M.Med. (Family Medicine) Research thesis

Study title:

Evaluating the growth, associated co-morbidities and mortality in children under the age of five years, six months after treatment for Severe Acute Malnutrition (SAM) in the Oudtshoorn sub-district.

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Declaration

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Abstract

Background

Malnutrition is an important cause of childhood mortality in South Africa. Severe acute malnutrition (SAM) is a major public health problem. The focus of treatment is awareness, early identification and nutritional intervention. With implementation of the revised World Health Organization's (WHO) guideline to diagnose SAM in the Oudtshoorn sub-district in the Western Cape more children are being identified and admitted for treatment. Very little data exists about the outcome of children after being discharged back into the community following treatment for SAM.

The aim of the study was to assess the success of the current rehabilitative and nutritional management programme for SAM by looking at weight gain, associated co-morbidities and mortality of children under five years of age six-months after discharge from Oudtshoorn District Hospital.

Methods

A descriptive survey was conducted by extracting data from the medical records. All children aged 6-59 months who were admitted for SAM from 2014 to 2016 were included. Weight-for-height, mid-upper-arm circumference (MUAC) and the presence of peripheral oedema were recorded on hospital admission. Co-morbidities, specifically HIV and TB, were also recorded. Mortality and repeated anthropometric measurements were captured at the six-month follow-up at the respective primary care clinics from the medical record or the nutritional treatment programme register.

Results

Sixty-three children were included with a median age 52 weeks (IQR 28-92). Six died (9.5%), ten failed to gain weight satisfactorily (15.8%) and overall children showed a median monthly weight increase of 325 grams per child (IQR 192-475). Co-morbidities were seen in 53 (84.1%) of children. The main associated co-morbidities were gastroenteritis, TB, anaemia, and respiratory tract infections. All participants were HIV negative. Only 73% of children had a MUAC measured at admission and 27% at follow up in primary care.

Conclusion

Overall 25% of children had an adverse outcome, although weight gain and mortality was within the minimum acceptable standards for community based programmes. Primary care clinics did not perform MUAC measurements adequately and relied only on weight-for-height. The usual co-morbidities were seen, although none of the children were HIV positive.

Introduction

Severe acute malnutrition (SAM) is a major global health problem.[1] Malnutrition is responsible for more than half of the 10 million annual deaths among children under the age of five years in low- and middle-income countries.[2, 3, 4] Both chronic and acute malnutrition are now considered as major threats to public health in these countries.[2, 3, 4] Sub-Saharan Africa and South-Asia have the highest prevalence, with approximately 73 million children under five suffering from acute malnutrition.[5, 6] Globally, around 20 million under-five children are suffering from SAM, mostly in Sub-Saharan Africa and Asia.[7] Treating SAM is important for reducing child morbidity and mortality and for the achievement of the global Sustainable Development Goals 2 and 3.[8]

SAM is defined by one or more of the following criteria:[7]

1. Weight-for-height (WFH) is less than -3 Z-scores (i.e. three standard deviations, or more, below the mean);

2. Weight-for-height is less than 70% of the median;

3. Mid-upper-arm circumference (MUAC) is less than 11.5cm;

4. Presence of bilateral pitting oedema of nutritional origin

While there are no universal targets for SAM treatment programmes, there are widely acknowledged minimum standards such as those set by the Sphere project's humanitarian charter.[10] Sphere minimum standards are international benchmarks for programme outcomes in humanitarian emergencies. The latest version of Sphere in 2011 suggests that overall therapeutic feeding programme mortality should not exceed 10%, less than 15% should default, and over 75% of children discharged from the programme should have recovered. Recovery is defined as "free from medical complications, regained appetite, and achieved and maintained appropriate weight gain without nutrition-related oedema."[10] Effectiveness of community-based treatment is defined as an average weight gain of at least 5g/kg/day.[11]

In 1999 the WHO defined SAM as weight-for-height < 3 standard deviations from a reference median or oedematous malnutrition. [11] The new WHO classification

in 2009 categorises acute malnutrition into 'moderately malnourished', SAM with complications and SAM without complications.[12] The latter can be managed at the community level.[13, 14] A six-month follow up period has been shown to provide adequate information regarding the initial outcomes of nutritional management programme in the community. In Uganda a study showed that at six months follow up the incidence of first negative nutritional outcome (NNO) was visible. NNO was a study specific measure used to indicate improvement or deterioration.[15] A study in Bangladesh concluded that the six months follow up of SAM children was crucial for early detection of relapses, complications, co-morbidities and mortalities. [16]

