute malnutrition (SAM) and 13 million of these children live in sub-Saharan Africa and of these children one million will die every year**.** (Unicef, 2012).

Child mortality has been linked to infectious diseases, malnutrition and lack of access to essential health services (Unicef, 2019) Chronic malnutrition in particular, evidenced by stunting and wasting, has been implicated in increased morbidity and mortality from infection in low resource countries (Prendergast, 2014). Malnutrition has also been found to be a predictor for mortality among hospitalized children under five years of age in Nigeria. (Olukayode, 2010).

A large part of the population in the Northwest is chronically vulnerable to food and nutrition insecurity because of several factors. The diminished availability of produce because of insecurity, high inflation and other effects of the economic crisis in the country has resulted in a nutrition crisis. The insecurity that has displaced several civilians from their villages to the main towns including Anka, Talata Mafara and Gusau and the takeover of the population's farms by the bandits, is preventing people from cultivating their farms and preparing the grounds for further nutritional crisis during subsequence year(s). The communities are being forced to work on farms for those bandits without rewards. This trend is likely to continue and will result in more people facing severe food insecurity and thus increase in SAM and GAM rates in Local Government Areas if no prevention or treatment will be taking place.

Zamfara State in North-West Nigeria has been experiencing civil unrest resulting in mass population displacement since 2014. Zamfara's under-five mortality rate accounts for 210 deaths per 1000 live births and is therefore almost twice as high as the national average in Nigeria (120 deaths per 1000 live births)**.** (Ogbuoji , 2019).

Médecins Sans Frontières (MSF) has been working in collaboration with the Ministry of Health (MOH) in Anka Local Government Area (LGA) in Zamfara State since 2010 following a lead poisoning outbreak. (Thurtle, 2014).

However many developing countries continue to experience poor child growth rates, high morbidity and mortality with about three million child deaths due under nutrition every year. (Black, 2013).

Infection and nutrition are intimately related through shared pathways involving poverty, limited national capacities for prevention, and effects on metabolism and immunity (Domaris, 2018).

Malnutrition may only be recognized as the cause of death when it is severe enough to cause clinical manifestations and be classified as severe acute malnutrition (SAM). Pelletier and coll. first demonstrated that malnutrition caused more than half of child mortality through its synergistic relationship with common infections, a much larger proportion than deaths classified under "nutritional deficiencies". Similarly, community-based studies of malaria demonstrate that its contribution to under-fives mortality is much greater than can be attributed to malaria-specific deaths alone**.** Both malaria and undernutrition are highly prevalent in sub-Saharan Africa, where child mortality remains above international targets (Pelletier, 1995).

The relationship between under nutrition and malaria is not well understood, and has been a subject of competing hypotheses. Nutritional interventions have been observed to worsen the outcome of malaria episodes among children in Nigeria and Senegal. (Imbert, 1997; Murray ,1978).

According to the mortality analysis done in Anka in 2022, it was founded that the average of mortality rate in ITFC is higher than 15% , this due to extrinsic (insecurity, poverty, distance, use f concoction, late consultation) and intrinsic causes(unexperienced new MoH staff, rupture of some important drugs,…)**(**MSF-MMR, 2021-2022).

In view of the above, mortality among children with severe acute malnutrition is a public health problem in Zamfara State/Nigeria.

We have set ourselves the objective of this research to determine morbi-mortality in children with severe acute malnutrition at the Intensive Therapeutic Feeding Center in Anka-Zamfara State General Hospital/Nigeria.

II. METHODOLOGY

Study design

We conducted a retrospective and analytic study using routinely collected data. All patient admissions to the ITFC ward of the Anka General Hospital/Anka Town-Zamfara State/Nigeria using exit status from 1 January 2021 to 31 December 2022.

Study population.

All children hospitalized for severe acute malnutrition at the Anka General Hospital were included in the study. All children hospitalized in ordinary pediatrics and those hospitalized in ITFC before the period of our study were excluded from the study. Sampling was exhaustive (n=7226).

Data collection procedure.

