LONG-TERM FOLLOW-UP OF CHILDREN TREATED FOR SEVERE ACUTE MALNUTRITION: A LONGITUDINAL COHORT STUDY

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Background

Tackling Severe Acute Malnutrition (SAM) is critical to achieving child survival targets, such as Millennium Development Goal 4. Most feeding programmes treating SAM report patient outcomes on discharge from the programme. Research on whether children subsequently remain alive and well is currently limited, particularly in settings where HIV is prevalent.

Aims

To describe long term outcomes following an episode of SAM

Methods

We followed up on all surviving children discharged from a large urban NRU-based malnutrition programme one year after completion of a probiotic RCT (with no overall effect). HIV patients started cotrimoxazole prophylaxis and were referred for ARVs if meeting WHO (2005) HIV staging criteria [3]3.

Results

From July 2006 to March 2007, 1024 patients contributed to 1187 admission episodes for treatment of SAM. 697/1024(68.1%) had oedematous malnutrition, 459/1024(45%) were HIV seronegative, and 445/1024(43%) were seropositive. HIV status was unknown in 120/1024(12%).

There were 238/1024(23.2%) inpatient deaths: 42/459(9.2%) among HIV seronegative children, 126/445(28.3%) among seropositives, and 70/120(58.3%) among those not tested. Overall programme nutrition cure (weight-for-height>80% on 2 consecutive outpatient visits) was 471/1024(46.0%): 310/459(67.5%) among seronegatives and 155/445(34.8%) among seropositives.

Long-term 1-year-outcomes were identified for 900/1024(87.9%) children. 365/471(77.5%) of children discharged as cured were alive and 37/471(7.8%) were reported dead. 28/37(75.6%) of these late deaths in the year since discharge were HIV-positive. Total cumulative programme deaths had risen to 428/1024(41.8%):, 77/459(16.7%) among HIV seronegative children; 274/445(61.6%) among known seropositives.

Conclusions

In this study, the majority of children discharged cured from a programme treating SAM were still alive 1 year after discharge. Overall programme mortality was high, however; HIV and failure to achieve cure were major underlying factors. Routine, short-term programme reporting systems would have underestimated this long-term post-SAM mortality. More studies are needed to explore long-term outcomes from other approaches to SAM treatment (notably in Community Management of Acute Malnutrition, CMAM programmes). Future analyses of variables in our programme will also play a role in understanding and addressing factors underlying positive or negative long-term outcomes.

MORTALITY A YEAR AFTER ADMISSION WITH HIV AND SEVERE ACUTE MALNUTRITION (SAM) IN MALAWI: A COHORT STUDY

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Background

Up to half the children in Nutrition Rehabilitation Units in Malawi are HIV seropositive. The mortality of HIV infected children during admission with SAM is 30%, but long-term outcomes, and uptake of HIV services, are unknown.

Aims

To determine the outcome, and service uptake, of HIV infected children admitted with SAM, one year after discharge.

Methods

Mortality was determined for 445 HIV sero-positive children attending an urban NRU in Blantyre. This represented 43.4% of all children admitted between July 2006 and March 2007. Ward discharges were followed up in the community if they defaulted from Outpatient Therapeutic Programme (OTP), and at one year after OTP discharge.

Results

There were 126 deaths during ward admission (28.3%). A further 94 children (29.5%) died within OTP, or were readmitted and died. 196 children were traced in the community at one year, with 29 (6.5%) not found. Another 54 deaths were identified (12.1%), giving a known one year mortality of 274/445 (61.6%) of admissions, and a known survival of 32%.

Taken as a proportion of the 319 NRU discharges, the early (OTP) mortality was 29.5%, and late (post OTP) mortality was 16.9%, representing 46.4% (148/319) of children surviving to ward discharge. Over half (28/54) the late deaths were in children achieving nutritional cure in OTP. Less than half (44.5%) of HIV sero-positive children discharged from the NRU was known to be alive at 1 year.

Most (149/161, 92%) children were reported as taking regular cotrimoxazole, with 78/116 of those alive having taken a dose in the previous 2 days. Supplementary feeding in the community was accessed by 81% (133/164). ARV information was available on 159 children (71%); of whom 121 were alive at one year. Of these 56% had started ARVs; 17 prior to NRU admission; 28 during admission or OTP; and 44 following OTP discharge.

A subgroup was asked about change in family circumstances in the year since admission. Orphaning occurred in 31/122 (25.4%) families, and parental separation in a further 24/122 (19.6%).

Conclusions

Almost two thirds of HIV infected SAM children die within a year of admission, and over half these deaths occurr after ward discharge. ARVs are not normally started for children with SAM until response to nutritional therapy can be assessed. As over 20% of nutrition cures (WH>80%) died (28/136) within a year, this suggests attainment of nutrition 'cure' in HIV does not adequately predict low mortality risk. Earlier, and possibly universal, access for HIV infected children to ARVs might be able to reduce this unacceptably high HIV related mortality in children with SAM.

CAN SEVERE ACUTE MALNUTRITION CASE FATALITY RATE IN HIV-INFECTED CHILDREN BE REDUCED? OUTCOMES OF A PROGRAMME TO IMPROVE MANAGEMENT OF SAM IN LEA TOTO PAEDIATRIC HIV SERVICES.

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Background

The Lea Toto Programme has provided paediatric care and support to some 4000 HIV positive children in 6 Nairobi slum areas since 1998. In September 2007, it recognized the increasing number of children with severe acute malnutrition (SAM) and introduced an approach that included greater concern for community and staff, more systematic nutritional screening and Outpatient Therapeutic Care (OTC).

Aims

To describe outcomes of children admitted to the therapeutic feeding programme.

Methods

This was a retrospective analysis of routine programme data. The programme admitted children based on usual criteria for admission (oedema, MUAC<110mm, WHZ<-3 z-score (NCHS), return from defaulting, readmission) but also using new criteria aimed at ensuring early initiation of therapeutic feeding (persistent weight loss, static weight, very low weight for age and visible wasting). In this programme, CD4 count was the main criteria for initiating antiretroviral treatment (ART).

Results

From September 2007 to March 2009, 206 children (224 admissions) aged from 6 to 196 months have been discharged from the programme. 74.4% of the admissions were for children between 6 and 59 months of age. Marasmus (MUAC<110mm or WHZ<-3), which represented 52.1% (116/223) of children, was the predominant admission criteria. Oedematous malnutrition represented 9.9% (22/223) of all admissions. Recovery rate (53.2%), mortality rate (13.7%) and default rate (19.7%) did not meet the SPHERE standard. In univariate analysis, mortality was significantly higher in the presence of vomiting (25.0% versus 11.6%; p=0.053), in the presence of dehydration (37.9% versus 7.8%; p<0.001), in the presence of chest retraction (38.5% versus 12.0%; p=0.020), and when inpatient care was required (46.2% versus 9.0%). The average (SD) length of stay from admission to recovery was 84.3 (65.6) days, which was longer than the 6 to 8 weeks previously reported in programmes treating predominantly HIV-negative children.

Conclusions

SAM in children infected with HIV is associated with high mortality even when antiretroviral drugs are accessible. Although the outcomes in this setting do not meet SPHERE standards, they in are encouraging since the rate of mortality is lower than that observed by other teams. These better results are probably the consequence of early detection and treatment.

GLUCOSE PRODUCTION AND ABSORPTION IN CHILDREN WITH KWASHIORKOR COMPARED TO MARASMUS.

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Background

Protein-energy malnutrition (PEM) is one of the major health problems of the third world. The most severe form of PEM is Kwashiorkor, which is associated with metabolic derangement that leads to a fatty liver and hypoglycemia. The etiology of the hypoglycemia in kwashiorkor is currently unknown.

Aims

To determine glucose production and absorption in children with kwashiorkor and marasmus.

Methods

Children with kwashiorkor (n=12), marasmus (n=6) and control subjects (n=5) were fasted overnight. During the overnight fast and study protocol, all children received a glucose infusion (2 mg/kg/min) to prevent hypoglycemia. A primed, constant infusion (0,15 mg/kg/min) of [6,6H2] glucose was infused intravenously for 2 hours. A subset of patients received an oral bolus of 1.75 g glucose per kg labeled with 10 mg/g [U-13C]glucose. Blood samples were taken regularly to determine glucose, insulin and c-peptide concentrations. Analysis of labeled glucose was performed via gas chromatography-mass spectrometry. Mathematical modeling was applied to determine pancreatic insulin response and oral glucose absorption.

Results

Albumin concentrations were significantly lower in children with kwashiorkor compared to marasmus and controls (P< 0,05). Hepatic glucose production was significantly lower in children with kwashiorkor (5,5 ± 0,3 mg/kg/min) compared to marasmus (7,7 ± 0,5 mg/kg/min) and controls (7,6 ± 0,9 mg/kg/min, P< 0,05). Glucose absorption was severely impaired (<40%/2 hrs) in 50% of kwashiorkor patients. Interestingly, glucose absorption was also impaired in 75% of marasmus patients ± edema, but with hypoalbuminemia. A similar pattern was seen in β-cell function with impaired insulin responses in kwashiorkor and hypoalbuminemic marasmus patients ± edema. Cortisol concentrations were similar in all groups, but glucagon concentrations at the end of the overnight fast were significantly lower in children with kwashiorkor compared to those with marasmus (P<0,05).

Conclusions

This study indicates impaired glucose production and severely decreased absorption in children with kwashiorkor. Decreased glucose production could be related to an impaired glucagon response, but it is not caused by increased insulin secretion. These results highlight the importance of adequate glucose intake in children with kwashiorkor. Children clinically diagnosed as marasmus, but with hypoalbuminemia show metabolic features resembling a kwashiorkor phenotype.

SEVERE DEHYDRATING DIARRHOEA IN MALAWIAN CHILDREN

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Background

Diarrhoea remains one of the most common causes of childhood deaths worldwide despite the widespread use of oral rehydration solution (ORS). The vast majority of the

nearly 2 million deaths occurring annually in children under five years of age are in resource-poor areas of south Asia and sub-Saharan Africa. Signs of critical illness in severely dehydrated children are poorly recognised, particularly in a resource-poor setting where management protocols have not been adequately evaluated.

Aims

We wish to highlight severe dehydrating diarrhoea (SDD) as an important target for both clinical and laboratory research. Although considerable efforts have gone into establishing the management of diarrhoeal disease in general, there is surprisingly little understanding of the aetiology, metabolic processes and risk factors for the very high mortality associated with SDD.

We suggest that the degree of fluid requirement as well as the prevalence of electrolyte disturbances, in particular hypokalaemia, are seriously under-recognised and may be contributing significantly to mortality. The heterogeneity of children with SDD renders the generic 'one size fits all' approach to fluid and electrolyte management in these critically ill children inadequate. There is a need to re-evaluate the efficacy of prevailing intravenous fluid protocols in resource-limited settings, especially in relation to electrolyte content and fluid volumes in well conducted multi-centre interventional trials.

Method

We will finally present the preliminary findings from an observational study on severe dehydration in Malawi which highlights some of the issues outlined above.

MODIFICATION OF THE PRUDHON INDEX FOR HIV PREVALENT SETTINGS

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Background

HIV prevalence is high within sub-Saharan Africa, and mortality within nutrition rehabilitation units (NRUs) is strongly associated with HIV status. The standard marker of NRU performance is the Prudhon index (PI), which does not account for HIV status of the child or population.**Aims**

To determine the risk of death in children with severe malnutrition taking into account HIV status, and to calculate an HIV adapted PI for NRUs in HIV-prevalent settings. To then test the equation on a cohort of children admitted in the subsequent year.

Methods

All 1470 children, aged 6-59 months old, admitted to the NRU in Blantyre, Malawi between July 2006 and July 2007 were entered into a database. Anthropometry, HIV serostatus and ward mortality were available for 1454 children. The model for Prudhon index was modified to account for HIV status. The model was then tested on the admissions from the subsequent year.

Results

HIV status was known for 1331/1454 (90.5%) children of whom 55% were seropositive. Oedema was present in 957/1454 (65.8%). During admission, 372/1454 (25.6%) of children died. According to univariate analysis, oedema was associated with lower mortality (OR 0.44, 95%CI 0.34-0.55), and HIV was correlated with higher mortality (OR 4.17, 3.09-5.71). Age and gender were not predictive. In multivariate analysis ORWH (optimum ratio Weight Height1.74) was strongly associated (OR 0.01, 0.005-0.035)) with mortality, followed by HIV (OR 2.66, 1.87-3.79). As in the PI, oedema was positively associated with mortality (OR 1.35, 0.99-1.85).

The modified PI model to predict the individual probability of death adjusted for HIV was:

Using this in 2007-8, when there were 1232 admissions and 348 deaths (28.2%), the modified PI predicted 297(24%), and the PI 79(6.4%) deaths. If HIV status had not been known, and an estimated prevalence of 55% used (from 2006-7), the modified PI predicts 276 deaths.

Conclusions

An HIV modified PI could be used to assess performance of NRUs in settings with high HIV prevalence. The HIV modified PI may also be used in units where individual HIV status is unknown, but where population prevalence is known. Generalisability is unknown, so testing in other HIV prevalent settings is required.

DIARRHEA IN UNINFECTED INFANTS OF HIV-INFECTED MOTHERS WHO STOP BREASTFEEDING AT 6 MONTHS: THE BAN STUDY EXPERIENCE

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Background&Aims

To describe diarrhea among early-weaned, uninfected infants of HIV-infected mothers enrolled in the currently ongoing Breastfeeding Antiretroviral Nutrition (BAN) Study.

Methods

Breastfeeding HIV-infected mothers at a major central hospital in Lilongwe, Malawi with CD4 counts>250/mm3 and their infants are randomised to a maternal or an infant antiretroviral regimen or to standard of care during breastfeeding. Mothers are counselled to exclusively breastfeed followed by rapid weaning by 28 weeks. In addition, mothers are also randomised to receive or not receive a nutritional supplement during breastfeeding. We examined the rates of diarrhoea, hospitalisations and diarrhoea-induced deaths due to diarrhoea in HIV-uninfected infants from April 2004 to June 2006 in comparison to national Malawi data in infants who follow local feeding practices of extended breastfeeding into the second year of life.

Results

Between April 2004-May 2006, 771 HIV uninfected infants had been enrolled of whom 225 reached 28 weeks. There was an increase in diarrhoea cases around the weaning time that continued through the end of the first year of life. Hospitalisations due to diarrhoea also peaked around weaning. The frequency of diarrhoea was consistent with rates published in the literature. There was a higher probability of infant diarrhoea in the rainy season relative to the non-rainy season (p<0.001). The overall infant mortality (43/1000) was much lower than that reported in the MDHS, 2004 Edition (76/1000 live births).

Conclusions and Recommendations

Diarrhoea increased during and following weaning among exclusively breastfed infants reportedly weaned at 6 months. This is consistent with the pattern seen in populations who practice prolonged breastfeeding, as this time coincides with introduction of complementary infant foods. Greater emphasis should be placed on hygienic preparation of weaning foods and water purification to reduce infant diarrhoeal morbidity in resource-limited settings.

HIV PREVALENCE AND MORTALITY AMOUNG CHILDREN UNDERGOING TREATMENT FOR SEVERE ACUTE MALNUTRITION IN SUB-SAHARAN AFRICA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background

Although there have been individual studies reporting high HIV prevalence and mortality among children with SAM, no systematic review has synthesized the data across the region.

Aims

Systematic review and meta-analysis. Included studies reported on HIV infection within a sample of children with SAM where HIV status was assessed using a blood test and SAM was defined using the WHO, Gomez, Wellcome or Waterlow definitions. Community based treatment was defined as including programmes delivered at community level and those with early discharge from nutrition rehabilitation unit (NRU) to hospital.

Results

Children from 17 studies were included in the analysis (n = 4891), of whom 29.2% were HIV-infected. HIV-infected children were significantly more likely to die than HIV-uninfected children (30.4% vs. 8.4%; P < 0.001; relative risk = 2.81, 95% CI 2.04—3.87). HIV negative children treated within community-based programmes had lower mortality (4.3%) than those treated within an inpatient nutrition rehabilitation unit (NRU) (15.1%).

There was no significant difference in mortality for HIV-infected children with SAM treated in the community based (30.0%) or NRU (31.3%) settings.

Conclusions

HIV prevalence is high in children with SAM in sub-Saharan Africa, and HIV-infected children are at significantly increased risk of mortality. There is an urgent need to integrate HIV testing and treatment into care for children with SAM in regions of high HIV prevalence.

BIOAVAILABILITY OF ZINC FROM TWO DIETS IN BANGLADESHI CHILDREN WITH PERSISTENT DIARRHOEA USING ZINC STABLE ISOTOPES

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Background

Zinc supplementation maintained the serum zinc level during persistent diarrhoea. Until now, there has been no accurate information about serum biochemical changes in children with persistent diarrhoea using reliable methods such as stable isotopes.

Aims

To measure the serum biochemical changes from two different therapeutic diets and supplementation of zinc during and after persistent diarrhoea.

Methods

A randomized, double-blind, placebo-controlled trial was conducted in 52 moderately malnourished male children, aged 6-24 months, with persistent diarrhea who were supplemented with 20 mg elemental zinc per day for a 2-week period. Children were randomly allocated to 3 groups: (a) rice-based diet + zinc, (b) chicken diet + zinc, and (c) rice-based diet + placebo. A 7-day metabolic balance study was done. Absorption of zinc was measured from the diet and supplementation using 70zinc and 67zinc isotopes. Zinc, copper and magnesium were analyzed from serum and stool by an atomic absorption spectrophotometer. The study was conducted at the ICDDR, B, Hospital, during March 1998-March 2000.

Results

There was a significant difference between absorption of supplemental zinc during diarrhea from the rice-based (43.93☐ 13.02 vs 51.37☐ 11.36, p=0.02) and chicken-based (38.42☐ 11.63 vs 51.84☐ 7.59, p=0.04) diets whereas absorption of zinc from the therapeutic diet was non-significant. Lactulose excretion at day-15 was significantly lower in the rice-based diet with zinc [20.9(12.53-45.3) vs. 7.05(1.73-16.45), p=0.003] and chicken-based diet with zinc [23.9(14.15-52.1) vs 9.0(2.33-18.4), p=0.04]. Endogenous loss of total zinc (mg) in stool over 4 days during diarrhoea and after recovery between the groups (rice-based and chicken based) was significant.