There is a need for improved programme evaluation, as most routine reporting systems miss late deaths and underestimate total mortality due to SAM. While treatment focusses on nutritional interventions, a more holistic view of SAM is needed, also identifying and managing underlying co-morbidities such as HIV and disability.[17] HIV infected children with SAM have higher mortality rates, although among those who survive, nutritional recovery is similar in HIV-infected and HIV-uninfected children.[18]

Little is known about the outcome of children once stabilized and discharged from hospital for further management in primary health care. The outpatient therapeutic feeding programme, together with primary health care, is the cornerstone of making services available in the community for the management of SAM.[14, 19] Adequate primary health care management can contribute to reducing child mortality as described in the WHO Sustainable Development Goal 3.[8] The few studies conducted in Bangladesh, Kenya, Malawi and Niger that have looked at this are mostly old, pre-HIV and use older definitions of SAM.[20]

Since the implementation of the revised WHO guidelines to diagnose SAM in the Oudtshoorn sub-district in the Western Cape province of South Africa in 2014, more children with SAM have been identified and admitted for treatment. The aim of this study was to evaluate the growth, associated co-morbidities and mortality in children under the age of five years, six months after treatment for SAM in the Oudtshoorn sub-district.

Methods

Study design

This was a retrospective longitudinal survey that surveyed children during their hospital admission and 6-months later at their primary care clinic and collected data from their medical records.

Setting

Children in the Oudtshoorn sub-district were evaluated. This forms part of the Eden district in the Western Cape Province. The population is estimated at 96 000 people. The community includes lower and middle income socioeconomic groups. A large proportion of people are unemployed or work as farmworkers. Poverty, alcohol abuse, domestic violence, large families and limited resources are some of the challenges they face. To a large extent the public sector primary care facilities are serving an uninsured poor rural community with limited resources available.[9]

Patients with SAM were initially admitted, assessed by the dietician, and treated in-hospital. Upon discharge the dietician arranged a six month follow up at the clinic. Seven clinics were in the catchment area of the hospital and had children referred for follow up: Oudtshoorn, Bongolethu, Bridgton, Toekomsrus, Dysselsdorp, De Rust and Calitzdorp. Mothers were expected to follow up initially weekly for two weeks then every two weeks until their follow up appointment with the dietician. A professional nurse examined the patient for complications, measured the anthropometry and assessed the health status at each visit. Ill patients were referred to the hospital and stable patients managed at the clinic.

Study population and sampling

Between 2014 and 2016 a total of 72 children under the age of five years were admitted for SAM at Oudtshoorn Hospital. All those who qualified for SAM according to the new WHO guidelines were included without any sampling. Children who were less than six months old were excluded to avoid prematurity as a confounding factor in meeting the SAM criteria. Children whose files could not

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be obtained, defaulted follow-up or could not be traced for evaluation, were also excluded.

Data collection

The hospital's medical records of all included children were obtained and data was extracted by the researcher into an Excel spreadsheet on age, weight, MUAC, head circumference, oedema, immunisations, co-morbidities, and mortality.

The clinics were informed of the research and data (anthropometric measurements, outstanding results, co-morbidities and mortality) was obtained by the researcher from the clinic's medical records or Nutritional Treatment Programme (NTP) registers six-months after discharge.

Data analysis

Data was captured in Excel and checked for errors or omissions. Continuous data was described in terms of the mean and standard deviation or if not normally distributed in terms of the median and interquartile range, while categorical data was described in terms of frequencies and percentages. The data was analysed using SPSS version 24.0 (Statistical Package for the Social Sciences). The prevalence of co-morbidities was defined as any conditions present at baseline or that occurred during the 6-month follow up. Weight gain per month was calculated from the weight at follow up minus the weight at baseline divided by the number of months between measurements.

Ethical considerations

Ethical approval was granted by the Health Research Ethics Committee of the University of Stellenbosch (HREC Reference No: S15/08/181). Additional permission to conduct the study was obtained from the Western Cape Health Department (Reference No: WC_2016RP23_373).

Results

A total of 72 children were recorded in the hospital register, but only 63 were included in the study due to the exclusion criteria. Of these 63 children, 32 (50.8%) were male and 31 (49.2%) were female, with a median age of 52 weeks (IQR 28-92).

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According to the WHO SAM criteria 92.1% had a -3 Z score on weight-for-height, 73.0% had a MUAC recorded of whom 38.1% had a MUAC < 11.5cm and 14.3% had nutritional pitting oedema. Immunisations were not up to date in 17.5% of children.