The data was collected during October 2022.We collected our data from the digital health information system and patients files analysis. We used such variables: age, sex, address (Ward) of residence, date of admission, date of discharge (Exit), Diagnosis, Average length of stay (ALS) in Intensive Therapeutic Feeding Centre(ITFC),

Statistical analysis.

The data were entered and analyzed using SPSS (Statistical Package Social Sciences) software version 26. Qualitative variables were expressed as frequencies and percentages. Quantitative variables were expressed as means and medians. The strength of association was estimated by the 95% confidence interval. The level of statistical significance was set at a p-value of $p < 0, 05$.

Ethics approval

Before collecting the data, we took into account both the administrative and ethical dimensions of the research (Zamfara state Health Research Ethics committee)

II.1.RESULTS OF THE ANALYSIS OF THE CAUSES OF DEATH - 30-12-2022.

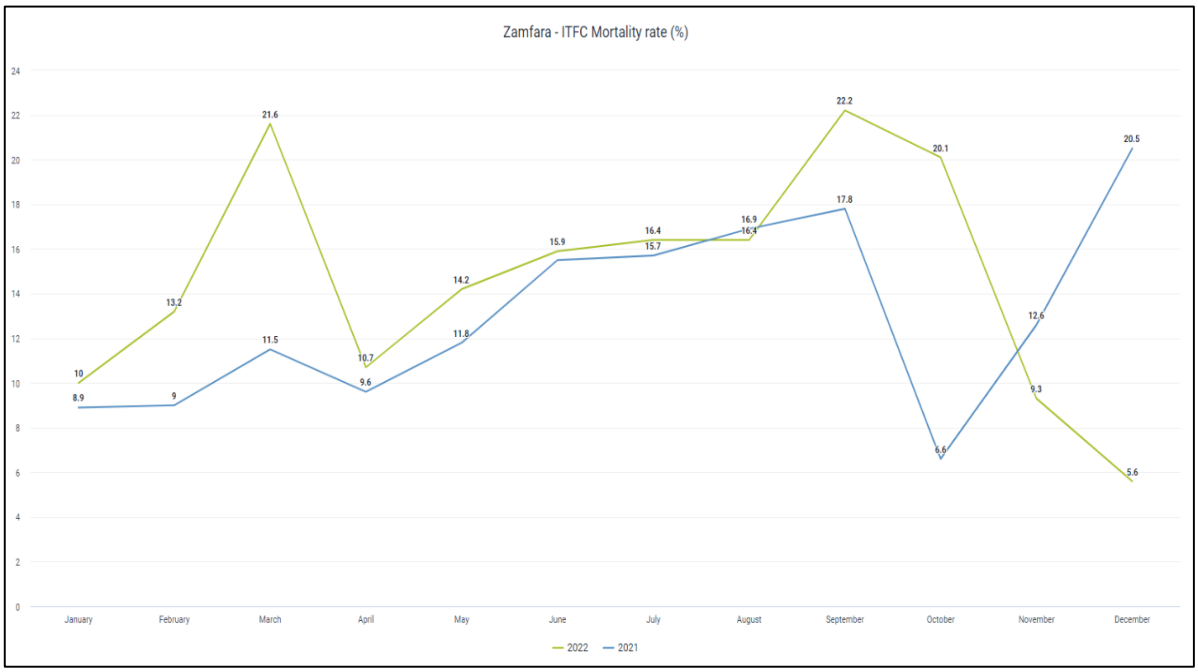
III.1.1. Analysis and conclusions of the epidemiologist/ Analysis of mortality in the ITFC of Anka General Hospital, 22 December 2022.