Conclusions

The moderately malnourished children suffering from persistent diarrhea had an adequate absorption of zinc from therapeutic supplementation and diet, either rice or chicken-based.

QUANTITY AND ZINC CONTENT OF MATERNAL MILK CONSUMED BY EXCLUSIVELY BREASTFED BABIES IN MOROCCO

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Background

Zinc is a trace mineral that is of critical importance to the young infant for normal growth and development. It is generally admitted that nutritional requirements for zinc are met for term infants by exclusive breastfeeding for about the first 6 months of life.

Aims

To provide longitudinal data on human milk consumption, using stable isotope techniques, at one, three and six months of life in normal birth weight (NBW) babies, and to determine zinc concentrations in maternal serum and milk.

Methods

Twenty paired mothers and babies were recruited. The amount of human milk consumed by the baby over a period of 14 days was assessed by the deuterium oxide "dose-to-mother" technique. The mother was given 30g of deuterium. Saliva samples were collected from both the mother and her baby. The technique also allows estimation of the baby's intake of water from sources other than human milk and the mother's body composition. The concentration of zinc in milk and plasma was determined using Selectable-Mode Inductively Coupled Plasma (ICP-SM).

Results

The average quantity of the mother's milk consumed by the NBW babies was 667,72 ± 373,68 g/day, 889,27± 519,39 g/day and 1211,18 ± 778,02 g/day, respectively, at one, three and six months after childbirth. The rate of exclusive breast-feeding was 42% in the first month. This rate decreased to 33,3% at the third and sixth months. The average quantity of zinc in mother's milk was 2.35±1.44 mg/ml, 1.98±1.01 mg/ml and 1.44±0.99 mg/ml, respectively, at one, three and six months after childbirth. Zinc in maternal serum was 0.58±0.18 mg/l, 0.59±0.16 mg/l and 0.47±0.15 mg/l, respectively, at one, three and six months after childbirth.

Conclusions

The isotope dilution method is an easy, non-invasive and accurate method for the assessment of human milk intake. The percentage of mothers who breastfeed is still low particularly after 3 months. Zinc deficiency is high among the studied group and a large scale study would be needed to confirm this.

REGULAR CONSUMPTION OF A COMPLEMENTARY FOOD FORTIFIED WITH ASCORBIC ACID AND FERROUS FUMARATE OR FERRIC PYROPHOSPHATE IS AS USEFUL AS FERROUS SULFATE IN MAINTAINING HEMOGLOBIN CONCENTRATION ABOVE 105 G/L IN YOUNG BANGLADESHI CHILDREN.

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Background

Non-water soluble iron compounds have been reported to be less well absorbed than ferrous sulfate in young children, and concern has been raised about their usefulness as food fortificants.

Aims

To evaluate the usefulness of ferrous fumarate and ferric pyrophosphate relative to ferrous sulfate in maintaining hemoglobin concentration above 105 g/L in Bangladeshi children.

Methods

A double blind study was conducted with 235 children (7-24 months; Hb >105 g/L) randomized into 3 groups. One serving of iron fortified infant cereal (9.3 mg iron; ascorbic acid:iron molar ratio 3:1) was consumed per day, 6 days/week, during 9 months. Blood samples were drawn at 4.5 months and 9 months.

Results

Raw data were reformatted and a "time to event" was calculated corresponding to reaching the following thresholds: Hb <105 g/L, plasma ferritin <12 ug/L or plasma C-reactive protein >10 mg/L at baseline, 4.5 months or 9 months. Data were censored when children did not reach the threshold or were lost to follow up. A Kaplan-Meier approach was used to compare the 3 groups. No statistically significant differences were observed for Hb <105 g/L (p=0.943), plasma ferritin <12 ug/L (p=0.601) or plasma C-reactive protein above 10 mg/L (p=0.508).

Conclusions

Contrary to earlier concerns, these results do not indicate differences in the usefulness between water soluble and non water soluble iron compounds in maintaining hemoglobin concentration and preventing iron deficiency. These data will be of importance in the development of food fortification strategies to combat anemia and iron deficiency in highly vulnerable population groups.

WOMEN'S ORGANISATIONS AND SOCIAL CAPITAL TO REDUCE PREVALENCE OF CHILD MALNUTRITION – LESSONS FOR SOCIAL CHANGE IN SUB-SAHARAN AFRICA?

Cost-effective technical interventions implemented at a national scale could reduce undernutrition related mortality and disease burden by 25%. Further sustainable progress in reducing undernutrition requires long-term investments in women's empowerment.

Persistently high levels of undernutrition with child and maternal mortality in Sub-Saharan Africa, particularly in rural areas, suggest that effective action is rarely a priority in high-burden countries

Barriers to scaling up range from limited national attention regarding undernutrition and technical recommendations to limited funding by donors for relevant cross-sectoral interventions.

A recent initiative in Kenya, Uganda and Tanzania holds that public pressure and debate in mass media are more effective drivers of change towards better public services than technical solutions or expert-driven technocratic reforms. Empowered women's groups typically contribute to advocacy for better services and outreach. Women's health groups in Nepal, Pakistan and Ethiopia have been empowered with knowledge of interventions to successfully reduce exposure to infection. Informed women's support groups cannot but strengthen "a unique mechanism for group counselling and promotion of positive behaviours." A critical step towards sustainability occurs when women themselves take ownership of interventions. Similarly, for members of women groups engaged with microcredit, child undernutrition has improved. Further assessments of microcredit initiatives need to be undertaken for their effect on nutrition outcomes.

Our two studies of women groups in Nepal and PNG offer lessons. Results suggest that membership in well-performing, informal women's organisations that do not access external assistance contributes to reduced child undernutrition in vulnerable households. Access to training for externally supported women's organisations with intensive support is associated with reduced prevalence of stunting. These studies represent at least a departure in the search for more insight into the context and impact of women organisations and their social capital in reducing undernutrition. In Nepal, informal women's groups listened to the radio, which was found to be significant in reducing child undernutrition.

We suggest that studies be undertaken to explore how informal women organizations in Sub-Saharan Africa may network with each other; improving their social capital and maternal nutrition knowledge, whilst, supported by radio, building advocacy for improved interventions for nutrition with child and maternal health.

FOOD PROVISION IN POST-DISCHARGE FOLLOW-UP OF CHILDREN WITH SAM HALVES ABANDON RATES AND REDUCES DAYS OH HOSPITALISATION IN LUANDA, ANGOLA

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HDP Nutritional Program Group

Background

The Hospital Divina Providencia (HDP) serves a poor suburban area of Luanda. A nutritional program with an inpatient centre and a clinic for follow-up visits has been implemented there since 2002.

Aims

To evaluate a policy of providing food at home after discharge from hospital to children admitted with severe malnutrition.

Methods

Hospital staff admitted children who had: a) weight/height < 70% (NCHS standards), b) bipedal oedema, c) weight/height between 70 and 80% but signs of complication.

Treatment was according to WHO guidelines. Children were discharged when they had a good appetite, had gained weight, and their oedema had resolved. Mothers were trained on how to manage the child, how to prepare foods, and when to return for follow-up. From May 2007, we provided food after discharge. We gave milk powder, with added sugar (the equivalent of 200 Kcal/kg/day and 6gr/kg/day of protein). Follow-ups initially occurred on a weekly basis. If the child had good weight gain, follow-ups were made every two weeks. Outcomes were recorded prospectively. We compared the outcomes of children in the two phases (with and without food provision).

Results

90 children were given only nutritional advice (January to May 2007). 412 children also received food provision (May 07 to December 2008). 28/78 (36%) children returned for follow-up visits when food was not provided compared to 285/362 (79%) when food was provided (RR 2.19; 95% IC 1.62 to 2.96; p<0.0001). The number of children reaching a weight/height > 85% remained stable.. The mean number of days of hospitalisation was reduced from 21+- 9.5 to 15 +- 8.7 after food provision (p< 0.0001). No deaths were observed during follow up but 3/285 children relapsed in the group given food. The cost of the food provided was 10 Euros per child for the whole follow up .

Conclusions

The number of children lost at to follow up was high, but it was reduced by 42% after food provision. Food provision also significantly reduced the duration of hospitalisation while the rate of rehabilitated children remained stable., at a cost of 10 Euros per child treated.

STABLE ISOTOPE TECHNIQUES TO ASSESS VITAMIN A BODY POOLS.

S A Tanumihardjo

Traditional methods to assess vitamin A status of groups have included serum retinol concentrations and relative dose response tests. Tracer dilution techniques with stable isotopes of vitamin A have emerged as a select method for estimating total body vitamin A pool size and for answering specific biological questions related to vitamin A metabolism. The isotopes of hydrogen (i.e., deuterium) and carbon (i.e., ^{13}C) have been successfully applied to humans to assess vitamin A status. Isotope dilution techniques consist of 1) administering an oral dose of isotopically labeled vitamin A to subjects, 2) collecting a blood sample after the tracer has mixed with endogenous vitamin A, 3) measuring the plasma isotopic ratio of tracer to tracee (unlabeled vitamin A), and 4) estimating the total amount of vitamin A in the body using a prediction equation. The plasma isotopic ratio of tracer to tracee can be measured using gas chromatography-mass spectrometric methods with a variety of different detection instruments.

Aside from liver biopsy, the isotope dilution technique is the only assessment technique that provides a quantitative estimate of total body vitamin A pool size. Because the technique is responsive to food and therapeutic supplementation with vitamin A, it can be used to evaluate the efficacy or effectiveness of intervention programs by quantitatively assessing the change in total body vitamin A stores in response to an intervention.

An added advantage is that the technique can estimate total body vitamin A along the entire continuum of vitamin A statuses from deficient to hypervitaminotic states. Additionally, it is not necessary to select subjects with deficient- or marginally-depleted initial status to detect a change in vitamin A status in response to an intervention. Thus, the tracer dilution technique can be useful for assessing change in vitamin A status in populations with low but adequate initial status, whereas the other indirect assessment techniques are only useful for detecting a change in status when initial status is deficient or marginally depleted. Vitamin A tracer studies have successfully assessed vitamin A status of groups and the efficacy of interventions in groups at risk of deficiency in several different countries. With improvements in the sensitivity of mass spectrometers, the method has gained momentum and is now more broadly available to those who wish to use the method to evaluate interventions. Although the degree of sophistication of the laboratory and resources available will usually dictate which vitamin A assessment method is chosen for population assessment and intervention evaluation, isotope dilution techniques have been used globally.

TROPICAL ENTEROPATHY AND ZINC HOMEOSTASIS

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Background

Tropical enteropathy and zinc deficiency are major public health problems worldwide. Tropical enteropathy is characterized by an increased urinary lactulose-mannitol ratio (L:M) when a site-specific sugar absorption test is administered with unmetabolized sugars. Zinc homeostasis is quantified with a dual stable isotope test of zinc absorption and excretion.

Aims

To test the hypothesis that endogenous fecal zinc (EFZ) was significantly correlated with tropical enteropathy

Methods

A site-specific sugar absorption test and dual stable isotope test was performed on 25 healthy Malawian children aged 3-5 y at high risk for enteropathy and zinc deficiency. EFZ as well as total zinc absorption and net zinc retention were calculated and correlated with the L:M ratio and fractional absorption of unmetabolized sugars.

Results

22 children (88%) had tropical enteropathy (L:M > 0.10), and the L:M ratio was 0.24 ± 0.10 (mean $\pm$ SD) . EFZ was 1.68 ± 1.06 mg/d, a quantity greater than is seen in healthy populations from the developed world. EFZ was positively correlated with the L:M ratio ($r = 0.62$, $P < 0.001$). Net zinc retention (0.67 ± 1.6 mg/d) was negatively correlated with the L:M ratio ($r = -0.47$, $P = 0.02$).

Similar significant correlations between the fraction of mannitol absorbed and EFZ and net zinc retention were found. Total absorbed zinc was not significantly correlated with the L:M ratio

Conclusions

A significant relationship between the L:M ratio and zinc homeostasis exists, suggesting that zinc deficiency is associated with tropical enteropathy in children.

MICRONUTRIENTS AND MALNUTRITION IN CHILDREN

T Ahmed

Children suffering from protein-energy malnutrition are also depleted in micronutrients; provision of micronutrients therefore is one of the key elements in the management of malnutrition. There is ample evidence that suggests that zinc supplementation should be considered in the management of acute diarrhea and in prevention of growth faltering in children specially those who are malnourished. Iron and zinc supplementation are also associated with 40% lower risk of severe acute lower respiratory infection in less well-nourished infants. On the other hand, multiple micronutrient supplementation has been found to be associated with an increased risk of diarrhea in less well-nourished infants. The efficacy of multiple micronutrient sprinkles in children with malnutrition still needs clarity. Results of a meta-analysis show that the use of sprinkles did not have any effect on growth, although there was a marked impact on anemia. The weight-for-age, length-for-age and weight-for-height indicators had insignificant overall effect with the weighted mean difference being 0.00, (95% CI -0.37, 0.37), 0.04, (95% CI -0.16, 0.24) and 0.04, (95% CI -0.44, 0.51) respectively.

Desirable intakes of micronutrients during the acute initial phase of severe acute malnutrition are known. A recent report suggests that the serum levels of micronutrient normalize within 15-30 days of therapy. Supplementation with a high dose of zinc in children with severe acute malnutrition has been associated with increased case fatality from septic illness; it is prudent not to exceed the recommended dose and period of supplementation with zinc in these children.

STABLE ISOTOPE TECHNIQUE TO EVALUATE IRON BIOAVAILABILITY IN INFANTS

L Davidsson.

.The prevalence of iron deficiency is unacceptably high globally, in particular among infants, children and women of child-bearing age in developing countries. Effective, food-based strategies to combat iron deficiency are, therefore, urgently needed. As only a fraction of dietary iron is absorbed and utilized, access to data on iron bioavailability from foods, diets and iron fortificants is crucial in the development of food fortification strategies and interventions based on dietary diversification.

From a methodological point of view, the rapid incorporation of newly absorbed iron into erythrocytes is a great advantage. Stable isotope technique to evaluate iron bioavailability has been developed based on the incorporation of stable iron isotopes into erythrocytes 14 days after administration of labelled test meals.

In most studies, the incorporation rate is assumed to be constant, 80-90 % in adults and infants respectively. However, when the incorporation rate cannot be assumed to remain stable, for example during pregnancy, incorporation of a stable isotope administered intravenously can be used to correct for changes in incorporation rate.

Large interindividual variation in iron bioavailability has been demonstrated, primarily due to differences in iron status between subjects, and paired comparisons are therefore essential when evaluating iron bioavailability from different foods or food fortificants. By using a double isotope technique, i.e., administration of two stable isotopes of iron (57Fe and 58Fe) - on consecutive days - information about iron bioavailability from two different test meals can be obtained simultaneously. Over the last few years, this technique has been used to generate new data on, in particular, iron bioavailability from iron compounds used in food fortification programs and information about dietary enhancers and inhibitors of iron absorption in infants and children.

FRIDAY PRESENTANTIONS

HOSPITAL-BASED DIARRHOEAL DISEASE SURVEILLANCE IN BANGLADESH: URBAN-RURAL DIFFERENTIALS IN MAJOR FINDINGS

Abu SG Faruque, Sumon K Das, Mohammed A Malek, Mohammed A Salam, A Cravioto.

Background

ICDDR,B maintains a Diarrhoeal Disease Surveillance System (DDSS) at its Dhaka (urban) and Matlab (rural) hospitals to monitor emergence of new enteric pathogens, re-emergence of conventional pathogens, changes in antimicrobial susceptibility of common bacterial isolates, and changes in characteristics of patient populations.

Aims

To examine urban-rural differentials in the annual isolation rates and trends in the isolation of common enteric pathogens from diarrhoea patients, antimicrobial susceptibility of V. cholerae and Shigella, and presenting characteristics in children under five years old.

Methods

DDSS of ICDDR,B was established at the Dhaka Hospital in 1979 and was extended to the Matlab Hospital in 1999 to collect information on demographic, epidemiological and clinical characteristics of patients. A systematic 2% sample of patients attending the Dhaka Hospital and all patients attending the Matlab Hospital from the Health and Demographic Surveillance System (HDSS) area of ICDDR,B are enrolled in the DDSS. Using a structured questionnaire, trained personnel interview patients and/or their attendants to collect relevant information including: socioeconomic and demographic characteristics; housing and environmental conditions; feeding practices, particularly of infants and young children; and use of drugs and fluid therapy at home. Information on clinical characteristics, anthropometric measurements, and treatments received at the facilities and outcomes of patients are also recorded. Extensive microbiological assessments of fecal samples (microscopy), culture, and ELISA) are performed to identify diarrhoeal pathogens and to determine antimicrobial susceptibility of bacterial pathogens.

Results

Vibrio cholerae O1 was isolated from 16% of patients in Dhaka and 3% of patients in Matlab in 2008. Stool specimens from diarrhoea patients in Dhaka yielded Shigella from 3% and 9% of the patients at these two hospitals, respectively. The isolation rate of rotavirus was similar (23% vs. 21%) at the Dhaka and Matlab Hospitals. In Dhaka, 68% of the Vibrio cholerae O1 isolates were resistant to tetracycline while 84% of the isolates were resistant in Matlab in 2008. However, all (100%) Vibrio cholerae O1 isolates in Dhaka were resistant to erythromycin compared to 84% in Matlab. In Dhaka, a rising trend in isolation of Vibrio cholerae O1 was noted while a declining trend of the same enteropathogen was observed in Matlab. In Dhaka, consistently high isolation of rotavirus was reported for the last few years while a reduced isolation rate of rotavirus was observed for last 3 years in Matlab in children under 2 years. Shigella detection rates are declining in Dhaka while they are rising in Matlab. Urban children under five were significantly more malnourished and less immunized than their rural counterparts.

Conclusions

The factors contributing to different isolation rates of pathogens, and childhood malnutrition in urban and rural settings need to be identified to better understand the epidemiology. Our findings also highlight the fact that establishment of a surveillance system might not provide data representative of the population at large, and there is a need for establishment of surveillance system at strategic locations in a country.