The total mortality was six children (9.5%). The median weight gain per month was 325 grams (IQR 192-475) or 10.8g/kg/day. Table 1 and Figure 1 presents the frequency of children in different categories of weight gained per month. Out of the 63 children 10 (15.8%) did not meet the minimum weight gain of 5g/kg/day. Only 17 (27.0%) had a MUAC performed on follow up at the primary care clinic, which gave insufficient data for comparison.

Table 1: Weight gain per month (N=63)

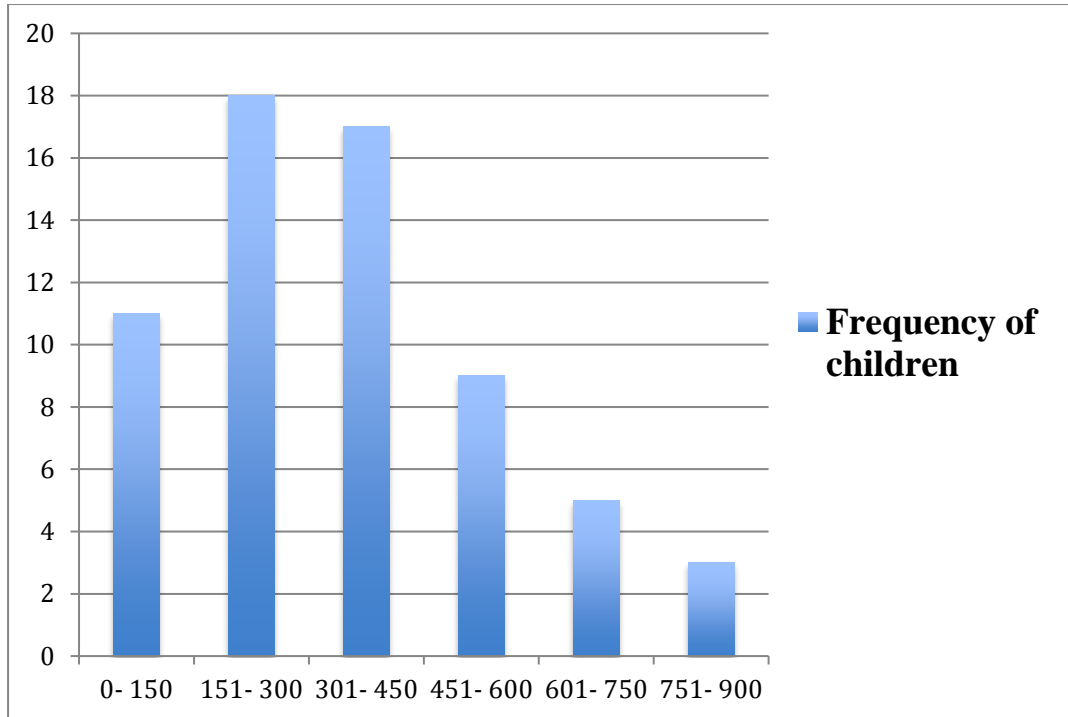| Weight gain g/month	n (%)
0-150	11 (17.5)
151-300	18 (28.6)
301-450	17 (27.0)
451-600	9 (14.3)
601-750	5 (7.9)
751-900	3 (0.05)

Figure 1: The categories of weight improvement per month per child (N=63).

Co-morbidities were seen in 53 (84.1%) of children. All children tested negative for HIV. The other significant co-morbidities (Figure 2) present were gastroenteritis (27.0%), tuberculosis (20.6%), anaemia (19.0%), respiratory infections (17.5%), prematurity (15.9%), foetal alcohol syndrome (9.5%), cardiac dysfunction (7.9%), cerebral palsy and dysmorphism (4.8%), and poisoning (3.2%).
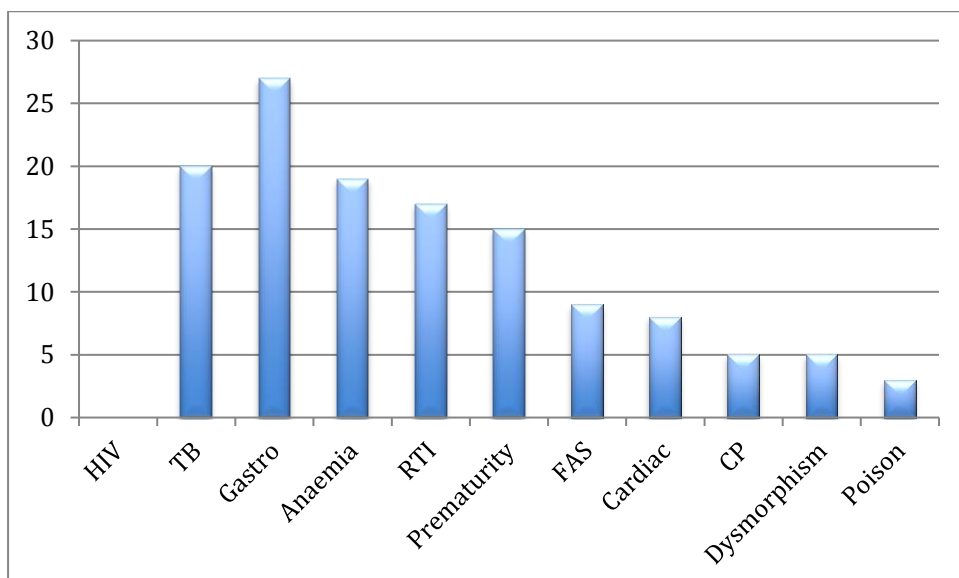