Table: Comparison of ITFC variables of Aug-Nov 2022 to the same period last year

	Aug-Nov 2022 (wk31-w47)	**Aug-Nov 2021 (wk31-w47)**	**p-value**
Average length of stay in the hospital,			p=0.0674
median (IQR)	4.5 (3.7 - 4.9)	5.7 (3.9 - 5.9)	
mean +/-SD	4.1 +/-1.1	5.1 +/-1.1	
Weekly mortality rate			**p=0.0019**
median (IQR)	23.8 (17.4 - 28.6)	15 (10.2 - 19.1)	
mean +/-SD	22.6 +/-8	14.3 +/-5.9	
Weekly exits			**p<0.001**
median (IQR)	22 (21 - 24)	84 (69 - 98)	
mean +/-SD	23 +/- 6	86 +/- 28	
Malaria positivity at ITFC			p=0.1687
median (IQR)	81.3 (77.8 - 91.3)	74 (71 - 81.8)	
mean +/-SD	80.9 +/- 11.8	75.8 +/- 9.2	
BOR			**P<0.001**
median (IQR)	68.2 (52.5 - 77.9)	102 (83.6 - 107.6)	
mean +/-SD	80.9 +/- 11.8	100.4 +/- 21	
Stabilization rate			**P<0.039**
median (IQR)	72.7 (65 - 81)	80.6 (75 – 82.1)	
mean +/-SD	72 +/- 12.6	79 +/- 4.8	

No difference in the average length of stay in the ITFC ward between August and November 2022 compared with the same period last year (2021). No difference in the malaria positivity rate between August and November 2022 compared with the same period last year (2021). The malaria mortality rate was higher between August and November last year than during the same period this year. Hospital beds were not overcrowded this year.

Graph 1: Comparative mortality rates 2022 vs 2021



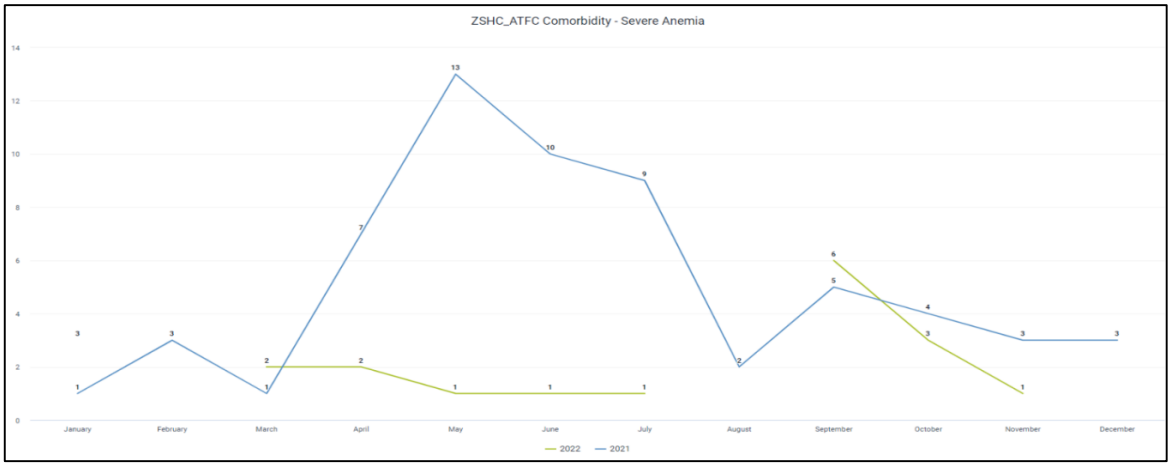
The graph shows that mortality within ITFC is very high in 2022 compared to the previous years (2021).

Table: Proportion of Anka ITFC patients diagnosed with co-morbidities at exit

	Aug-Nov 2022 (wk31-w47)	Aug-Nov 2021 (wk31-w47)	p-value
malaria co-morbidity_ITFC weekly			p=0.5594
median (IQR)	54.2 (47.8 - 68.2)	51.3 (45.9 - 62.1)	
mean +/-SD	55.6 +/-18	52.3 +/-13.9	
Anemia			**p=0.026**
median (IQR)	4.5 (4.2 - 8)	2.3 (1.3 - 3.5)	
mean +/-SD	5.8 +/-4.2	3 +/- 2.3	
AWD			**p=0.024**
median (IQR)	8.7 (0 - 12.5)	12.9 (8.9 - 18.4)	
mean +/-SD	7.7 +/- 6	13.2 +/- 7	
LRTI			**p=0.023**
median (IQR)	4.5 (0 - 6.5)	7.7 (4.9 - 9.4)	
mean +/-SD	4.6 +/- 4	7.6 +/- 3.1	
Measles			
median (IQR)	0	1.8 (1.1 - 3.1)	**p<0.001**
mean +/-SD	.25 +/-1	2.1 +/-1.7	
TB			p=0.34
median (IQR)	0	0	
mean +/-SD	0.25 +/- 1	0.38 +/- 0.9	