CASELOAD IMPLICATIONS OF 2006 WHO CHILD GROWTH STANDARDS FOR CHILD HEALTH & NUTRITION PROGRAMMES TREATING WASTED INFANTS AGED <6 MONTHS: SECONDARY DATA ANALYSIS OF 21 DHS DATASETS

M Kerac, M McGrath, C Grijalva-Eternod, H Blencowe, J Shoham, Andrew Seal

Background

Treating wasted infants aged <6 months old (infantU6m) is challenging. One problem is lack of background disease-burden data. Programmes cannot easily know population coverage,; whether individual or public-health strategies are appropriate, and ; whether they these approaches are making an impact. Better defined epidemiology of infantU6m wasting is important.

Aims

To describe the prevalence of wasting among infantU6m in nutritionally vulnerable settings and examine the influence of 2006 WHO Child Growth Standards (WHO-GS) compared to National Centre for Health Statistics (NCHS) growth references.

Methods

Secondary analysis was carried out on 21 representative developing country Demographic and Health Survey (DHS) country datasets . Data were available for 15,534 infantU6m and 147,694 children aged 6-<60m (mean per country: 7,773, range: 1,710-45,398). Severe wasting was defined as weight-for-height (WHZ)<-3. Moderate wasting was defined as WHZ$\geq$-3 to and <-2 (NCHS or WHO-GS). Regression lines were calculated to illustrate the magnitudes of change from

NCHS to WHO-GS for infantU6m and children. Population data from the UN World Population Division was used to explore how changes might manifest in terms of numbers eligible for selective feeding programmes.

Results

Using NCHS references, country infantU6m wasting (WHZ<-2) prevalence ranges from 1.1%-15.0% (mean 6.6%) in the countries examined (equivalent to 3.7 million wasted infantU6m worldwide). Using WHO-GS, prevalence increases, ranging from 2.0%-34.1% (mean 18.4%, equivalent to 10.3 million wasted infantU6m worldwide). Taking the slope of NCHS-WHO regression lines to illustrate magnitudes of change, country prevalence of severe infantU6m wasting increases 3.54-fold and moderate wasting increases 1.43-fold using WHO-GS z-scores rather than NCHS z-scores. This compares to 1.68-fold and 0.86-fold changes for severe and moderate wasting in children aged 6 to <60m.

Conclusions

Wasting among infantU6m is prevalent. Transition to the WHO-GS significantly increases the numbers eligible for feeding programme admission. This represents important opportunities to treat more infantU6m and move towards realising MDG4. However, there are also considerable risks, including treatment programmes designed for older age-groups becoming overwhelmed, and of efforts to treat (e.g. early complementary feeding), undermining or failing to adequately support establishment of exclusive breastfeeding as a treatment outcome. Policy makers and programme managers should plan for these changes and consider the how to minimise risks and maximise benefits.

BREASTFEEDING VERSUS OTHER FEEDING IN RELATION TO MICRONUTRIENT AND ENTEROPATHOGEN IN BANGLADESHI CHILDREN WITH ACUTE DIARRHOEA

S.K.Roy, M. Khanam, A. Begum, N. Alam, S.K. Thakur, K. Paul, W. Khatun, Debjani Sarker

Background

The nutritional status of infants largely depends on their feeding practices. There is inadequate information about the relationship between recovery from diarrhoea and nutritional status, diarrhoeal pathogens, and feeding practices or micronutrient status of young children hospitalized for acute diarrhoea.

Aims

To assess the relationships of dietary pattern with nutritional status, micronutrient status and bacterial pathogens in young children with acute diarrhoea.

Methods

Two hundred and nine children between 4 and 24 months of age with fewer than 3 days of diarrhoea were randomly selected from Dhaka Hospital of the ICDDR,B on their admission day. Feeding practices of the subjects were recorded during an interview of their caretakers. Nutritional status was assessed with standard anthropometric measurement. Diarrhoeal pathogens were isolated by microbiological assay and serum zinc and vitamin A were assayed using biochemical analysis.

Results

Twelve percent of the children were exclusively breast-fed, 10% were fed formula, 37% were fed breast milk and formula, 14% were fed rice gruel with powder milk, and 27% were fed the family diet along with milk. Breast feeding rate was 67% and 28% in the infants below 5 months and children above 1 year, respectively. Sixteen percent of the illiterate mothers exclusively breast fed their infants compared to 7% of mothers above primary education (p=0.01). 15% of the poor mothers exclusively breast fed their infants compared to 7% of the middle class mothers (p=0.01). Serum zinc and Retinol Binding Proteins (RBP) of the exclusively breastfed babies were higher compared to those of formula-fed infants. Stool pathogens were isolated from 67% of the subjects. Exclusively breastfed infants had fewer bacterial pathogens than non-breastfed subjects (12% vs. 25%). On the other hand, rotavirus was more frequently isolated from breastfed subjects. Fifty three percent of the study children were moderately malnourished (≤75% of wt/age of NCHS median). The results of the study suggested that children's age, mother's education and socioeconomic status had a negative relationship with breast-feeding and nutritional status.

Conclusions

Exclusive breast-feeding was associated with fewer bacterial pathogens and higher serum zinc and retinol level among the young infants who presented with diarrhoea.

INFANT AND YOUNG CHILD FEEDING BEHAVIORS DURING AND AFTER ILLNESS IN MALAWI

B. Mtimuni, A. Kalimbira, G. Chapota, A. Joabe

Background

Acute and chronic illnesses and inadequate feeding practices are among the principal causes of malnutrition in children. Illness does not result in chronic malnutrition when children are well-fed before, during, and after illness.

Aims

To gain an understanding of infant and young child feeding practices, including during and after illness.

Methods

The study employed a consultative research design in which qualitative data were collected from mothers of well and sick infants and young children 6–23 months of age. In-depth home interviews and observations were conducted with 60 mothers from the three regions of Malawi to determine what and how they were feeding their children.

Results

All mothers said that the illness itself was the most important factor affecting appetite in children who stop eating during illness. Some mothers only breastfeed their babies during illness while others offer other foods to the child. Mothers reported that maize porridge, rice, and biscuits are foods that are good for sick children. Foods to avoid include carbonated drinks, cassava leaves with sodium bicarbonate, raw cassava and sweet potatoes, roasted maize, eggs, and cold foods. Taking the child to the hospital to correct illness was mentioned by some mothers as an important way to improve appetite when the child is ill.

When asked if they feed their infants more, less, or the

same when the child has recently recovered from an illness, about one-quarter of mothers said they feed more or more frequently and about one-quarter said they feed the same amount and types of food. A few mothers reduce the food children receive after the illness and gradually increase it thereafter. Other mothers add ingredients to increase the energy density of the normal diet. Only a few mothers said the reason they feed more after illness is so their babies "gain weight."

Conclusions

Increasing knowledge about optimal infant and young child feeding practices during and after illness is an important strategy for reducing malnutrition in Malawi.

MOLECULAR GENOTYPING OF CRYPT-OSPORIDIUM ISOLATES FROM CHILDREN IN KUWAIT WITH DIARRHOEA

J Iqbal, Hira Pr.

Background

Cryptosporidiosis is recognized worldwide as a significant cause of diarrhoeal diseases in both adults and children, especially those less than 2 years of age.

Aims

Cryptosporidium spp. isolated from young children in Kuwait was characterized at the molecular level to understand the transmission of infection.

Methods

Over a period of 2 years, fecal specimens from 97 Kuwaiti children with persistent diarrhoea, which were found to be positive for Cryptosporidium spp. by microscopy, were genotyped and sub-typed with a small subunit rRNA-based PCR-restriction fragment length polymorphism analysis. Informed consent was taken from all individuals included in the study.

Results

The median age of infected children was 4.9 years, and the majority of the infections (>70%) occurred during the cooler months (January to April), indicating a marked seasonal variation. More than 85% of the children with cryptosporidiosis had only Cryptosporidium infection. Socio-demographic information did not reveal any particular mode of transmission of infection. Genotyping of the organisms isolated showed that ninety-five (95%) of the children had C. parvum, 4 (4%) had C. hominis, and 1 (1%) had both C.parvum and C. hominis. Altogether, 9 subtypes of C.parvum and C. hominis were observed.

Conclusions

Our study revealed a very different distribution of Cryptosporidium genotypes in Kuwaiti children compared to other tropical countries. The genotypes and subtypes isolated are discussed with relation to the seasonality and possible mode of transmission of this infection in Kuwait.

A RETROSPECTIVE STUDY OF CRYPTOSPORIDIUM DIARRHOEA IN A REGION WITH A HIGH HIV PREVALENCE

Nel ED, Cotton MF, Rabe H, Goodway J.

Background

Cryptosporidium has emerged as an important cause of diarrhoea in children. No data are available describing cryptosporidial diarrhoea in the Western Cape Province of South Africa.

Aims

The aim of this study was to describe cryptosporidial diarrhoea in children presenting to Tygerberg Children's Hospital, a referral hospital in the Western Cape, South Africa.

Methods

A retrospective review was performed of patients presenting to Tygerberg Children's Hospital with diarrhoea and cryptosporidium detected in the stool from June 2004 to April 2005. Demographic details, duration of hospitalisation, mortality, HIV status and long term outcome of HIV infected children were recorded. Data are summarised with means and standard deviations or medians where appropriate. Medians were compared with the Mann- Whitney U Test. Categorical data were compared with the Chi-squared test.

Results

Cryptosporidium was found in 90 stool specimens of 63 children younger than 18 years. Thirty-nine (62%) were male. The mean age was 18.7 months (sd 17 months). Fifty-two (83%) were younger than 2 years. Thirteen children were HIV positive, 19 were HIV negative, and the HIV status of 31 was not determined.

There were eight deaths related to the cryptosporidium infection. Four were known to be HIV infected (all were also severely malnourished). The median CD4 count (percentage of total lymphocyte count) of survivors was significantly higher than that of those who died (28 % vs 12.5%, p 0.033). Two of the remaining 4 children who died were also malnourished.

Forty-eight children required hospitalisation and 15 were treated as outpatients. The median duration of hospitalisation for HIV infected children was significantly longer than for children not infected with HIV or of unknown status (18 days vs 8.5 days, p =0.018). Records were available for 8 of 9 surviving HIV infected children (median follow-up period 27 months (range 0.4- 39 months)). All except one received HAART. No patient developed signs suggestive of cholangiopathy.

Conclusions

The mortality and morbidity of cryptosporidium diarrhoea is high. Most deaths occur in HIV-infected or malnourished children. The majority require hospital admission. There was no evidence of cholangiopathy in HIV infected survivors receiving HAART.

A REVIEW OF BACTERIAL INFECTIONS IN MALNOURISHED INFANTS AGED UNDER 6 MONTHS: IMPLICATIONS FOR CASE MANAGEMENT IN DEVELOPING COUNTRIES

H.Bailey , M Kerac , A Seal

Background

Management of severe acute malnutrition (SAM) in infants aged <6 months (infantsU6m) is challenging. One cause of excess mortality is infection. Optimizing antimicrobial therapy has the potential to improve outcomes.

Aims

To review whether current guidelines (many recommending amoxicillin as initial therapy) are consistent with current evidence on underlying infection in infantsU6m SAM.

Methods

We searched MEDLINE & Embase databases for studies reporting on the prevalence of bacterial infection in malnourished infantsU6m. Differentiating urinary tract infections (UTI), pneumonia and septicaemia, we examined all available data on causative organisms and antibiotic sensitivity patterns.

Results

Many studies identified were old, and few focused exclusively on malnutrition. Only one reported on infantsU6m. The rest presented aggregate data on infants and children of varying ages and varying nutritional status. Prevalence of UTI in 14 studies ranged from 3.3-38%. Of 197 positive cultures, 51.8% were E.coli, and 17.3% Klebsiella sp. Gram negative bacteria accounted for 92.4% of isolates. Prevalence of pneumonia in 10 studies ranged from 11-63%. Of 167 isolates, 61.1% were Gram negative bacteria. Staphylococcus aureus made up the majority of Gram positive isolates(21.6%). Prevalence of bacteraemia ranged from 5.5-36%. Commonest organisms were Salmonella sp.(20.3%), Staphylococcus aureus (12.6%), Klebsiella sp.(12.3%), E.coli (12.1%) and Streptococcus pneumoniae (10.5%). Outcomes in malnourished children with bacteraemia were poor; CFR ranges were reported as 13-78% and 22-31% compared to 5-11% in non-bacteraemic children. Younger children were more at risk of bacteraemia in one study; children <1 year had a RR of 1.77(CI 1.43-2.18) of bacteraemia relative to older children. Of the studies reviewed, median in vitro sensitivity of isolates was 24% for amoxicillin and 25% for ampicillin.

Conclusions

Evidence to support the choice of antibiotic protocol infantsU6m SAM is limited. Interim guidelines can be based extrapolation from closely related patient groups like malnourished children and non-malnourished infants. Reports of low sensitivity to current 1st line antibiotics suggest that antibiotic use in infantU6m SAM urgently need to be reviewed. To inform future guidelines and intervention strategies, directly applicable and up-to-date studies are needed, notably RCTs of different antimicrobial regimes. These would offer far stronger evidence than currently available from observational studies.

PRESENTATION AND TREATMENT RESPONSES AMONG HIV-INFECTED AND UNIFECTED CHILDREN WITH SEVERE MALNUTRITION

Nahashon Thuo, Kathryn Maitland,Alison Talbert, Japhet Karisa Sarah Atkinson,James A Berkley

Background

HIV infection and exposure makes a significant contribution to the burden of childhood malnutrition in sub-Saharan Africa. Case fatality rates are reported higher in HIV infected children. It is however unclear which, if any, components of anti-microbial, supportive, or nutritional care may need to be specifically tailored for HIV-infected children.

Aims

To compare the clinical presentation, invasive bacterial species and antimicrobial resistance profile, co-morbidities, rates of weight gain, episodes of diarrhoea, duration of rehabilitation and outcome among HIV-infected and uninfected children with severe malnutrition.

Methods

Children aged 6 months to 5 years admitted to Kilifi District Hospital, Kenya from 2005 to 2008 with weight for height z score<-3 or MUAC <11cm or kwashiorkor were included. Standardized clinical data plus a blood culture, HIV rapid test, full blood count and malaria slide were collected at admission. Daily progress and clinical signs were recorded.

Results&Conclusions

Approximately 20% of children with severe malnutrition were HIV-infected. Clinical features at presentation, microbial species and sensitivities of blood cultures, co-morbidities, weight gain, occurrence of persistent and/or secondary diarrhoea, survival curves and multivariable analysis of the effect of HIV infection will be presented.

THE ROUTINE USE OF ANTIBIOTICS DOES NOT IMPROVE OUTCOMES IN THE HOME-BASED TREATMENT OF SEVERE ACUTE MALNUTRITION

R. E. Amthor I. Trehan M. J. Manary

Background

The treatment of severe acute malnutrition in children with ready-to-use therapeutic food has become the standard of care although controversies continue to exist regarding the optimal means of implementation.

Aims

To determine if the routine inclusion of antibiotic therapy improves outcomes in the home-based treatment of severe acute malnutrition with ready-to-use therapeutic food.

Methods

This retrospective cohort study compared longitudinal data from the treatment of two groups of children in rural Malawi aged 6-60 months presenting with uncomplicated severe acute malnutrition. One group received a 7 d course of amoxicillin at the onset of treatment according to the standard protocol in Malawi. The other group was not prescribed any antibiotics. All children were treated at home with ready-to-use therapeutic food. The primary outcome of this study was recovery, defined as weight-for-height z score (WHZ) > -2 and no edema. Cox regression modeling using

time as a covariate assessed the longitudinal effects of initial differences in the patient population on recovery.

Results

2364 children were included in this study; 514 children were treated according to the standard protocol and 1850 were treated without antibiotics. The two study populations differed in that the standard protocol group was more wasted and less likely to have edema. After 12 weeks, the proportion of children in the standard protocol group who recovered was lower (84%) than those in the no antibiotic group (88%) (P = 0.02). Regression modeling indicated that recovery was associated with not receiving amoxicillin.

Conclusions

These preliminary results suggest that routine antibiotics may not be useful in the treatment of uncomplicated severe acute malnutrition. A randomized, placebo-controlled trial is necessary to definitively determine the effect of antibiotics on recovery from uncomplicated malnutrition with home-based therapy.

Conclusions

Children in Malawi experience a high rate of severe RVGE during the first year of life caused by a wide diversity of RV strains. RIX4414 reduced severe RVGE episodes by half and all-cause severe GE by a quarter. Rotavirus vaccination is expected to have a major public health impact in Malawi and other developing countries with high rotavirus and diarrhoeal disease burden.

THE ENHANCED DIARRHEAL DISEASE CONTROL INITIATIVE

Evan Simpson, MPH

Background&Aims

In June, 2009 the World Health Organization's Strategic Advisory Group of Experts (SAGE) recommended the inclusion of rotavirus vaccination into all national immunization programs. Concluding their recommendation, SAGE stated:

"Use of the (Rotavirus) vaccine should be part of a comprehensive strategy to control diarrhoeal diseases and should include, among other interventions, improvements in hygiene and sanitation, zinc supplementation, community-based administration of oral rehydration solution and overall improvements in case management." (Weekly Epidemiological Record, 5 June, 2009)

In this presentation, participants will learn of a comprehensive strategy to control diarrhea by stimulating awareness and demand for new interventions, including rotavirus vaccine, zinc treatment, and low-osmolarity oral rehydration solution, while also expanding coverage of established interventions such as breastfeeding. This program, the Enhanced Diarrheal Disease Control Initiative (EDD), addresses the policy and implementation challenges of scaling-up new interventions through a comprehensive approach.

The scientific achievements leading to the development of rotavirus vaccines, zinc treatment and low-osmolarity ORS signals the potential for a new era in diarrheal disease control. However, these interventions must be made relevant and accessible to the public health agenda of developing countries. Doing so requires stimulating demand, updating policies, and ensuring availability.

EDD is one potential mechanism for advancing evidence around these new interventions in the context of public health impact. In this presentation the audience will learn of the formative research that lead to the development of EDD and some preliminary outcomes from pilot projects in Asia and Africa.

Methods

This project utilized qualitative research surveys for hypothesis testing and which informed the development of this advocacy, policy and communications strategy to advance new interventions for diarrheal disease control.

Results

Pilot projects in Vietnam and Kenya have achieved significant changes in policies and protocols necessary for the eventual uptake of new interventions for diarrheal disease control.