Figure 2: The prevalence of co-morbidities among children with SAM (N=63).

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Discussion

The main findings of this study included a median weight gain of 325g per child per month, which translates to a weight gain of 10.8g/kg/day, which is above the minimum standard (5g/kg/day) for the community setting. [12] Overall 10 children had inadequate weight gain and 6 children died giving an adverse outcome in 16 (25%) of children.

There is minimal research available regarding the follow up weight for comparison. In the FuSAM study they also acknowledged that observations (weight-for-height-, weight-for-age- and height-for-age catch-up growth) in SAM literature are rare. This offers key lessons for policy makers and managers for improvement. [17]

The mortality of 9.5% was within the standard of <10% set by the Sphere project.[10] In Dhaka, Bangladesh of 180 participants only 5/180 (2.5%) died.[16] An important reason why the value was significantly lower in the Dhaka study could be poor follow up.

Surprisingly, none of the children were HIV positive, although all were tested and it is possible that there could have been false negative results. Nevertheless the result is significant as other African studies of SAM found an HIV prevalence of 29%.[21] One explanation for the difference is that the local HIV prevention of mother to child transmission programme has been very successful.

Significantly, almost 20% of children had concomitant TB, gastro-enteritis, anaemia and/or respiratory tract infections. The prevalence of TB, gastro-enteritis and respiratory tract infections as co-morbidities correlates with previous studies.[22, 23, 24] In Lusaka, Zambia of the recorded co-morbidities, 30% had diarrhoea, 25% had pneumonia, 12% had anaemia and 5% had tuberculosis.[23] The prevalence of the first three co-morbidities was similar in this study, but the prevalence of TB was higher due to the high incidence rates for TB in South Africa.

Only 27% of children had a MUAC performed on follow up, making it difficult to compare data with baseline. Working closely with staff some of the reasons for

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omitting this were due to high patient volumes, decrease manpower, being unaware about the updated WHO guidelines and believing that weight alone was sufficient. Primary healthcare providers should be informed of the WHO guidelines as only assessing the weight-for-height parameter could easily result in missing some children with SAM.[25] With follow-up visits to the clinic it would be of great value to measure the MUAC and weight-for-height to determine nutritional recovery.[26] This data will also help with future research and support the availability of parameters essential to nutritional recovery.

Comprehensive follow-up in primary health care, beyond nutrition, is important. Although 82.5% of immunizations were up to date, there was an opportunity for improvement. Early recognition and treatment of associated co-morbidities and support for families to attend follow-up is essential to ensure favourable outcome and reduce mortality.[17]

The number of qualifying participants was slightly reduced due to loss to follow-up, untraceable files or relocation. Part of the initial outcome was to measure the MUAC at follow-up. The monitoring of weight-for-height together with the MUAC could have given a more objective impression on nutritional recovery. Although the weight was captured not all participants were followed up as scheduled, regularly or until nutritional recovery. Anaemia as a co-morbidity was captured due to the diagnosis noted in the file, but not all files included an actual haemoglobin result.

Conclusion

Children treated for SAM in the Oudtshoorn sub-district had a 9.5% mortality rate, 15.8% failed to gain weight satisfactorily, although the median monthly weight increase was 325 grams. These outcomes were within the minimal standards expected of community based programmes. Co-morbidities included TB, gastro-enteritis, anaemia and/or respiratory tract infections, although none of the children were HIV positive. Diagnostic and follow up measurements relied predominantly on weight-for-height and there was insufficient use of MUAC. There were opportunities for catch up immunisations.

Acknowledgements

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