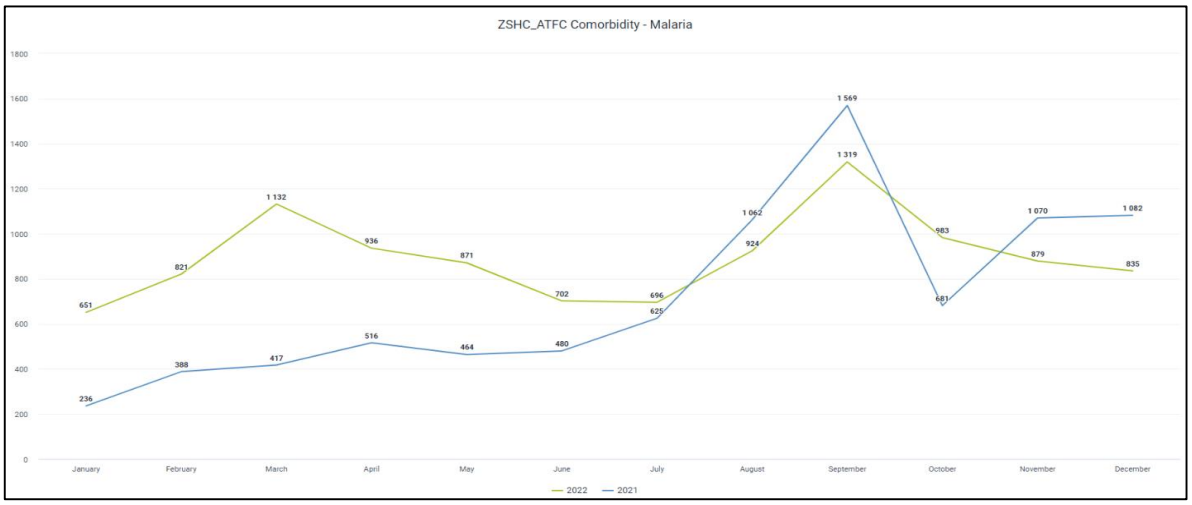
The proportion of patients discharged with anemia was higher in 2022 (August-November) than in the same period last year (2021). But the increase in the proportion of mortality was greater than the median increase in the proportion of anemia between the two periods. No difference in the proportion of malaria co-morbidity diagnosed among patients discharged between the year 2022 (August-November), and last year (2021), at the same period. The proportion of severe acute diarrhoea was higher last year (August-November-2021) than in 2022 at the same time. The proportion of Lower Respiratory Infections was higher last year between August and November than this year at the same time. The proportion of anaemia(August to November 2022) was higher than in the same periods in the previous three years. But the increase in the proportion of mortality was very high compared with the median increase in the proportion of anaemia.