Conclusions

A portfolio or coordinated approach to introducing several new interventions for diarrheal disease appears to be effective in stimulating policy and protocol changes leading to adoption.

GLOBAL UPDATE ON THE STATUS OF ROTAVIRUS VACCINES

JE Tate AD Steele, MM Patel1,
MM Cortese D Payne J Gentsch
UD Parashar

Background

In 2006, two new rotavirus vaccines were found to be safe and efficacious in large clinical trials in Europe and the Americas and subsequently were introduced into the immunizations programs of several countries. In 2009, based on early promising results of vaccine trials in Africa and Asia, the World Health Organization extended its recommendation for use of rotavirus vaccines to all countries globally. This presentation will review the status of rotavirus vaccines worldwide including results of post-introduction monitoring to assess vaccine effectiveness, impact, and safety and will discuss challenges to vaccine introduction.

Methods

A review of published and unpublished data regarding rotavirus vaccine effectiveness, the impact of vaccination on disease burden, and the status of introduction of rotavirus vaccines globally will be presented.

Results

Post-introduction data from the Americas suggest that rotavirus vaccination is highly effective and safe in preventing severe rotavirus disease. Early data from clinical trials in Africa suggest that rotavirus vaccination will also prevent substantial disease in developing countries. However, challenges to vaccine introduction still exist including lack of data on interaction with other EPI vaccines, especially OPV, and safety issues such as the risk of intussuception and administration to HIV-infected infants. Issues such as supply and price of the vaccine and equity of distribution of these new vaccines also need to be addressed.

Conclusion

Rotavirus vaccines have great potential to reduce the substantial global burden of rotavirus disease. Additional data is needed to fully quantify the impact of rotavirus

vaccination programs but these data will become available as additional countries introduce vaccine.

IMPACT OF DOUBLE SUPPLEMENTATION ZINC-VITAMIN A ON MORBIDITIES AMONG YOUNG CHILDREN IN BURKINA FASO: A RANDOMIZED, DOUBLE BLIND, PLACEBO-CONTROLLED INTERVENTION

Lucien Bado, Augustin N. Zéba, Tarnagda Zékiba, Hermann Sorgho , Issaka Zongo, Noël Rouamba, Salia Diabaté, Jean-Bosco Ouédraogo.

Background

Zinc and vitamin A are essential micronutrients required for normal immune system functioning and can help build resistance to infections, including diarrhea, pneumonia, and possibly malaria.

Aims

To assess the impact of the double supplementation zinc-vitamin A on the morbidity and nutritional status among preschool children in Burkina Faso.

Methods

We used a randomized, double blind, placebo-controlled intervention trial. 320 healthy children aged 36–60 months were randomly assigned to one of two intervention groups: 10 mg Zn/6d/week plus 200.000 IU vitamin A for the supplemented group and zinc placebo plus 200.000 IU vitamin A for the placebo group. Children had daily follow-ups to assess morbidity, including malaria and diarrhea, with detection and recording over a period of six months. Microscopic examination of blood smears was done in the case of fever (T ≥ 37.5°C) for malaria detection. The profile of malaria immunoglobulin G (IgG) anti-msp1 and IgG anti-csp was assessed in the two intervention groups using ELISA method. Anthropometric data were performed at baseline and at the end of the study in two cross-sectional surveys, and were were transformed into z-score indexes. Plasma zinc was used to assess zinc status.

Results

A total of 268 children completed the study. The double supplementation permitted a significant reduction of anemia cases from 18.0 to 5.4% (p 0.05). Malaria and fevers attacks were, respectively 23% (p=0.009) and 13.3% (p<0.001) lower in the supplemented group. In the supplemented group, a significant increase of the IgG anti csp (p=0,034) and IgG anti msp1 (p=0,008) was noted. Additionally, the supplementation permitted a significant improvement of children's linear growth relative to the placebo group (0.50 vs 0.39 cm/mo; p<0.0001). We also found a reduction from 35.31% to 10.17% cases of zinc deficiency in the supplemented group, but found no significant difference relative to placebo group (p< 0.28).

Conclusions

Zinc supplementation and adequate vitamin A status improves the immune system, and thus, may protect against some diseases such malaria and anemia and help to resolve nutritional deficiencies in low income countries.

STABLE ISOTOPE TECHNIQUE TO ASSESS BREASTFEEDING DURING EARLY LIFE IN BURKINA FASO

Nadine Coulibal Césaire Ouedraogo David Ouedraogo Salia Diabat Augustin N. Zeba1 Jean-Bosco Ouedraogo

Background

Following WHO recommendations, the current guidelines recommend exclusive breast-feeding for at least 6 months of age in Burkina Faso, but few women exclusively breast-feed beyond 4 months. Many questions remain today; at what time do maternal prenatal nutrients stores become depleted, for exclusively breast fed infants? What may be the optimal duration of exclusive breast-feeding in our context? The technique of administering deuterium oxide (D2O) doses to the mother offers an accurate measure of maternal body composition and milk intake.

Aims

To evaluate the national breast-feeding program in order to establish the exclusive breast-feeding practice rates in Burkina Faso.

Methods

We recruited 24 mother/baby pairs within 7 days after delivery in a rural health centre of ''Valley du Kou'' village, located at 25 km from Bobo-Dioulasso. Anthropometry, clinical data, and saliva samples were collected at the inclusion date (M0), 2nd month (M2), 4th month (M4) and 6th month (M6). At these scheduled follow-up times, saliva samples were collected before and after D2O dose administration (30 ml) to the mother (D0, D1, D3, D4, D13 and D14). The body composition, breast milk and other liquid intake were measured using the FTIR techniques.

Results

This report concerns only the data of the M0. The average intake of breast milk was 498.08 mL (107.00 mL, 816.00 mL). 17 women breastfed exclusively. The average proportion of mother's fat-mass tissue was 21.7% (9.0%, 39.5%).

Conclusions

Few women breastfed exclusively; other liquids are introduced into babies' diets at an early stage of life. The stable isotope technique is a helpful tool for the breastfeeding program assessment and could be used to determine effective implementation in Burkina Faso.

IRON DEFICIENCY AND RISK OF INFECTION IN YOUNG MALAWIAN CHILDREN

Phiri KS, Calis CJC, Brabin B,Boele van Hens-broek M

Background

A major unresolved concern that may influence iron deficiency control strategies is the interaction between iron status, iron supplementation and susceptibility to infection. There are two main postulates: firstly that iron deficiency (ID) aids immunity (the 'nutritional immunity' hypothesis), and secondly that it hinders host defence against infection.

Aims

To assess the risk of infection in iron deficient Malawian children.

Methods

Children presenting to hospital with an Hb <5g/dl were recruited as cases of severe anaemia, children attending for all other reasons apart from severe anaemia were recruited as hospital controls[HC]; and children residing in same area as an anemia as community controls[CC]) in two districts in southern Malawi. We measured the prevalence of iron deficiency, bacteraemia, malaria, and HIV infection at recruitment.

Results

A total of 1161 children (381 cases, 377 HC, 380 CC) were recruited. The prevalence of iron deficiency among cases (49%) was much lesser than HC (68%) or CC (75%). There was a significant decrease in prevalence of ID with age in all groups. However there was a non-significant association between ID and bacteraemia, malaria or HIV infection by study groups.

Conclusions

It appears that children presenting with severe anaemia are less likely to have ID which is in agreement with the nutritional immunity theory. This has important implications of iron supplementation in the management of severe anaemia in children.

THE INTERNATIONAL LIPID-BASED NUTRIENT SUPPLEMENTS PROJECT (ILINS PROJECT)

Ken Maleta (on behalf of the iLiNS research Project group)

BACKGROUND

In recent years there has been great success with the use of novel lipid-based fortified foods such as Plumpy'nut® for treating severely malnourished children. The next step is to make it cost-effective to use similar products, but with a much lower daily ration, to prevent malnutrition. Our research consortium adopted the term lipid-based nutrient supplements (LNS) to refer generically to the range of products in which multiple micronutrients are embedded in a lipid-based food product. The daily ration of LNS can range from as little as one teaspoon (5 g, ~25 kcal) (e.g. "Grandibien", being marketed in Niger) to more than 200 g/day (e.g. Ready-to-Use-Therapeutic Foods (RUTF) such as Plumpy'nut®, used for treating severely malnourished children. The daily ration of LNS and its micronutrient composition can also be adapted depending on the needs of the target population. Although most of the LNS products to date have included peanut butter, there are alternative formulations without peanuts. Thus, there is great flexibility in the choices of LNS products that can be used for a given program or for retail sale.

We have pioneered the use of LNS for home fortification of complementary foods in Ghana and Malawi respectively, and our results suggest that this approach increases linear growth of infants, normalizes their gross motor development, and prevents severe stunting, effects that have not been demonstrated with micronutrient supplements alone. We believe that there is also great potential for using LNS to improve nutritional status of pregnant and lactating women, and thereby also enhance their children's growth and micronutrient status. In addition, a food-based approach such as LNS offers the possibility of local economic benefits via purchase of locally grown ingredients and product distribution and sales. For these reasons, we believe that the LNS approach represents a potential breakthrough in nutritional strategies to prevent malnutrition.

OBJECTIVES:

The goal of the International Lipid-based Nutrient Supplement Project (iLiNS Project) is to contribute to the reduction of maternal and child undernutrition by providing an evidence base for the use of lipid-based nutrient supplements in low-income populations. This will be addressed by answering 5 key questions

1)   How to adapt LNS formulations to the nutrient composition of locally available vegetable oils
2)   How to reduce cost, while maintaining the benefit for linear growth, by modifying the ingredients and daily ration size of LNS for infants and young children
3)   How much zinc to include in LNS to achieve the desired effects on growth and functional outcomes for infants and young children
4)   To what extent can LNS provided to pregnant and lactating women improve maternal nutrition, birth outcomes and child growth
5)   How to make LNS an economically feasible approach for preventing malnutrition, by determining how much populations are willing to pay for LNS, the cost-effectiveness of LNS, and efficient delivery systems

METHODS

The project entails a series of clinical trials in three African countries ranging from testing the acceptability of the reformulated products; efficacy of products for children and pregnant and lactating mothers; efficacy of formulations containing zinc and economic studies of LNS use. Additionally to influence policy, the project has an advocacy component which entails coordination meetings and production of a technical LNS document.

Collaborators

This project is a joint effort of the University of California, Davis, the University of Tampere (Finland), the University of Malawi, the University of Ghana, the Institut de Recherche en Sciences de la Santé (Burkina Faso), Nutriset (France), Project Peanut Butter (Malawi) and Helen Keller International made possible with generous grant to the University of California by the Bill and Melinda Gates Foundation. The project started in January 2009 and will continue until December 2013.

Project Team

The iLiNS research group includes Seth Adu Afarwuah, Lindsay Allen, Per Ashorn, Ulla Ashorn, Kenneth Brown, Kathryn Dewey, Sonja Hess, Anna Lartey, Kenneth Maleta, Mark Manary, .Jean Pierre Bosco Ouedraogo, John Phuka, Stephen Vosti and Mamane Zeilani

SATURDAY PRESENTANTIONS

OUTPATIENT TREATMENT OF SEVERE ACUTE MALNUTRITION AS A ROUTINE PART OF PRIMARY HEALTH CARE ACTIVITIES IN LUSAKA ZAMBIA.

S Collins, A Hailu, PD Kabi, N Dent,
C Muleya, B Amadi, MO Bachmann,
S Mollison

Background/Aims

Severe acute malnutrition (SAM) currently affects about 13 million children under five years old worldwide and is associated with 1-2 million preventable child deaths each year. Community-based Therapeutic Care (CTC) is a new model of care that treats most cases of severe acute malnutrition solely as outpatients. The model has proved to be highly effective in emergency settings when implemented by Non-Governmental Organisations and has recently been endorsed as the recommended model for the treatment of SAM by the United Nations. However, there is little data about non-emergency situations, where CTC is implemented as part of standard primary health care. This study describes the outcomes of a CTC programme implemented over a 25 month period by the Lusaka District Health Management Team with minimal external support.

Methods

A prospective cohort study within a CTC programme was implemented in 12 government clinics in Lusaka. Data were collected from the clinical records of 2860 admission events of children aged 6 -59 months admitted into to the programme with marasmus, kwashiorkor or marasmic kwashiorkor between September 2005 and September 2007. Outcomes were recovery, mortality, default, discharge, transfer to hospital, and length of stay.

Results

Of 2523 recorded exits from the programme 1865 (73.9%) patients recovered, 65 (2.6%) died, 150 (5.9%) were referred to hospital, 8 (0.3%) were discharged unrecovered and 435 (17%) defaulted.

Conclusions

The outpatient management of SAM in this context produces outcomes that exceed international standards for the treatment of SAM and can be effectively integrated into urban primary healthcare services in resource poor countries. However, difficulties in logistics and ongoing community mobilisation activities are considerable barriers to implementing such programmes in the long term. The intervention was highly cost-effective in terms of cost, lives saved, and DALY gained.

PROBIOTIC/PREBIOTIC-ENHANCED THERAPEUTIC FOOD FOR TREATMENT OF SEVERE ACUTE MALNUTRITION IN A HIV PREVALENT SETTING:

A DOUBLE-BLIND EFFICACY RCT IN MALAWI

M.Keraç J.Bunn A.Seal M.Thindwa
A.Tomkins K.Sadler P.Bahwere S.Collins

Background/Aims

Severe Acute Malnutrition (SAM) is a global public health priority affecting 13 million children worldwide and causing 1-2 million deaths per year. Aims were to determine the clinical and nutritional efficacy of a probiotic/prebiotic functional food (Synbiotic2000ForteTM) for treating SAM in a HIV prevalent setting.

Methods

From July 2006 to March 2007, 795 Malawian children were enrolled in a randomised, double-blind, placebo controlled efficacy study. All SAM admissions to the nutrition ward of a large referral hospital were eligible. After stabilization with milk feeds, children were randomised to Ready-to-Use Therapeutic Food(RUTF) with or without Synbiotic. The average prescribed Synbiotic dose was ≥1010 colony-forming-units lactic acid bacteria/day for duration of treatment (median 33 days).

The primary outcome was nutritional cure (weight-for-height >80% of NCHS median on two consecutive outpatient visits). Secondary outcomes included death, weight gain, time to cure, and prevalence of diarrhoea, fever or respiratory symptoms.

Results

Groups were wellmatched at baseline. Outcomes were similar: 53.9%(215/399) cure in Synbiotic patients, 51.3%(203/396) in controls(p=0.40). Other secondary outcomes were also similar(p>0.05), including total deaths (27.1%(108/399) Synbiotic deaths vs. 30.0%(119/396) control deaths (p=0.31)). HIV seropositivity was associated with worse outcomes, but it did not confound the overall negative results. Subgroup analyses showed possible trends towards reduced late mortality. There were no group differences in initial inpatient deaths (p=0.38). Deaths throughout the remainder of the study were 47/338(13.9%) in the Synbiotic group and 67/344(19.4%) in controls (p=0.05). There were no occurrences of probiotic-associated sepsis and no excess probiotic-associated mortality in the HIV seropositive group.

Conclusions

In our setting, Synbiotic2000 ForteTM, did not improve SAM outcomes. Explanations other than no effect include:

deaths from causes unaffected by Synbiotic actions, organism sensitivity to cotrimoxazole antibiotics, Synbiotic sharing or cross-infection between children, and suboptimal dose/dose regime. The observation of reduced outpatient mortality may be due to bias, confounding variables or chance, but it is biologically plausible and has potential for public health impact.

EFFICACY OF A STANDARDIZED PROTOCOL USING LOCAL DIET DURING NUTRITIONAL REHABILITATION OF SEVERELY MALNOURISHED CHILDREN IN BANGLADESH

MM Islam T Ahmed B Nahar M Ali GG Fuchs RM Suskind

Background

Adequate catch-up growth of severely malnourished children requires feeding with diets that are nutritious, inexpensive, easy to prepare, and culturally acceptable. Locally available diets for nutritional rehabilitation (NR) are less expensive and sustainable. A standardized diet protocol (SDP) was developed based on such diets for improving catch-up growth during NR.

Aims

To assess the efficacy of a standard protocol using local diets for management of severe acute malnutrition in children.

Methods

Severely malnourished children with diarrhea and other acute illnesses were managed according to a treatment protocol based on WHO guidelines. After completion of acute phase of management, children aged 6-60 mo underwent nutritional rehabilitation when the SDP based on khichuri, halwa, and a milk-cereal diet were used. The amount of milk-cereal diet was gradually reduced such that the children were mostly on khichuri and halwa at the time of discharge. Multivitamins, zinc and iron were also given. The Nutrition Rehabilitation Unit (NRU) is located at the Dhaka Hospital of (ICDDR,B).

Results

From June 1996-December 2003, 1,712 severely malnourished children were managed in the NRU. Criteria for admission included improvement in general condition following care in the longer-stay ward and having any of the following nutritional indexes: weight-for-length <70% of NCHS median, weight-for-age <50% or bipedal edema. For statistical analysis, children were divided into groups based on their daily body weight gain (g/kg/d), group A ($\geq$ 5.00 g/kg/d) and group B (0-4.99 g/kg/d). Eighty-one percent of the children had a body weight gain $\geq$ 5.00 g/kg/day. Overall, the children required a median of 12 (IQR 8,18) days to achieve a odema-free weight-for-length >80%. Logistic regression analysis shows that each unit less in weight-for-height/length z-score on admission of children who did not have oedema on admission, did not become ill during rehabilitation phase, stayed at NRU for more than 12 days, and completed the usual rehabilitation at the NRU, correlated with a higher probability of poor weight gain.

Conclusions

The use of a standardized diet protocol based on locally prepared and culturally appropriate diets is an efficacious and sustainable method of nutritional rehabilitation of severely malnourished children.

SUPPLEMENTARY FEEDING WITH LIPID BASED NUTRIENT SUPPLEMENT BUT NOT CORN/SOY BLEND IMPROVES WEIGHT GAIN AMONG MODERATELY UNDERWEIGHT CHILDREN: A RANDOMISED CONTROLLED 12-WEEK TRIAL IN RURAL MALAWI

C Thakwalakwa, P Ashorn, J Phuka, Y Cheung, A Briend, M Kataja, T Puumalainen, K. Maleta

Background

Poor growth and early childhood undernutrition, especially between 6 and 18 months old, is very common in rural Malawi and elsewhere in Sub-Saharan Africa. No good community level treatment for this special group has been identified. Lipid-based nutrient supplements (LNS), also known as ready- to-use therapeutic food, appear more beneficial than supplementation with corn-soy blend (CSB) in severely undernourished children. However, no comparisons have been made between supplementation with LNS or CSB to no supplementation to determine efficacy in promoting growth in moderate underweight children.