Graph 4: Anemia comorbidity in ITFC-ANKA



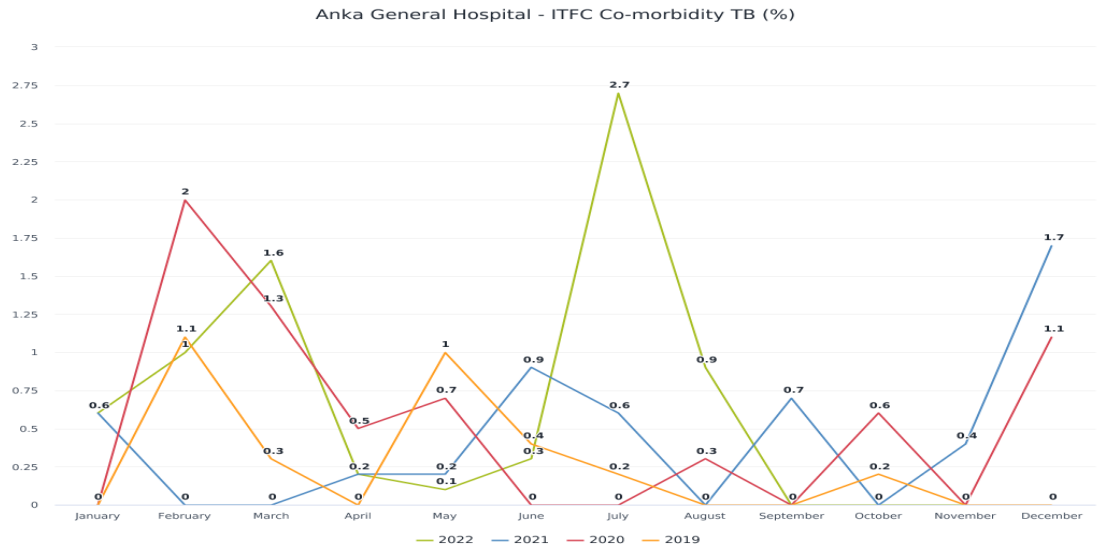
In the figure below, the proportion of anemia from August to November 2022 was higher than the proportion in the same periods of the previous year. But the increase in proportion of mortality was very high when compared to the median increase in proportion of anemia which was 2.2.

Graph 5: Comorbidity of malaria in ITFC-Anka



In the figure above: though proportion of malaria cases in ITFC patients high in the period of 2022, the difference was not significant.

Graph 6: Tuberculosis comorbidity in ITFC-Anka.



In the figure above: TB co-comorbidity for the months July and august of 2022 was high. In general, the comparison between August – November of 2022 and 2021, gives no significant difference.

Table 3: weekly mortality rate by MSF projects/ facilities Comparison of ITFC mortality in AGH with other facilities or projects.

Table: weekly mortality rate by MSF projects/ facilities

	Aug-Nov 2022 (wk31-w47)	**Aug-Nov 2021 (wk31-w47)**	**p-value**
AGH Weekly ITFC mortality rate			**p=0.0019**
median (IQR)	**23.8 (17.4 - 28.6)**	**15 (10.2 - 19.1)**	
mean +/-SD	22.6 +/-8	14.3 +/-5.9	
Gummi weekly ITFC mortality rate			
median (IQR)	**6.9 (3.1 - 12.5)**		
mean +/-SD	9.2 +/- 7		
Talata-mafara weekly ITFC mortality rate			
median (IQR)	**8.7 (5.2 - 15.2)**		
mean +/-SD	10.6 +/- 8.2		
Sokoto specialist hospital weekly ITFC mortality			
median (IQR)	**18.8 (10 - 24.4)**		
mean +/-SD	18.4 +/-12		

Comparison of ITFC mortality in AGH with other facilities or projects

- Anka General Hospital has higher ITFC mortality rate than Gummi, Talata Mafara and Sokoto specialist hospital
- Sokoto specialist hospital needs close follow up and regular review of mortality as the proportion of mortality was still high.

IV.DISCUSSION

No difference in the average length of stay in the ITFC ward between August and November 2022 compared with the same period last year (p=0.0674). No difference in the malaria positivity rate between August and November 2022 compared with the same period last year (2021) (p=0.1687). Malaria is the leading comorbidity associated with malnutrition in the Intensive Therapeutic Feeding Center at Anka.

Malaria is present everywhere in Nigeria; 97% of the population is at risk of contracting malaria. According to the World Malaria Report 2021, in 2020 Nigeria recorded the highest number of malaria cases in the world (27% of global malaria cases), as well as the highest number of malaria deaths (32%). In 2020, the country accounted for 55.2% of malaria cases

in West Africa**.** (WHO, 2021) **.**In Zamfara state, the endemicity of malaria could be explained by the highest level of insecurity, which has a negative impact on the population's access to primary health care. The insecurity, is a barrier for the population to get mosquito from Primary Health care team due to inaccessibility of their area.