Aims

To test the hypothesis that 6-15 –month old, moderately malnourished infants and children receiving food supplementation with LNS or corn-soy blend (CSB) grow more during a 12-week intervention than control infants not receiving any supplementation.

Methods

We did a single- centre, randomised, controlled, single-blinded trial in Mangochi district, rural Malawi. 192 moderately malnourished infants aged 6-15 months and children were randomized into either corn-soy blend (CSB), lipid-based nutrient supplement (LNS) or control (no supplementation) group. The main outcome measure was weight gain. Analysis was by intention to treat.

Results

The mean weight gain was 470g in the control group, 610g in the LNS group and 510g in the CSB group (p=0.109). Mean weight-for-age increase was -0.32, 0.02 and -0.31 (p=0.030).. The differences were more marked when adjusted for baseline age and weight-for-age. No differences were observed in length, weight-for-length and length-for-age in the three groups. The proportion of children who improved in weight-for-age was 24%, 47%, and 27% in control, LNS and CSB groups, respectively, with an inter-group difference in proportion (p=0.010). No statistically significant differences were observed between in the improvement in weight-for-length and length-for-age in the three intervention groups.

Conclusions

In a poor food-security setting, moderately underweight infants and children receiving lipid based nutrient supplements for 12 weeks gain more weight than those not receiving food supplementation. Children receiving corn-soy blend and those not receiving supplementation gain about the same weight. However, in this trial, LNS and CSB were not directly compared.

ALTERNATIVE FOODS FOR ADDRESSING MODERATE MALNUTRITION: PRELIMINARY RESULTS OF A RANDOMISED INTERVENTION TRIAL WITH COMPARISON OF THREE TYPES OF SUPPLEMENTARY FOODS.

L Rossi[1,] V Angelini[2], M Grossiord[3,] AD Israel[4]

Background

Recently claimed hypotheses state that lipid-based supplements (high energy and micronutrient) would be better adapted for a programme addressing moderate malnutrition than high protein and low nutrient dense foods.

Aims

To compare whether the use of different food supplements, namely, Supplementary Plumpy (SP), Plumpy Doz (PD) and standard dry ration (CTL), would be efficacious on treatment of moderate acute malnutrition.

Methods

The study took place in Action Contre la Faim (ACF) Supplementary Feeding Centres (SFCs) of Northern Rakhine State (Myanmar). The protocol was a comparative trial of 3 foods for treatment of moderate malnutrition in children aged 6-59 months. 12 weeks of intervention with weekly assessment of weight, height and mid-upper arm circumference (MUAC) were planned. Preliminary data related to the first 6 weeks of treatment are presented. The results are presented as means, analysed with one-way ANOVA (Bonferroni correction), and proportions (%), cross tabulated and analysed with chi-square test.

Results

1 479 children (752M - 727F) were allocated PD (521), SP (468), CTL (490). After 6 weeks, the nutritional status of more females (54) than males (27) deteriorated (indicated by transfer to therapeutic feeding centres). The majority (56%) were treated with PD, 28% were treated with SP, and 26% were treated with CTL. 54 children dropped out (27M/F) with a larger proportion of PD (46%) and SP (39%) than CTL (15%). SP caused greater weight increase (g/kg/wk) 12,9 ± 8,5 than PD 11,0 ± 8,9 (p<0,05) and CTL 11,7 ± 7,7 (not significant). PD resulted in a larger MUAC increase 3,7 ± 4,3 than SP 2,7 ± 3,5 (p<0,05) and CTL (2,7 ± 7,2) (not significant). At the mid-point of intervention, children significantly improved in weight-for-height SD (-2,60 ± 0,28 vs -1,96 ± 0,49). SP showed larger increases of weight-for-height 0,67 ± 0,46 than PD 0,58 ± 0,51 (p<0,05) and CTL 0,61 ± 0,43 (not significant).

Conclusions

After 6 weeks of intervention, low acceptance of beneficiaries to the new products was revealed. Better performance of SP than PD on children growth was observed even though both products seemed not to perform better than CTL. Further confirmation of these findings will be provided at the end of the trial.

Use of LNS in Pregnancy and Infancy
SUMMARY OF TWO PROPOSED LNS TRIALS IN THE GAMBIA

S Unger

Trial 1:

A randomised trial to investigate the effects of pre-natal and infancy nutritional supplementation on infant immune development in rural Gambia (The ENID Trial: Early Nutrition and Immune Development)

We are conducting a randomised controlled trial of combined pre- and post-natal nutritional supplementation among pregnant women and their infants in the West Kiang region of The Gambia. The aim of this study is to determine the impact and potential mechanisms of different supplementation regimens, including LNS, on infant immune development. The primary outcome of this study will be thymic development during infancy. Antibody response to vaccination will be assessed as a key secondary functional outcome. Subsidiary analysis will also investigate impact on growth and development.

We hypothesise that early-life immunocompetence can be enhanced by a 'life-course' approach involving LNS to achieve nutritional repletion in late gestation and infancy, and, consequently to reduce vaccine failures and morbidity as well as to enhance growth.

Trial 2:

A randomised trial to investigate the effects of physician-prescribed, lipid-based multiple micronutrients on the health of children presenting to a primary health care centre in The Gambia (The MMCT – Multiple Micronutrients Clinical Trial) We are conducting a randomised, controlled trial of lipid-based multiple micronutrients prescribed by physicians to children under five of the West Kiang region of The Gambia who present to the clinic at MRC Keneba. The aim of the study is to determine the therapeutic efficacy of providing lipid-based multiple micronutrients to children in primary health care clinics in sub-Saharan Africa. The primary outcome of this study will be the frequency of self-referred clinic return attendances. Anthropometry, appetite and micronutrient status will be used as secondary outcome measures. Further immunological investigation will be undertaken in a subgroup of children presenting with a lower respiratory tract infection (LRTI).

We hypothesise that physician-prescribed LNS with a comprehensive set of micronutrients will improve the health status of children self-presenting to a primary health care clinic. We also hypothise that supplementing vulnerable children with LRTI with LNS will produce a more balanced immune response that will result in faster resolution of LRT-disease.

FOOD CONSUMPTION PATTERNS AND CAREGIVER FEEDING BEHAVIOURS AMONG MODERATELY MALNOURISHED CHILDREN IN RURAL MALAWI DURING SUPPLEMENTATION WITH LIPID-BASED NUTRIENT SUPPLEMENTS OR CORN-SOY BLEND

V. L. Flax, J. Phuka, Y. B. Cheung, U. Ashorn, K. Maleta, P. Ashorn,

Background

The way caregivers use supplementary food for malnourished children and integrate it into feeding patterns impacts the benefits achieved by supplementation. The present study adds to our previous research on usage patterns of lipid-based nutrient supplements (LNS) by investigating caregivers' behaviors and including corn-soy blend (CSB) for comparison.

Aims

To identify differences in feeding patterns and caregivers' feeding behaviors for children receiving either LNS or CSB.

Methods

Observational data for each participant were collected on semi-structured forms during one 11h home visit. Comparisons between the study groups were made using t-test and Fisher's exact test.

Results

A total of 170 children aged 6- to 17-months received either LNS (n=85) or CSB (n=85) during a 12-week intervention trial in southern Malawi. When all meals and breastmilk were examined, there was no difference between the study groups in total mean number of feeding episodes or mean daily time spent feeding. Supplement was fed more frequently to children in the LNS (1.0) than the CSB (0.8) group (p=0.035). Differences between the study groups were found in type of utensil used to feed supplement (spoon CAB 94%, LNS 48%, p <0.001); caregiver handwashing before supplement meals (CSB 64%, LNS 36%, p =0.001); and proportion of supplement that was not consumed by the child during supplement meals (CSB 24%, LNS 8%, p<0.001). These behaviors were similar for CSB and LNS mixed with porridge (spoon 96%, hand washing 63%, supplement lost 21%), but not for plain LNS (packet 69%, hand washing 20%, supplement lost 2%).

Conclusions

Most differences between the study groups appear to be linked to the way LNS are served (plain vs. mixed with porridge). Programs promoting LNS in Malawi should consider behaviors related to mode of serving and provide appropriate advice to caregivers in order to optimize supplement intake and hygiene.

IMPACT OF COMMUNITY-BASED FOLLOW-UP CARE, WITH OR WITHOUT FOOD SUPPLEMENTATION AND/OR PSYCHOSOCIAL STIMULATION, ON THE RECOVERY OF SEVERELY UNDERWEIGHT BANGLADESHI CHILDREN: A RANDOMIZED INTERVENTION TRIAL

MI Hossain B Nahar T Ahmed JD Hamadani Janet M Peerson KH Brown

Background

Improved community-based management regimens need to be developed and evaluated for the management of severely malnourished children.

Aims

The study was done to assess the effect of community-based follow-up care, with or without food supplementation and/or psychosocial stimulation, as alternatives to current hospital-based follow-up care of severely underweight children previously hospitalized for diarrhoea.

Methods

507 severely underweight (WAZ <-3) children 6-24 months of age hospitalized at ICDDR,B- Hospital were randomly assigned to one of five outpatient treatment regimens once they recovered from diarrhea: i) fortnightly follow-up at the ICDDR,B-Hospital, including growth monitoring, health education, and micronutrient supplementation (H-C, n=102); ii) fortnightly follow-up at the community-clinics, using the same treatment regimen as Group H-C (C-C, n=99); iii) follow-up as per Group C-C plus supplementary food (SF) to provide 225kcal/d as a cereal, legume, oil mixture (C-SF, n=101); iv) follow-up as per Group C-C plus psychosocial stimulation (PS) (C-PS, n=102); or v) follow-up as per Group C-C plus both SF and PS (C-SF+PS, n=103).

Results

The children's mean±SD age was 12.6±4.0 months, WAZ was -3.83±0.61, and WLZ was -2.71±0.76. There were no significant differences in baseline characteristics by treatment group. The rate of spontaneous attendance at scheduled follow-up visits differed significantly by treatment group (C-SF > C-SF+PS > C-PS > C-C > H-C; p<0.05). The mean rates of weight gain (absolute weight in kg/3 months, and percent weight gain from baseline) differed significantly by treatment groups and were: C-SF+PS, C-SF, and C-PS varying from 0.88 to 1.01 kg, and 15.1 to 17.3% > C-C and H-C varying from 0.63 to 0.76 kg, and 11.1 to 13.2 % respectively; p<0.05). Children of all groups managed at the community had greater linear growth than those in group H-C (p<0.05). Wasted children (admission WLZ < -2) had a greater weight gain than non-wasted children especially in C-SF and C-SF+PS groups.

Conclusions

Community-based provision of follow-up services increases adherence to the follow-up schedule, and provision of FS with or without PS enhances the rates of nutritional recovery. Community-based service delivery, especially including supplementary food permits better rehabilitation of greater numbers of severely underweight children.

INVESTIGATING THE ECONOMIC DIMENSIONS OF LNS USE FOR PREVENTING MALNUTRITION

T Phiri, S Vosti

Policy decisions related to LNS products cannot be taken on the basis by nutritional efficacy alone. Individuals and households have preferences regarding how to spend their scarce time and other assets, and they also have strategies for improving their welfare and dealing with uncertainty – all of these factors can influence both the value households place on LNS products and households' willingness and ability to consume them when faced with non-zero prices for LNS products. In addition, few envision LNS products being distributed only through health clinics; some target populations may be more cost-effectively served by alternative distribution mechanisms, e.g., retail food markets or female-run small-scale enterprises. Research at all three iLiNS research sites will be undertaken to address these and related issues, all of which have policy content. In this presentation we focus on LNS demand and on the cost-effectiveness of distributing LNS products using alternative distribution mechanisms.

Three types of studies will be used to assess demand for LNS products. First, field-based survey questionnaires will be used to generate estimates of 'willingness-to-pay' for LNS products by caregivers (or others responsible for food purchases) in the households participating in the LNS trials; these individuals will have direct experience with the LNS products and will have opinions about a given product's effects and (hence) 'value.' Second, we will use new techniques in field-based experimental economics that allow researchers to use 'auctions' to better understand the value decisionmakers place on LNS products and to generate more refined estimates of demand for them. Third, in a subset of LNS nutrition trial villages, village-wide market tests involving the offer of LNS products for sale (at prices that vary randomly each month, for approximately 4 mo) will be undertaken to measure LNS product demand in a market setting, and to identify household-level and other factors influencing that demand.

Cost-effectiveness analysis will be used to generate estimates of the cost-effectiveness of LNS products with regard to several nutritional and developmental outcomes (e.g., stunting, cognitive skills development, iron-deficiency anemia). These studies will generate an array of estimates of cost-effectiveness based for alternative LNS product distribution mechanisms, for each site. These estimates will be compared with cost-effectiveness measures taken from the literature on other interventions aimed at achieving the same outcomes.

CHILDHOOD MALNUTRITION: THE ASIAN PERSPECTIVE

T Ahmed

Of the 20 countries with the highest burden of childhood malnutrition, the most populous countries are in Asia. In India and Bangladesh, malnutrition (underweight, weight-for-age <-2 SD) affects more than 40% of under-five children, while in Pakistan more than 30% children are malnourished. These rates are much higher than in many sub-Saharan countries. Since most childhood deaths in developing countries are associated with mild and moderate malnutrition, it is imperative to improve the overall nutritional status of this huge segment of child population in Asian countries. The most florid form of malnutrition, severe acute malnutrition (SAM) characterized by weight-for-height <-3 SD or nutritional edema, is also widely prevalent Asian countries, with the rate for Bangladesh being 2.9%. The case fatality rates of children suffering from SAM in the community are unknown. However, the CFR ranges from 5-30% among children with SAM treated in facilities. Global estimates of the number of deaths due to SAM vary greatly. The latest figure of close to 0.5 million deaths due to SAM is based on recent WHO estimates as reported in the Lancet Nutrition Series.

Concerted efforts are needed to reduce the burden of childhood malnutrition in Asia. For prevention and treatment of millions of children with moderate malnutrition in Asia, existing large scale nutrition programs have to be improved in terms of quality of service provided, the package of interventions and the effectiveness of counseling of care providers. Such programs should be instituted in countries that have a high prevalence of childhood malnutrition but are currently making no large scale efforts. The WHO guidelines for management of acutely ill children with SAM have been shown to effectively reduce CFR in facilities. But implementation of the guidelines has to be scaled up to reach the lowest level health care facilities. The ultimate goal, however, is to reach out to children with SAM through community-based management. This is however not a reality in Asian countries because of lack of policy decisions, data on acceptability, cost-effectiveness and sustainability of the newly developed ready-to-use-therapeutic foods (RUTF). Local recipes for RUTF are a must for making community-based management of SAM sustainable.

The importance of taking care of childhood malnutrition, including SAM, has to be ingrained at the policy level in all Asian countries. At the least, if we are to achieve Millennium Development Goals 1 and 4, appropriate mobilization of health human resources, training, ensuring therapeutic food and other supplies are mandatory and will have to be done immediately.

POSTER Presentations

DIETARY INTAKE AND NUTRITION STATUS OF PREGNANT WOMEN ATTENDING ANTENATAL CARE SERVICES AT MULAGO HOSPITAL - KAMPALA (UGANDA)

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Background

Dietary intake and maternal nutrition status during pregnancy are important health aspects for a mother and her unborn child. Although of widely recognized importance, the two have been minimally documented in Uganda.

Aims

To assess dietary intake, nutrition and heamoglobin status of pregnant women attending ANC services at Mulago Hospital.

Methods

A cross-sectional study was carried out on 290 pregnant women attending antenatal care services at Mulago Hospital. Data was collected using a semi-structured questionnaire, a 98 item food frequency questionnaire (FFQ), 24-hour dietary recall and anthropometry. Data consisted of socio-demographic characteristics, obstetric profiles, medical histories, clinical examination and heamatological laboratory measures. Nutrition status was measured by Mid Upper Arm Circumference (MUAC) and 4 point skin fold thickness. Nutrient intake was processed by the nutri-survey computer programme and values were compared with the WHO recommended dietary allowances.

Results

The daily most consumed foods were plantain (matooke) (74.3%), cow ghee (64%), cooking oil (64%), tea (64%), bread (48%), milk ((43.9%), dark green leafy vegetables (37%), ground-nuts 34.8%, and beans (34.2%) on a daily basis. Mean daily energy intake was 2110 ± 630.6, or about 85% of the recommended dietary allowance (RDA). Low consumption of cereals and fruit was significant in regard to micronutrient dietary deficiencies for Folic acid, Zinc, Iron and Calcium. The mean pregnancy weight was 66.8 ± 10.2 kg, Mid Upper Arm Circumference (MUAC) 29. 4 ± 3.1 cm. Slightly over 5% of study women were classified as undernourished (MUAC < 25cm, TSF < 15mm) while 41% were aneamic (Hb< 11g/dl). Younger pregnant women were more like to have lower pregnancy weight, lower MUAC and less hemoglobin than their older counterparts (p < 0.05).

Conclusions

The results indicate that younger pregnant women attending Mulago Hospital antenatal care services may be at risk of anemia and nutrient deficiency. A proactive nutrition intervention strategy is recommended.

EVALUATING THE MOYO CHART – A NOVEL, LOW-COST, WEIGHT-FOR-HEIGHT SLIDE CHART FOR IMPROVED ASSESSMENT OF NUTRITIONAL STATUS IN CHILDREN

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Background

Worldwide, 73 million children suffer from acute malnutrition. Correct diagnosis of nutritional status based on a child's weight-for-height is a critical first step towards potentially life-saving treatment. The 'MOYO' chart, developed at Queen Elizabeth Hospital, Malawi, is a low-cost, appropriate-technology slide chart which replaces traditional 'look-up tables' with a simple step-by-step guide to nutritional assessment. Anecdotal evidence through initial field experience suggests that the new chart is easier to use, quicker and more accurate. However, formal validation of these assumptions is important – especially prior to planned rollout of the chart in collaboration with health charity TALC (Teaching Aids at Low Cost, http://www.talcuk.org/) .