The weekly mortality rate comparison between different facilities supported by MSF show that Anka General Hospital has higher ITFC mortality rate(mean of 22.6+/-8.2) than Gummi(mean of 9.2+/-7) Talata Mafara(mean of 10.6+/-8.2) and Sokoto specialist hospital(mean of 18.4+/-12).The higher mortality rate in Anka General Hospital is due to the bad security context of Anka. Other locations are relatively calm and population has an easy access to health care, but in Anka the population is very poor that why their use to come very late to the hospital and most of them die in 24 hours. Before arriving to the hospital, they use concoction leading to intoxication.

Mortality among children with severe acute malnutrition was very high in 2022 compared with the previous years (2021):

On the one hand, during the year 2022, there was a measles epidemic never seen before in the Anka LGA. The response to this epidemic had not been well coordinated, there was some negligence on the part of the Nigerian government (Ministry of Health of Zamfara-State) because the suspected cases of measles had been from November 2021, Although samples had been taken for analysis, the results had not been made public and so the epidemic had not been declared in time by the Ministry, which had delayed the proper response that would have included all the pillars but only the management of simple and severe cases and health promotion were managed by MSF. Vaccination was organized 4 months later, which led to a high mortality rate among malnourished children with weakened immune systems. Children suffering from malnutrition or other factors that weaken the immune system are most at risk of death from measles**.**(WHO,2023)

-In August 2022, MSF decided to introduce a new approach, that of co-remote management, involving Ministry staff more in all activities, due to the insecurity, MSF was obliged to reduce its teams in Anka Town and bring a team of managers to Sokoto, a town about 200km from Anka Town, where they would manage the project on a daily basis, supporting the skeleton team in the field. With this approach, MSF significantly reduced its experienced staff and replaced them with new staff from the ministry with no experience and no proper handover or training beforehand. This has frankly increased the commitment or involvement of the Ministry in the activities as the trend was reversed, before there was at least 80% MSF staff in the Anka Hospital for at least 10 years but with the new approach there has been 80% Ministry staff with some MSF staff just for technical support, however there has been a negative impact on the mortality rate in ITFC where children are brought in a poor condition.

As far as TB is concerned, you will see that it represents the last co-morbidity with malnutrition at Anka Hospital, i.e. 0.25% in 2021 and 0.38% in 2022. This can be explained by the fact that tuberculosis screening is not systematically carried out, even though there is GeneXpert in the hospital laboratory, gastric tubing is rarely done, and even the Keith Edouard score is not systematically done in children with severe acute malnutrition. Undiagnosed and untreated tuberculosis would have contributed to this very high mortality rate in ITFC.

The term consumption has been virtually synonymous with tuberculosis throughout the history (Rubin, 1995) and the link between tuberculosis and malnutrition has long been recognized; malnutrition may predispose people to the development of clinical disease and tuberculosis can contribute to malnutrition. In a study, within a month of starting routine radiographic examination of cases of malnutrition, it was observed that 11 cases of advanced malnutrition were showing evidence of tuberculosis, but with negative Montoux reaction.

False negative tuberculin reaction is because of immune suppression in protein malnutrition states. Nutritional rehabilitation of such children renders the tuberculin test positive in these children (Rao, 1966).

In the figure above, the proportion of anemia from August to November 2022 was higher than the proportion in the same periods of the previous three years. But the increase in proportion of mortality was very high when compared to the median increase in proportion of anemia which was 2.2. To understand if the increase in proportion of anemia has association with increase in mortality among ITFC patients, further assessment and comparison of anemia among deaths and stabilized patients need to be done (this can be done by retrospective data collection from patient chart). How the team managed anemia cases and severity of anemia in ITFC patients, need further analysis.

Anemia is one of the comorbidities associated with malnutrition because it is caused by malnutrition as well as malaria. This double comorbidity (severe acute malnutrition-malaria) increases the risk of developing anemia. The age group varied between 6 and to 59 mo. Of patients with SAM, 67.3% had severe anemia; 13.8% had moderate anemia. Of these patients, 25% required packed red blood cell transfusion. A high incidence of severe anemia in SAM with a large proportion (25%) requiring blood transfusion is a pointer toward nutritional anemia being a very common comorbidity of SAM requiring hospital admission. Because megaloblastic anemia closely followed microcytic anemia, supplementation with vitamin B12 in addition to iron and folic acid would be recommended. (Neha , 2014).

When malaria parasites enter the bloodstream after an infectious mosquito bite, they infect the red blood cells. At the end of this infectious cycle, the red blood cells burst. This

process reduces the number of red blood cells and, at an advanced stage, can lead to severe anemia.(WHO,2023).

According to the Retrospective analysis of fungemia among children in Anka General Hospital, Nigeria done by Ruth Olubiyo and coll (2023), Among 656 patients with clinically diagnosed severe sepsis and/or treatment failure for whom a blood culture was taken during the study period, 24 patients (3.7%) had yeast isolated. Of the 20 patients included in this study,11(55%) were aged between 6 and 23 months and 13 (65%) were admitted to the ITFC ward. Seventeen patients (85%) were categorized as SAM.

In Anka General Hospital, Ruth and call found that in children with severe sepsis at admission or with treatment failure, 20 (3.7%) had a confirmed yeast BSI(bloodstream infections).This study reveals that the isolation of yeast in blood culture among pediatric patients with a clinical profile of severe sepsis and SAM is not negligible. It is the first case series from Zamfara state in northwest Nigeria showing this result. This study highlights the need to include antifungal treatment in Nigerian hospitals where an increased number of patients with severe sepsis and SAM are being admitted (Ruth, 2021).

The lack of diagnosis of fungemia would have contributed in some small way to the high mortality rate in ITFC-Anka General Hospital, because all patients with sepsis are put on antibiotics, forgetting that fungemia, which is certainly rare, can be treated with an antifungal, which is unfortunately rarely associated with management.

CONCLUSION

Morbi-mortality in Anka ITFC-Anka general hospital-Zamfara state/ Nigeria 2017-2022. As objective of this research is to determine Morbi-mortality in children with severe acute malnutrition at the Intensive Therapeutic Feeding Center in Anka-Zamfara State General Hospital/Nigeria. This study was retrospective and analytic. All patient admitted to the ITFC ward of the AGH-Zamfara State (2021-2022) were included (n=7226), sampling was exhaustive. Globally, mortality in ITFC is higher than the standard (It is more than 10%). Mortality within ITFC is very high in 2022 compared to 2021.The proportion of patients discharged with anemia was higher in 2022 (August-November) than in the same period last year (2021). Proportion of malaria comorbidity is high in the period of 2022. It should also be pointed out that the co-morbidity of malnutrition with malaria, measles, TB and sepsis has an impact on mortality. The mortality rate is very high in Anka General Hospital –ITFC (Intensive Therapeutic Feeding Center), due to a number of extrinsic factors (insecurity, poverty, use of traditional drug, late consultation, long distances, etc.) and intrinsic factors (shortage of essential medicines, inexperienced staff, etc.).Unfortunately, it is very difficult to act on the extrinsic factors because they are beyond the control of MSF, which is trying to help this population abandoned to its sad fate. It should also be pointed out that the co-morbidity of malnutrition with malaria,

measles, Tuberculosis and sepsis has an impact on mortality. Despite free treatment for malnutrition in the state of Zamfara, the use of concoctions is a major contributor to the high mortality rate among children with severe acute malnutrition, as it leads to serious poisoning, which is difficult to treat within the Intensive Therapeutic Feeding Center because it is very limited. Raising awareness about the use of concoctions would therefore help to reduce the mortality rate.

We therefore recommend that the government put an end to insecurity, which is at the root of poverty, leading to a lack of food, malnutrition and inaccessibility to quality care on time.

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APPENDIX

LIST OF ABBREVIATIONS

AGH : Anka General Hospital

AWD : Acute Watery Diarrhea

GAM : Global Acute Malnutrition

IQR : Interquartile range

ITFC : Intensive Therapeutic Feeding Center

LGA : Local Government Area

LRTI : Low Respiratory Track Infection

MoH : Ministry of Health

MSF : Médecin Sans Frontières

SAM : Severe Acute Malnutrition

SD : Standard Deviation

TB : Tuberculosis

UNTI : Unité Nutritionnelle Therapeutique Intensive

W : Week