Aims

To finalise the format of the MOYO chart by exploring the hypothesis that it improves the speed, accuracy and ease of nutritional assessment.

Methods

In a cross-over RCT, alternately using the MOYO chart and traditional look-up tables, 80 medical students at the University of Addis Ababa will participate in a written examination classifying hypothetical cases as severely malnourished, moderately malnourished or normally nourished. Primary quantitative outcome measures will be diagnostic accuracy and 'time per correct diagnosis'. Perceived ease of use and acceptability will be measured qualitatively by participant survey.

Results

In a pilot study of 10 students, students took a mean 87 seconds per correct diagnosis using a look-up table and 80 seconds per diagnosis using the MOYO chart. Of 50 possible diagnoses done over a time slot of 15mins, the 10 pilot students obtained a mean accuracy of 76.5% using lookup tables and 77.8% accuracy using the MOYO chart. Wide confidence intervals do not allow interpretation or inter-group comparison at this stage. The main RCT is due on the 11th and 12th of June and initial results will be ready for poster presentation at CAPGAN.

Conclusions

Further refinements to the chart design are expected following the results of the Ethiopia RCT. Although it plays only a small role in the assessment and optimal treatment of malnutrition, the MOYO chart exemplifies the need to optimise each step of the patient care pathway in order improve patient outcomes.

SURVIVAL OF CHILDREN DISCHARGED FROM A COMMUNITY-BASED THERAPEUTIC CARE PROGRAMME

Paluku Bahwere[1], Ellen Piwoz[2], Caroline Tanner[2], Kate Sadler[1], Angella Mtimuni[1], Steve Collins[1].

1 Valid International, Oxford, UK
2 Academy for Educational Development, USA

Background

Programs to treat severe acute malnutrition (SAM) in the community have recently been expanded, but the long-term survival of children discharged from these programs is unknown.

Aims

To describe survival of children 6 to 59 months up to 2 years after discharge from a community therapeutic care programme (CTC) in Dowa, Central Malawi.

Methods

Two cohorts were studied. One was a retrospective cohort of 2007 children admitted for treatment of SAM from August 2002 to May 2005 who were located a median period of 15.5 months (10.5-23.3) post-discharge. The other was a cohort of 694 children of whom 394 were prospectively followed for 3 months after graduation from the programme. For both cohorts, survival status, date and cause of death were ascertained during home visits.

Results

In the retrospective cohort, 220 admitted children (11.1%) died during treatment. At follow-up, 69 out of the 1783 who were discharged alive either as cured, defaulter or medical transfer had died, 180 had moved but were alive at the time the family moved, and 113 could not be located due to incorrect address information. The overall mortality after discharge for children with known survival status was 4.1% (69/1670). When examined by status at the time of discharge, mortality was 3.8% (42/1095) if discharged as cured, 6.9% (9/130) if discharged as defaulter, 5.9% (1/17) if discharged due to medical transfer, and 4.0% (17/372) for children who were discharged with no reason indicated. In the prospective cohort, in-programme mortality was 2.3% (15/649). Out of the 634 children discharged alive, 394 were followed post-discharge and 2 had died within 3 months of graduation (0.6%).

Discussion &Conclusions

Post-discharge mortality of children treated for SAM in the community was 4.1%, which is lower than expected based on community under 5 mortality in Central Malawi. Comparative analyses of post-discharge mortality by "person years of follow-up" are underway and will be presented. Preliminary data suggest that scaling-up of community-based treatment of SAM using this model of care has the potential to reduce mortality

ROUTINE ANTIBIOTICS FOR UNCOMPLICATED & COMPLICATED SEVERE ACUTE MALNUTRITION IN CHILDREN AGED 6-59 MONTHS: A REVIEW OF THE EVIDENCE

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Background

Most current protocols for the case-management of severe acute malnutrition (SAM) recommend a course of broad-spectrum antibiotics (AB) on admission. This policy arose when treatment was inpatient-based and children often presented relatively late, with clinical complications. In community management of acute malnutrition, children are often identified at a much earlier stage of SAM. Those with 'uncomplicated SAM' by definition do not have serious underlying infection. Also, the HIV pandemic affects both uncomplicated and complicated SAM. This has changed the profile of bacterial infection in many countries. A review of antibiotic use in SAM is needed in order to improve child-mortality reduction in line with MDG-4.

Methods

Interviews were conducted with experts involved in guideline development to understand the basis of current policies. A systematic literature review of publications relevant to the use of AB in SAM was undertaken, including those about existing protocols and relevant publications about clinical and microbiological patterns of infection in SAM. In addition, severe malnutrition guidelines' chapters on antibiotics protocols were reviewed, examining indications, timeframes, types of antibiotics used.

Results

WHO 1999 guidelines: "Management of severe malnutrition: a manual for physicians and other senior health workers" are the basis of many SAM protocols currently in use by UN, non-governmental organisations, and health ministries. However, Antibiotic recommendations sometimes differ, including in important international documents, the WHO IMCI (integrated management of childhood illness), the WHO 2004 consultation on severe malnutrition, and the MSF (Médecins Sans Frontières) 2007 clinical guidelines. Cotrimoxazole and amoxicillin are most frequently recommended. Others include ceftriaxone, metronidazole, chloramphenicol. CMAM guidelines also suggest giving Antibiotics to all children with "uncomplicated" SAM.

Discussion

The logical basis for recommending AB for "complicated" SAM seems clear given these are high risk patients. Probability of infection is likely different and lower in uncomplicated SAM. Benefits need to be balanced against possible side-effects and risks of increasing resistance. No large trials have been done, and no studies distinguish the clear benefits of each AB. To inform future SAM policies, there is an urgent need for new microbiological studies, randomised controlled trials, and consensus processes to guide best practice.

RICKETS, AS A PUBLIC HEALTH NUTRITION PROBLEM IN BANGLADESH

Background

Rickets has emerged as a public health nutrition problem in Bangladesh during the last 2 or 3 decades.

Aims

The aim of our survey was to determine the overall national prevalence of rickets among Bangladeshi children aged 1-15 years, and examine its association with their nutritional status.

Methods

In total, 16,000 children in rural areas and 4000 children in urban areas were randomly selected from all 6 divisions of Bangladesh. Children were of either sex and belonging to all socio-economic groups. After enrollment, they were examined for presence of features of rickets and their parents/ guardians were interviewed to find out the current and past feeding practices of each child. Quantitative data was collected through anthropometrical measurement (weight, height, MUAC). In clinically suspected cases, radiological examination was done to identify radiological signs of active rickets.

Results

197 rachitic cases were identified among 20,000 children 1-15 years of age. The national survey showed the prevalence rate of rachitic children was 0.99 %. The proportion of rickets was highest in the Chittagong division, 76.6%. Proportions were 3.6% in Barishal, 7.6% in Dhaka, 2.5% in Khulna, 4.5% in Rajshahi and 5.6% in Sylhet. About one third of families had more than one rachitic child in Cox's Bazar district. Overall stunting prevalence was 75% and that of severe stunting was 53%. The prevalence of underweight children was 70% and that of severely underweight children was 40%. The prevalence of wasting was 17% and that of severe wasting was 1.4%. According to radiological findings, X-ray findings were classified into three groups; about 24% children had active rickets, 35% had signs of early stages of developing rickets, and the rest (41%) had no radiological evidence of rickets.

Conclusions

The estimated number of cases (5.5 million lacs of children 1-15 years old) in the country needs adequate treatment with nutritional, medical and surgical intervention. New cases must be prevented with appropriate public health nutrition measures.

ASCORBIC ACID COUNTERACTS THE INHIBITORY EFFECT OF PHYTIC ACID ON IRON BIOAVAILABILITY FROM A TRADITIONALCOMPLEMENTARYFOOD CONSUMED BY PAKISTANI INFANTS

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Background

Although human milk contributed significant quantities of ascorbic acid (mean molar ratio ascorbic acid to iron was 2.3:1), no significant difference in iron bioavailability was found between khichuri consumed with water or with human milk in our recent study in Bangladesh.

Aims

To evaluate the effect of added ascorbic acid on iron bioavailability from khichuri at 2:1 and 4:1 (molar ratio ascorbic acid to iron).

Methods

Erythrocyte incorporation of iron stable isotopes 14 days after administration was used as a proxy for iron bioavailability. On 4 consecutive days, infants (6-10 months old) consumed 8 servings of khichuri. 4 were labeled with 57Fe (test meal A with ascorbic acid) and 4 were labeled with 58Fe (test meal B without ascorbic acid). These were fed in the order AABBAABB or BBAABBAA

Results

Geometric mean iron bioavailability increased from 8.1 % to 15.1 % (n=9; p=0.002 paired Student's t-test) and from 10.5 % to 35.0 % (n=10; p<0.000.1) after addition of ascorbic acid at 2:1 and 4:1 molar ratios relative to iron, respectively.

Conclusions

Ascorbic acid increased iron bioavailability to a statistically significant extent when added at molar ratios in the same range as evaluated in our previous study of human milk as a source of ascorbic acid. These results indirectly indicate that components of human milk modify ascorbic acid's influence on iron bioavailability. Data on the enhancing effect of ascorbic acid on iron bioavailability cannot be extrapolated to when human milk is the source of ascorbic acid.

NUTRITIONAL STATUS OF PEOPLE LIVING WITH HIV/AIDS (PLWHA)

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Background

HIV/AIDS is clearly a public health problem in the world. HIV positive people need to pay special attention to their nutritional status. Good nutritional status is a fundamental part of the management, care and support for the people living with HIV/AIDS (PLWHA) and is vital to help maintain health and quality of life. A person may be receiving treatment for opportunistic infections and combination therapy for HIV; these treatments and medicines may influence eating and nutrition. Good nutrition will reinforce the effect of the drugs taken.

Aims

The study was conducted to assess the nutritional status of people living with HIV/AIDS (PLWHA).

Methods

A cross-sectional study was conducted among 122 respondents who were infected with HIV/AIDS in the Ashar-Alo Society, Dhaka centre, Mohammadpur from January 2008 to July 2008. A purposive sampling technique was adopted to select PLWHA because they were members of the society. Data was collected using a structured questionnaire for socio-demographic status, physical activity, feeding pattern, anthropometry measurement, and clinical examination. Data were analyzed by SPSS win 12 inc.

Out of 122 PLWHA 49.3% male and 41.5% female were living with HIV/AIDS. According to BMI, 56(45.9%) were undernourished, 46(37.7%) had normal body structure, 15(12.3%) were overweight, and only 5(4.1%) were obese. The mean±SD of weight and height was statistically significant (p<0.05) in between them (weight 55.8±8.9 kg vs. 49.9±9.6 kg; p<0.05 and height 164.9±6.3 cm vs. 152.6±9.1 cm; p<0.05). The mid arm circumference was a little bit higher among males □ 24.0±2.8 cm□ compared to females □ 23.4±3.7 cm□ . But, BMI was slightly higher among females □ 21.5±4.2□ than males □ 20.6±3.9□ .]

Conclusions

Good nutritional status is very important from the time a person is infected with HIV/AIDS. HIV makes demands on the body's nutritional status. Nutritional care and support promote well-being, self-esteem and a positive attitude toward life for people living with HIV/AIDS and their families. Healthy and balanced nutrition should be the goals of counseling and care for people at all stages of HIV infection.

CHANGES IN PREVALENCE OF ZINC DEFICIENCY FOLLOWING ZINC SUPPLEMENTATION IN AN HIV POSITIVE ADULT POPULATION IN WESTERN KENYA.

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Background

Multiple micronutrient deficiencies constitute a significant public health problem in Kenya. Low zinc (Zn) and iron (Fe) status are frequent. HIV + persons are known to be at greater risk for micronutrient deficiency due to decreased consumption of food, HIV enteropathy which involves diarrhea, increased gut inflammation, intestinal permeability and malabsorption, all of which result in losses of Zn. Kenyan populations apparently have a habitually low, or marginal, dietary Zn intake. Therefore, dietary Zn supplementation studies in an HIV population can provide information on long-term homeostatic responses to micronutrient intervention.

Aims

Due to the effect of HIV on Zn micronutrient levels, all participants in this RCT were screened for HIV to determine its impact or effect following supplementation with Zn which is a necessary component of basic immune function.

Methods

The study was a double-blind, RCT conducted at the Kombewa Clinical Research Center, Kisumu, Kenya. A sub-group of one hundred HIV+ adults (CD4 > 250 cells/mm3), aged 18-55 years, had plasma Zn levels measured at baseline, at day 90 and day 120 on follow up. They were randomized to be supplemented with either 20 mg elemental Zn (as Zn-sulphate) or placebo daily for 90 days. Plasma trace elements were analyzed by ICP-OES. Indices of inflammation (serum Ferritin, C - reactive protein) and vitamin A (VA) were also analyzed using standard kits.

Results

At baseline, 26% were Zn-deficient (<65 µg/dL), 32% were VA-deficient (<30 µg/dl), and 25% were Fe-deficient (<60 µg/dL). After 90 d of Zn supplementation, 4.3% were Zn-deficient and the concentrations of plasma Zn increased by an average of 18.7 µg/dL in subjects receiving Zn-supplements, and only 2.1 µg/dL on average in placebo subjects (p<0.0023). At day 120 (after 30 days without supplementation), 17.7% were Zn-deficient. Serum CRP decreased over time in both groups (p=0.04) independent of either supplement or placebo.

Conclusions

Zn-supplementation at 20mg reduced the prevalence of Zn-deficiency in a population of HIV + adults but needs to be maintained long term to avoid recurrent deficiencies.

IMPACT OF EXCLUSIVE BREAST-FEEDING ON WEIGHT GAIN OF LOW BIRTH WEIGHT BABIES

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Background

Low birth weight, as high as 36%, is a major challenge in Bangladesh. Infants born with LBW suffer from extremely high rates of morbidity and mortality from infectious disease and are underweight, stunted or wasted beginning in the neonatal period and continuing through childhood.

Aims

We hypothesized that it would be possible to increase the rates of appropriate breastfeeding practices by providing nutrition education to the mothers and family. This, in turn, will significantly (at least by a mean of 500 g) improve the body weight gain of low birth weight babies at the end of 2-months of the study compared to the controls. The objective of the study was to see the impact of nutrition education on early initiation of breastfeeding, exclusive breastfeeding and growth of low-birth weight babies.

Methods

A total of 184 LBW newborns were selected from two hospitals, and randomly allocated to either the intervention or the control group. The study was conducted in Maternal Care and Health Training Institute (MCHTI), Azimpur,

Dhaka and Dhaka Medical College (DMC) Hospital, Dhaka. The mothers in the intervention group received nutrition counseling on early initiation of breastfeeding and exclusive breastfeeding twice a week each month for a 2-month period, while the control-group mothers did not receive any education. The nutritional status of the newborn was assessed every 2 weeks.

Results

In the intervention group the rate of early initiation of breastfeeding was significantly higher than the control (62.8% vs. 37.2%, p<0.001). The mean initial body-weight and length of the LBW babies was similar in both the groups. Body-weight (5166±404 vs. 4363±408) g, p<0.001 and length (50.2±1.3 vs. 48.7±1.6) cm, p<0.001 of the LBW babies increased significantly in the intervention group compared to the control group after 2 months. The incident of illness was less in the intervention group compared to the control group (10% vs. 66%, p<0.001).

Conclusions

Weight and length gain of the LBW babies were significantly greater through early initiation of breastfeeding and exclusive breastfeeding. Exclusive breastfeeding proves to be an important tool to decrease the risk of malnutrition and mortality among the LBW babies.

CAN A "CLINICAL SEVERITY SCORE" (CGS) PREDICT THE RISK OF DEATH IN MALNOURISHED CHILDREN? PRELIMINARY RESULTS.

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Background

Risk of death in severely malnourished children is high. Indicators that predict mortality could assist health workers to target scarce resources. Previous studies have shown that some clinical signs (lethargy, hypothermia, hypoglycaemia, bradycardia, capillary refill time greater than 2 seconds, weak pulse volume, impaired consciousness level) and laboratory tests (hyponatriemia and hypokaliemia) identify children at high risk of mortality.

Aims

To evaluate the performance of a clinical severity score in predicting death in malnourished children.

Methods

The study was conducted at the Hospital Divina Providencia (a district hospital in Luanda, Angola). Malnourished children (W/H < 70% or presence of bipedal oedema) were hospitalised and treated according to WHO guidelines. The clinical score is divided in five key areas (nutrition, respiration, circulation, temperature, and skin) and was performed on admission. A ROC-curve analysis was used to assess sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) to mortality.

Results

The score was obtained in 107 consecutive severely malnourished children. Mean value was 6.7 (range 3-8). Two cut-points shown good predictive values: a score of 9 had a NPV of 95.9% and a PPV of 60.6%, while a score of 12 had a NPV of 92%, and a PPV of 80%.

Conclusions

These preliminary results show the clinical score is useful. A score of 9 perform reasonably well in predicting survival, while a score of 12 predicts mortality. The results need to be confirmed in a wider sample size.

MALNUTRITION AS A SIGNIFICANT CONTRIBUTING FACTOR TO MORTALITY IN HIV-AFFECTED INFANTS LIVING IN THE POOREST AREAS OF URBAN KENYA

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Background

The Human Immunodeficiency Virus (HIV) pandemic has rendered the Millennium Development target of reducing child mortality by two-thirds difficult to achieve. This is a study of the factors contributing to the death of infants enrolled in a programme for children exposed to HIV infection and living in the poorest areas of Nairobi.

Aims

To establish the circumstances surrounding the deaths and underlying conditions causing death of children enrolled in the programme. Such an analysis would guide the programme in initiating relevant interventional measures to promote survival chances as much as possible.

Methods

All deaths of children who died in the Lea Toto programme during 2007 and 2008 were investigated. The most likely cause(s) of death were attributed to details of the final illness, nutritional status, level of immunosuppression and social circumstances.

Results

In 2007, 110 children died out of a cohort of approximately 2400 (4.6%); of these deaths, 38% were under 1 year of age - a third of these having been enrolled for less than a month. Although PCR testing started in February 2007, the result was only known for 42% (33% positive, 9% negative). Major causes of death were respiratory infections and dehydration, with severe malnutrition as a contributory factor in 60%. In view of these findings, efforts have been made to expedite PCR testing and anti-retroviral treatment, and improve nutritional rehabilitation and emergency treatment. In 2008, 100 children died out of a larger cohort of approximately 2800 (3.6%), but the proportion of infants increased to 49% (33% HIV positive, 33% negative, 33% unknown). Factors included malnutrition and social instability. About 70% of the mothers and babies in this population have received some preventive care recently (PMTCT).

Conclusions

Despite great efforts to improve early infant diagnosis, nutritional support and treatment of sick children, infant mortality is still high in this most vulnerable population. Since malnutrition is noted to be a significant contributing factor in a majority of deaths, greater effort should be put into prevention and curative programmes for all the children that are at risk.

ASSESSMENT OF SEVERE MALNUTRITION AMONG HOSPITALISED KENYAN INFANTS UNDER 6 MONTHS OLD

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Background

Non-exclusive breast-feeding and infectious diseases, including HIV, place infants under 6 months of age at risk of malnutrition. Severe malnutrition is believed to be uncommon in this age group, however there is uncertainty regarding interpretation of anthropometry and currently few accepted options for intervention.

Aims

To determine the predictive value of mid upper arm circumference (MUAC) for bacteraemia and subsequent death among hospitalised infants aged 2 to 6 months.

Methods

Anthropometry and blood cultures were performed for consecutive admissions to Kilifi District Hospital, Kenya from 2000 through 2008 and subsequent outcomes were recorded. Predictive value was evaluated by the area under receiver operating characteristic (ROC) curves. Mortality in the year following discharge was evaluated by household visits in a demographic surveillance system and analysed by the Kaplan Meier method and Cox proportional hazards regression.

Results

MUAC at admission among 3,432 infants 2 to 6 months of age performed at least as well in predicting inpatient death (ROC area 0.76 to 0.82, depending on age) as among children aged 6 to 60 months and at least as well as weight-for-length Z score. MUAC <11cm occurred in 19% of infants aged 2 to 6 months and was associated with case fatality of 22 to 23% (depending on age) compared to case fatality of 3 to 5% for MUAC ≥11cm (P<0.001, relative risk 6.64 [95%CI 4.08 to 10.8]). 10 to 17% were bacteraemic compared to <5%, respectively (p<0.001). Relative risks were not diminished by adjustment for HIV antibody status or history of prematurity. Among infants discharged alive, one-year survival was strongly associated with admission MUAC.

Conclusions

Severe malnutrition frequently occurs among hospitalised infants under 6 months in this setting. Unadjusted MUAC is an effective marker of high risks of death and bacterial sepsis. Identification of malnutrition at health services contact in this age group could improve outcomes through appropriate antimicrobials and standardized therapeutic feeding.

CHANGES IN INCIDENCE OF PAEDIATRIC INFLAMMATORY BOWEL DISEASE IN SOUTHWEST OF ENGLAND FROM 1997 TO 2007

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Background

In 1997, a national prospective survey of childhood (less than 16yrs) Inflammatory Bowel Disease (IBD) in the United Kingdom provided the best international prospective incidence data of a large IBD cohort. It documented a national incidence of 5.2 /100,000(1, 2). 33 children were from the South West (SW) region. It is not possible to repeat the national study because the numbers are too large. In the SW, a single regional centre manages Paediatric IBD. Since 1990 a regional prospective database of all children with newly diagnosed IBD has been maintained.

Aims

To document the current incidence of IBD and analyse changes compared to the National survey.

Methods

Data was collected from 13 paediatric centres within the SW Region using international diagnosis codes (ICD10) identifying newly diagnosed cases of IBD including Crohn's Disease (CD), Ulcerative Colitis (UC) and Indeterminate Colitis (IC). Patient details were correlated with the database. The population data was obtained from the office of National Statistics.

Results

All 13 centres responded. There were a total of 47 newly diagnosed children with IBD during 2007 compared with 33 in 1997. 44/47 were diagnosed at the regional centre and were on the database; 3 /47; all from one centre were not. The details of the incidence figures are tabled at the end of the abtract.

Conclusions

There has been a definite increase in the incidence of Paediatric IBD in SW England. The increase is in the number of children with CD but more significantly also in UC while IC incidence remains stable.

Conclusions and Recommendations

Diarrhoea increased during and following weaning among exclusively breastfed infants reportedly weaned at 6 months. This is consistent with the pattern seen in populations who practice prolonged breastfeeding, as this time coincides with introduction of complementary infant foods. Greater emphasis should be placed on hygienic preparation of weaning foods and water purification to reduce infant diarrhoeal morbidity in resource-limited settings.

HIV PREVALENCE AND MORTALITY AMOUNG CHILDREN UNDERGOING TREATMENT FOR SEVERE ACUTE MALNUTRITION IN SUB-SAHARAN AFRICA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background

Although there have been individual studies reporting high

REGION	TOTAL IBD (Per 100,000)	CD (Per 100,00)	UC (Per 100,000)	IC (Per 100,000)
United Kingdom BPSUSurvey (1997)	739(3.1)	417(3.1)	211(1.6)	88(0.6)
South West England (1997)	33(2.4)	20(2.4)	10(1.2)	3(0.4)
South West England (2007)	47(5.34)	26(3.0)	17(2.0)	4(0.45)

HIV prevalence and mortality among children with SAM, no systematic review has synthesized the data across the region.

Aims
Systematic review and meta-analysis. Included studies reported on HIV infection within a sample of children with SAM where HIV status was assessed using a blood test and SAM was defined using the WHO, Gomez, Wellcome or Waterlow definitions. Community based treatment was defined as including programmes delivered at community level and those with early discharge from nutrition rehabilitation unit (NRU) to hospital.

Results
Children from 17 studies were included in the analysis (n = 4891), of whom 29.2% were HIV-infected. HIV-infected children were significantly more likely to die than HIV-uninfected children (30.4% vs. 8.4%; P < 0.001; relative risk = 2.81, 95% CI 2.04—3.87). HIV negative children treated within community-based programmes had lower mortality (4.3%) than those treated within an inpatient nutrition rehabilitation unit (NRU) (15.1%).There was no significant difference in mortality for HIV-infected children with SAM treated in the community based (30.0%) or NRU (31.3%) settings. Barriers to scaling up range from limited national attention regarding undernutrition and technical recommendations to limited funding by donors for relevant cross-sectoral interventions.   A recent initiative in Kenya, Uganda and Tanzania holds that public pressure and debate in mass media are more effective drivers of change towards better public services than technical solutions or expert-driven technocratic reforms. Empowered women's groups typically contribute to advocacy for better services and outreach. Women's health groups in Nepal, Pakistan and Ethiopia have been empowered with knowledge of interventions to successfully reduce exposure to infection. Informed women's support groups cannot but strengthen "a unique mechanism for group counselling and promotion of positive behaviours." A critical step towards sustainability occurs when women themselves take ownership of interventions. Similarly, for members of women groups engaged with microcredit, child undernutrition has improved. Further assessments of microcredit initiatives need to be undertaken for their effect on nutrition outcomes. Our two studies of women groups in Nepal and PNG offer lessons. Results suggest that membership in well-performing, informal women's organisations that do not access external assistance contributes to reduced child undernutrition in vulnerable households. Access to training for externally supported women's organisations with intensive support is associated with reduced prevalence of stunting. These studies represent at least a departure in the search for more insight into the context and impact of women organisations and their social capital in reducing undernutrition.   In Nepal, informal women's groups listened to the radio, which was found to be significant in reducing child undernutrition.

We suggest that studies be undertaken to explore how informal women organizations in Sub-Saharan Africa may network with each other; improving their social capital and maternal nutrition knowledge, whilst, supported by radio, building advocacy for improved interventions for nutrition with child and maternal health.

FOOD PROVISION IN POST-DISCHARGE FOLLOW-UP OF CHILDREN WITH SAM HALVES ABANDON RATES AND REDUCES DAYS OH HOSPITALISATION IN LUANDA, ANGOLA

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Background
The Hospital Divina Providencia (HDP) serves a poor suburban area of Luanda. A nutritional program with an inpatient centre and a clinic for follow-up visits has been implemented there since 2002.

Aims
To evaluate a policy of providing food at home after discharge from hospital to children admitted with severe malnutrition.

Methods
Hospital staff admitted children who had: a) weight/height < 70% (NCHS standards), b) bipedal oedema, c) weight/height between 70 and 80% but signs of complication. Treatment was according to WHO guidelines. Children were discharged when they had a good appetite, had gained weight, and their oedema had resolved. Mothers were trained on how to manage the child, how to prepare foods, and when to return for follow-up. From May 2007, we provided food after discharge. We gave milk powder, with added sugar (the equivalent of 200 Kcal/kg/day and 6gr/kg/day of protein). Follow-ups initially occurred on a weekly basis. If the child had good weight gain, follow-ups were made every two weeks. Outcomes were recorded prospectively. We compared the outcomes of children in the two phases (with and without food provision).

Results
90 children were given only nutritional advice (January to May 2007). 412 children also received food provision (May 07 to December 2008). 28/78 (36%) children returned for follow-up visits when food was not provided compared to 285/362 (79%) when food was provided (RR 2.19; 95% IC 1.62 to 2.96; p<0.0001). The number of children reaching a weight/height > 85% remained stable.. The mean number of days of hospitalisation was reduced from 21+- 9.5 to 15 +- 8.7 after food provision (p< 0.0001). No deaths were observed during follow up but 3/285 children relapsed in the group given food. The cost of the food provided was 10 Euros per child for the whole follow up .

Conclusions

The number of children lost at to follow up was high, but it was reduced by 42% after food provision. Food provision also significantly reduced the duration of hospitalisation while the rate of rehabilitated children remained stable., at a cost of 10 Euros per child treated.

STABLE ISOTOPE TECHNIQUES TO ASSESS VITAMIN A BODY POOLS.

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Traditional methods to assess vitamin A status of groups have included serum retinol concentrations and relative dose response tests. Tracer dilution techniques with stable isotopes of vitamin A have emerged as a select method for estimating total body vitamin A pool size and for answering specific biological questions related to vitamin A metabolism. The isotopes of hydrogen (i.e., deuterium) and carbon (i.e., 13C) have been successfully applied to humans to assess vitamin A status. Isotope dilution techniques consist of 1) administering an oral dose of isotopically labeled vitamin A to subjects, 2) collecting a blood sample after the tracer has mixed with endogenous vitamin A, 3) measuring the plasma isotopic ratio of tracer to tracee (unlabeled vitamin A), and 4) estimating the total amount of vitamin A in the body using a prediction equation. The plasma isotopic ratio of tracer to tracee can be measured using gas chromatography-mass spectrometric methods with a variety of different detection instruments.

Aside from liver biopsy, the isotope dilution technique is the only assessment technique that provides a quantitative estimate of total body vitamin A pool size. Because the technique is responsive to food and therapeutic supplementation with vitamin A, it can be used to evaluate the efficacy or effectiveness of intervention programs by quantitatively assessing the change in total body vitamin A stores in response to an intervention. An added advantage is that the technique can estimate total body vitamin A along the entire continuum of vitamin A statuses from deficient to hypervitaminotic states. Additionally, it is not necessary to select subjects with deficient- or marginally-depleted initial status to detect a change in vitamin A status in response to an intervention. Thus, the tracer dilution technique can be useful for assessing change in vitamin A status in populations with low but adequate initial status, whereas the other indirect assessment techniques are only useful for detecting a change in status when initial status is deficient or marginally depleted. Vitamin A tracer studies have successfully assessed vitamin A status of groups and the efficacy of interventions in groups at risk of deficiency in several different countries. With improvements in the sensitivity of mass spectrometers, the method has gained momentum and is now more broadly available to those who wish to use the method to evaluate interventions. Although the degree of sophistication of the laboratory and resources available will usually dictate which vitamin A assessment method is chosen for population assessment and intervention evaluation, isotope dilution techniques have been used globally.

TROPICAL ENTEROPATHY AND ZINC HOMEOSTASIS

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Background

Tropical enteropathy and zinc deficiency are major public health problems worldwide. Tropical enteropathy is characterized by an increased urinary lactulose-mannitol ratio (L:M) when a site-specific sugar absorption test is administered with unmetabolized sugars. Zinc homeostasis is quantified with a dual stable isotope test of zinc absorption and excretion.

Aims

To test the hypothesis that endogenous fecal zinc (EFZ) was significantly correlated with tropical enteropathy

Methods

A site-specific sugar absorption test and dual stable isotope test was performed on 25 healthy Malawian children aged 3-5 y at high risk for enteropathy and zinc deficiency. EFZ as well as total zinc absorption and net zinc retention were calculated and correlated with the L:M ratio and fractional absorption of unmetabolized sugars.

Results

22 children (88%) had tropical enteropathy (L:M > 0.10), and the L:M ratio was 0.24 ± 0.10 (mean $\pm$ SD) . EFZ was 1.68 ± 1.06 mg/d, a quantity greater than is seen in healthy populations from the developed world. EFZ was positively correlated with the L:M ratio ($r = 0.62$, $P < 0.001$). Net zinc retention (0.67 ± 1.6 mg/d) was negatively correlated with the L:M ratio ($r = -0.47$, $P = 0.02$).

Similar significant correlations between the fraction of mannitol absorbed and EFZ and net zinc retention were found. Total absorbed zinc was not significantly correlated with the L:M ratio

EMERGENCE OF MULTIDRUG-RESIST-ANT STRAINS OF VIVRIOCHOLERAE 01 AND SHIGELLA: MAJOR HEALTH CHAL-LENGES IN BANGLADESH

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Background

In Bangladesh, cholera is endemic and follows a distinct seasonality; tetracycline and doxycycline (long-acting tetracycline) have long been the antibiotics of choice for treating severe forms of this disease.

Methods/Results /Conclusions

The appearance of multidrug-resistant strains of V. cholerae O1, ElTor (strains resistant to furazolidone, trimethoprim-sulphamethoxazole, tetracycline, and erythromycin) were first observed in Matlab in October 2004 which was associated with a change in the serotype, from Inaba to Ogawa, and the isolation of such strains increased dramatically. By February 2005 all clinical strains were resistant to these drugs. Such multidrug-resistant strains started to emerge in Dhaka in November 2004 among both Ogawa (13%) and Inaba (5%) strains of V. cholera O1, and by February 2005 all (100%) of the Ogawa strains became resistant. By March 2005, nearly all the V. cholerae O1 El tor Ogawa isolates, 83% (5/6) at the Matlab Hospital, and 96% (43/45) at the Dhaka Hospital were multidrug-resistant. Based on the multidrug-resistant phenotype, it appeared that there were two or more clones of V. cholerae O1 ElTor, with changing proportions, were in circulation at different time points. We have, for the first time, encountered this unique, multidrug-resistant pattern among V. cholerae O1, including resistance to erythromycin in Bangladesh. We also observed a consistent increase in the median MIC of V. cholerae O1 strains isolated at the Dhaka Hospital of ICDDR,B over the last many years to ciprofloxacin. These findings are of major concern since further increase in the MIC may render ciprofloxacin totally ineffective in the management of cholera caused by such multidrug-resistant strains. Our observations clearly demonstrate the need to monitor MIC in areas where cholera is endemic along with assessment of the clinical efficacy of ciprofloxacin in the treatment of cholera. Resistance to tetracycline and erythromycin is persisting more than four years, a finding that we have not observed earlier in Bangladesh.

Shigellosis is also endemic in Bangladesh, where all four species of Shigella are prevalent, with Shigella flexneri being the most common species. Two distinct peaks of S. dysenteriae type 1 were observed in 1984 (n=3,925) and 1993 (n=5,175). In 1984, 98% of S. dysenteriae type 1 was resistant to tetracycline, 84% to TMP-SMX, 84% to chloramphenicol, and 10% to ampicillin. Resistance to ampicillin increased to 52% in 1985. In 1993, all (100%) epidemic S. dysenteriae type 1 isolates were resistant to nalidaxic acid, 98% to TMP-SMX, and 95% to ampicillin, but only 2% were resistant to mecillinam. Among S. dysenteriae type 1 strains, resistance to nalidixic acid increased from 5% in 1986 to 80% in 1990 and 100% in 1993, and resistance of S. flexneri strains to this drug increased from 4% in 1986 to 60% in 2002. Currently, resistance of S. flexneri isolates to mecillinam (40%) and ciprofloxacin (25%) is steadily increasing. Systematic monitoring of the changes in the distribution of various species and serotypes of Shigella and their antimicrobial susceptibility are important for empiric antimicrobial therapy for dysentery caused by this group of organism.

SEROGROUP O8 : K21 CAUSING DIAR-RHOEA IN THE ESTUARINE ECOSYS-TEM OF BANGLADESH

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Background

Vibrio parahaemolyticus, a pandemic pathogen, causes gastroenteritis in high frequency in Bangladesh and India. Very little is known about the sero-distribution, virulence, or molecular traits of the bacterium occurring in estuarine ecosystem of Bay of Bengal from where the pandemic serogroup, O3: K6, was first reported.

Aims

To investigate virulence potential, as well as phenotypic and genetic traits of V. parahaemolyticus causing diarrhoea in the estuarine ecosystem of Bangladesh.

Methods

Forty-four V. parahaemolyticus strains, of which 42 isolated from Bay of Bengal estuaries and 2 from clinical sources of one of the areas, were analyzed for sero-distribution, Kanagawa phenomenon (KP), virulence and related genes by PCR, molecular fingerprinting by randomly amplified polymorphic DNA (RAPD), enterobacterial repetitive intergenic consensus-PCR (ERIC-PCR), and PFGE to determine clonal relatedness.

Results

Serotyping indicated O8, O3, O1, and K21 to be the major O and K serogroups, respectively, and O8 : K21, O1 : KUT and O3 : KUT predominant. The K antigen(s) were untypable and pandemic serogroup O3 : K6 was not detected. Species-specific genes, toxR and tlh, were confirmed by PCR in all but two of the strains which also lacked toxR. A total of 18 (41%) strains possessed the virulence gene encoding thermostable direct haemolysin (TDH) and one had the TDH-related haemolysin (trh) gene, but not tdh. Ten (23%) strains exhibited KP surrogating virulence, of which six, including the two clinical strains, possessed tdh. Of the 18 tdh+ strains, 17 (94%), including the two clinical strains, had sero-markers O8 : K21, one O9 : KUT, while the single trh+ strain was O1 : KUT. None had pandemic marker genes GS or ORF8. DNA fingerprinting employing RAPD, ERIC-PCR, and PFGE (SfiI-digested DNA), and cluster analysis showed divergence among the strains. Dendrograms constructed using PFGE (SfiI) images from a soft-database, including the pandemic and non-pandemic V. parahaemolyticus strains representing diverse geographic origin, however, showed that local strains formed a cluster, as did pandemic strains of diverse origin, i. e., "clonal complexes".

Conclusions

The demonstrated prevalence of tdh+ and diarrheagenic serogroup O8:K21 strains in drinking water sources of the coastal villages of Bangladesh indicates a significant human health risk for inhabitants.

SCALING-UP ZINC FOR DIARRHOEA TREATMENT IN BANGLADESH: INVESTIGATING THE ROLE OF PHARMACEUTICAL MEDICAL REPRESENTATIVES IN THE PROMOTION OF ZINC SUPPLEMENTATION

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Background

It is estimated that zinc treatment could save the lives of 70,000 children per year in Bangladesh (Jones G, Lancet 2003). The first national initiative to scale up zinc supplementation is near completion. Success largely depends upon convinced providers in the public, private and NGO sectors to prescribe zinc for childhood diarrhoea. Pharmaceutical laboratories employ medical representatives (MR) to promote products and influence prescription practices.

Hypothesis

Full course of zinc treatment (incorporated into the SUZY project of ICDDR,B) will reduce the severity and duration of illness episodes and also protect children from future diarrhoeal events and mortality (Sazawal, Ruel, Roy, Faraque and Baqui et als.).

Objectives

1) Ensure the availability of zinc countrywide; 2) Provide zinc supplementation in diarrhoea to all children under five years.
3) Decrease unnecessary use of antibiotics and other antidiarrhoeals.

Methods

This was an observational study of MR–health provider interactions carried out in two urban and three rural sites of government districts in 2005. MR's were selected who were: 1) involved in the sale of children's drug products, 2) higher performing, and 3) willing to be accompanied by a field researcher throughout the work day. Five MRs from urban and six from rural sites of two companies were selected. Observation of 23 licensed and 15 unlicensed providers visited by 11 medical representatives were completed.

Results

Medical representatives frequently interact with licensed and unlicensed providers engaged in the treatment of childhood illnesses. Important differences in the content of product presentations and in MR-health provider relationships were identified, reflecting variations in the social and educational backgrounds and needs of the providers. Pharmaceuticals expend a great deal of personal time on product promotion by employing medical representatives. They reach large numbers of providers and are a major source of information about drugs.

Conclusions

Scaling-up zinc as a treatment for childhood diarrhea in the private sector needs a supportive pharmaceutical industry and engaged medical representatives. Results from this study will help guide the development of interpersonal communication messages and tools to employ when approaching health care providers.

BACTERAEMIA, HIV AND MORTALITY IN CHILDREN WITH SEVERE ACUTE MALNUTRITION (SAM)

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Background

Bacteraemia is a significant cause of mortality in SAM, with resistance to antimicrobials, particularly chloramphenicol, increasing. First line treatment for SAM with suspected sepsis is parenteral chloramphenicol and gentamicin in Malawi.

Aims

To report organisms causing bacteraemia in children admitted with SAM. To seek associations of bacteraemia with mortality, oedema, and HIV status. To determine resistance patterns locally and appropriateness of current WHO antibiotic regimes.

Methods

We conducted a retrospective chart review of children with SAM and suspected infection in whom blood was cultured and who were admitted to an inpatient malnutrition rehabilitation unit where half of all admissions are HIV seropositive. Outcome and clinical indicators were linked to blood culture results over 32 months.

Results

Blood cultures were taken on 922 children from 4322 admissions (21.3%). No growth was found in 542, a probable contaminant was found in 222, and a probable pathogen was found in 157 (16.5%). 5 children had more than one pathogen. Non-typhoid salmonella (NTS) was the dominant culture (73/163, 44.9%), followed by other Gram negatives (Gm-ves) (57/163, 34.8%). Gram positives were cultured in 33/163 (20.3%).

HIV serostatus was available for 697 children, 418 of whom were seropositive. Bacteraemia was associated with HIV (OR 2.45, 95%CI 1.54-3.91), but not oedema (OR 0.72). Bacteraemic children had similar mortality (34.7%) to children with contaminants (33%) or no growth (32%). Overall ward mortality in 2006 was 23.8%.

NTS grew in 45/418 HIV seropositive children, compared to 13/279 seronegative children (OR 2.16, p<0.05), with.97% of isolates resistant to cloramphenicol. However, mortality in children with NTS was half (14/53, 26%) that with other Gram-ves (25/49, 52%), but similar to those with Gram+ve organisms (10/29, 32%).

Half the children with Gram-ve sepsis reported a cough (61/121), higher than those who reported diarrhoea (45/121).

Conclusions

HIV was associated with bacteraemia, and NTS was invariably resistant to chloramphenicol. Cough was commonly present in Gram–ve sepsis, indicating Gram negative antibiotic coverage important, and that WHO ARI antibiotics may be inadequate for respiratory infection. Mortality was no greater in NTS than culture negative children and no worse than overall ward mortality. Other Gram-ve infections carried higher mortality rates. Daily ceftriaxone, though expensive, is a potential alternative to chloramphenicol, but trials are needed to test if outcomes would be improved.

In most studies, the incorporation rate is assumed to be constant, 80-90 % in adults and infants respectively. However, when the incorporation rate cannot be assumed to remain stable, for example during pregnancy, incorporation of a stable isotope administered intravenously can be used to correct for changes in incorporation rate.

Large interindividual variation in iron bioavailability has been demonstrated, primarily due to differences in iron status between subjects, and paired comparisons are therefore essential when evaluating iron bioavailability from different foods or food fortificants. By using a double isotope technique, i.e., administration of two stable isotopes of iron ($57Fe$ and $58Fe$) - on consecutive days - information about iron bioavailability from two different test meals can be obtained simultaneously. Over the last few years, this technique has been used to generate new data on, in particular, iron bioavailability from iron compounds used in food fortification programs and information about dietary enhancers and inhibitors of iron absorption in infants and children.

Fluid resuscitation in children with severe malnutrition

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Current WHO guidelines for fluid resuscitation in children with severe malnutrition differ from those recommended for non malnourished groups in every respect. Intravenous volume replacement is only recommended for advanced, decompensated shock, the volume infused are lower than standard and the strength of solutions recommended are of 50% isotonicity. Scientific rationale have been advanced to support these recommendations however neither clinical physiological studies nor clinical trials have been conducted to examine the cardiovascular consequences of shock and response to these recommendations. These studies are warranted given the unacceptably high mortality of this group, managed in accordance with current guidelines (> 50%).

In Kilifi, Kenya we have undertaken a programme of work on a high dependency ward to examine haemodynamic consequences, response to shock and outcome. The studies include a Phase I study of the safety of WHO shock management; Phase II trial comparing WHO arm against modest fluid expansion using isotonic solutions (Ringers Lactate and 5% albumin). Linked to these were echocardiagraphic studies examining cardiac function in shock and response to fluid management.

Our data suggest that the current recommendations for management of shock in children with severe malnutrition are too stringent. They only identify children with advanced, preterminal shock– in whom prognosis is poor. Haemodynamic data, urinary output in response to fluid resuscitation and cardiac studies all point to gross intravascular volume depletion, an appropriate response to fluid but limited due to inadequate volume used. No child developed signs of pulmonary oedema. Further studies are required that examine isotonic fluid resuscitation in children with compensated shock using much greater volumes-titrated by response to fluid.

EOSINOPHILIC OESOPHAGITIS: ARE WE MISSING IT?

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Background

Eosinophilic oesophagitis (EoE) is increasingly being recognised world wide as a new disease entity. In some areas it has been suggested that the incidence is higher than that of inflammatory bowel disease (IBD).

Aims

To identify the number of children over a one year period who had undergone oesophageal biopsies and met the histological criteria for the diagnosis of EoE and to correlate this with their clinical features.

Methods

We retrospectively reviewed the histology report of all children who underwent oesophagogastroduodenoscopy (OGD) in our tertiary paediatric gastroenterology department, (referral population 900,000 children), between October 2007 and October 2008. Data regarding patient demographics and indication for OGD (clinical symptoms) was collected from our endoscopy register. Histology was reported by a single Consultant Paediatric Histopathologist and was collected by accessing the hospital pathology results server. The site of the oesophageal biopsy, presence of eosinophils and number was recorded. A histological diagnosis of EoE was suggested if $\geq$ 15 eosinophils/high power field in any part of the oesophageal biopsy were seen (FISPGHAN working group guidelines, 2008). Clinical features and histology were correlated.

Results

132 children had OGD with oesophageal biopsies (age range 6 months-17 years). All had distal oesophageal biopsies taken unless the oesophagus was macroscopically abnormal and/or a diagnosis of EoE was suspected clinically, in which case proximal oesophageal biopsies were also taken. 3/132 children met the histological criteria for EoE on distal oesophageal biopsies and correlated with those children in whom EoE was considered on clinical grounds. There was no difference in numbers of eosinophils between distal and proximal biopsies.

Conclusions

Diagnosis of EoE depends on both clinical and histological criteria. We identified only 3 patients (incidence of 0.3/100,000 children) with this condition compared to 47 new cases of children with IBD within the same geographical area and time period (incidence of 5.2/100,000 children). Children whose oesophageal biopsies met the histological criteria for EoE, had clinical symptoms suggestive of EoE.Distal oesophageal biopsies alone were diagnostic. None of the children without clinical suspicion of EoE had oesophageal biopsies suggestive of EoE on histology.

INTRODUCTION OF ROTAVIRUS VACCINE IN AFRICA: THE NEED FOR SURVEILLANCE OF INTUSSUSCEPTION CASES

M Kirsten

Background

Intussusception (IS) is an important cause of bowel obstruction in infants. When the first rotavirus vaccine was introduced in America in 1998 an increase in the incidence of intussusception was reported and the recommendation to use the vaccine withdrawn in 1999. Two new vaccines are currently available, and several studies were done in the first world to investigate the possible causes and incidence of IS. The Brighton collaboration described clinical case definition to help clinicians all over the world to make the diagnosis of IS. Little is known about the natural history of IS in Africa.

Methods

This is a review of literature about IS in Africa. Twelve articles from African countries published in the past 10 years were used to put together the characteristics of IS in Africa. In addition we analyzed a retrospective (1999-2003) and prospective (2004-ongoing) study of IS in Steve Biko Academic Hospital, Pretoria, South Africa.

Results

Several aspects of IS in Africa differs from that reported in the rest of the world. The incidence is higher than the first world, but lower than Asia. The mortality in America is <1%, but much higher in Africa. It ranges from 4 – 25%.

Conclusion

Data from studies elsewhere cannot be used in the post-marketing surveillance of new vaccines in Africa. Studies to report the natural history of IS should be done in every country or region of Africa, prior to the introduction of rotavirus vaccine.

A RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL OF RIFAXIMIN, A NON-ABSORBABLE ANTIBIOTIC, IN THE TREATMENT OF TROPICAL ENTEROPATHY

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Background

Tropical enteropathy is characterized by an increased urinary lactulose-to-mannitol (L:M) ratio on a site-specific sugar absorption test and is associated with increased intestinal permeability and decreased nutrient absorptive capacity. The etiology of tropical enteropathy is postulated to be intestinal bacterial overgrowth.

Aims

To test the hypothesis that treatment with a non-absorbable, broad-spectrum antibiotic, rifaximin, would reduce the L:M ratio in rural Malawian children, among whom tropical enteropathy is common.

Methods

All children aged 3-5 y from one village were enrolled in a randomized, double-blind, placebo-controlled trial

of treatment with rifaximin for 7 d. The L:M ratio was measured before and after treatment, and the change in the L:M ratio was the primary outcome. Secondary outcomes were changes in the urinary sucrose-to-lactulose (SUC:L) and sucralose-to-lactulose (SCL:L) ratios, as well as changes in the fractions of each test sugar recovered in the urine.

Results

144 children participated. 76% of the subjects had an elevated L:M ratio upon enrollment (L:M ≥ 0.10). Children who received rifaximin did not show an improvement in their L:M ratio compared to those who received placebo (-0.01 ± 0.12 vs 0.02 ± 0.16, P = 0.51, mean ± SD); nor were there significant differences between the two groups in excretion of lactulose, mannitol, sucralose, or sucrose, or in the SUC:L and SCL:L ratios.

Conclusions

Rifaximin had no effect on the tropical enteropathy of 3-5 year-old Malawian children, suggesting that small bowel bacterial overgrowth is not an important etiologic factor in this condition.

CHOLESTATIC JUNDICE IN CHILDREN LESS THAN 2 YEARS OLD: A CASE-SERIES OF HISTOPATHOLOGICAL DIAGNOSES ON LIVER BIOPSY

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Background

Cholestasis in early life reflects a diverse group of aetiologies. Prompt identification and diagnostic assessment are imperative to recognize disorders amenable to treatment. While published literature suggests that 25-30% of cases of cholestatic jaundice should be due to biliary atresia and that neonatal hepatitis should make up about 15%, our clinical impression was that we were seeing a greater than expected number of neonatal hepatitis cases in our hospital. In a retrospective analysis we did indeed find that neonatal hepatitis syndrome was as common as extrahepatic biliary atresia in our hospital. We embarked on a prospective study to investigate this further.

Aims

To review the prevalence of the various histopathological categories found in infants with cholestatic jaundice in our setting, and compare it to that described in the literature.

Methods

A retrospective analysis from January 2006 to April 2008 was followed by a prospective descriptive analysis from May 2008 to May 2009 to determine the histopathological diagnoses of all liver biopsies performed on infants less than 24 months presenting with cholestatic jaundice at the Steve Biko Academic Hospital.

Results

A total of 92 liver biopsies were performed with a median age of 4 months (range 4 days to 24 months). Comparative histopathological findings are shown in table 1. The most prevalent histological diagnosis was neonatal hepatitis (35%), followed by extrahepatic biliary atresia (27%). There was no difference between the retrospective and prospective arms. 36% of cases were HIV exposed. The relative exposure risk for HIV was not different in the groups with neonatal hepatitis or biliary atresia. Small numbers of cases had viral exposure to Hepatitis B, C, CMV, Rubella and Toxoplasmosis.

No difference in exposure to traditional medication (26%) was found.

Conclusions

In this study the frequency of extrahepatic biliary atresia, intrahepatic cholestasis and infective hepatitis is comparable to that in the literature. The frequency of neonatal hepatitis is,however, virtually double the expected 15% and is the most common cause of cholestatic jaundice in our experience (35%). This finding is as yet unexplained and requires further investigation.

DEVELOPMENTS IN TROPICAL ENTEROPATHY AND MALNUTRITION: LESSONS FROM INDIGENOUS CHILDREN IN NORTHERN AUSTRALIA

Professor David Brewster

The high burden of diarrhoeal disease in Northern Territory (NT) indigenous children is highlighted by a 16-fold higher admission rate to hospital (330.7 per thousand) than for non-indigenous children of the same age (20.3 per thousand). They are also more likely to have serious complications such as severe dehydration, hypokalaemia, acidosis and malnutrition, resulting in longer mean lengths of stay in hospital of 8.9 (CI 8.4-9.5) days vs 3.5 (2.9-4.3) days for non-indigenous. Our research in Darwin has showed that NT indigenous children suffer from high rates of small intestinal mucosal damage, referred to as tropical or environmental enteropathy syndrome, due to living in unhygienic conditions in overcrowded housing. Using intestinal permeability testing with dual sugars and nitric oxide excretion, we documented that apparently healthy indigenous children have abnormal absorptive and barrier functions of the small intestine, and excessive gut inflammation in comparison to non-indigenous children. This underlying enteropathy predisposes NT indigenous children to a greater severity of diarrhoeal complications, including osmotic diarrhoea and poor growth (FTT).

In contrast to the NT, indigenous children from remote communities in Far North Queensland (FNQ) suffer less diarrhoea, and have far fewer complications. We sought to explore these striking differences in order to better understand the risk factors for enteropathy in NT indigenous children. We observed striking differences in educational levels, hygiene practices and quality of housing between NT and FNQ. There was also less overcrowding and much more bottle feeding of infants in FNQ, consistent with better domestic hygiene.

We carried out a systematic review of hygiene and public health interventions likely to improve outcomes for Australian Aboriginal children living in remote communities, which identified 19 eligible studies. The evidence showed a clear and strong effect of education and handwashing with soap in preventing diarrhoeal disease among children. In the largest well-designed study, children living in households that received plain soap and encouragement to wash their hands had a 53% lower incidence of diarrhoea (95% CI, 35 to 59%). There was also evidence of an effect of education and other hygiene behaviour change interventions, as well as the provision of water supply, sanitation and hygiene education on reducing rates of diarrhoeal disease. The size of these effects is small and the quality of the studies generally poor. We concluded that research which measures

the effectiveness of hygiene interventions is complex and difficult to implement. Multifaceted interventions (which target handwashing with soap and include water, sanitation and hygiene promotion) are likely to provide the greatest opportunity to improve child health outcomes in remote Indigenous communities.

SALT IODISATION AND URINARY IODINE EXCRETION LEVELS DURING POST IODISATION PHASE IN INDIA.

Umesh Kapil

Background

In India, out of 282 districts surveyed, 242 have been identified to be having Iodine deficiency disorders as a public health problem. The production of iodised salt has increased from 0.3 million tons in 1983 to 4.5 million tons in 1999. All the state governments have adopted a policy of Universal Salt Iodisation (USI), under which the entire population is to receive only iodised salt.

Aims / Methods

To assess the iodine content of salt as consumed by beneficiaries and to assess the UIE levels amongst the beneficiaries in post iodisation phase. Methodology: A total of 17,654 salt and 9,286 urine samples were collected from 28 districts in the 7 states and one Union Territory. The samples were analysed using the standard iodometric titration and acid digestion method.

Results

The median urinary excretion levels were 15.5 mcg/dl (Rajasthan), 17 mcg/dl (Delhi), 10 mcg/dl (Bihar), 13.5 to 19.5 mcg/dl (Himachal Pradesh), 20 mcg/dl (Andaman and Nicobar) and 14.5 mcg/dl (Pondicherry), indicating an iodine sufficient nutriture in the areas. More than 90 per cent of the salt samples were iodised with the exception of Goa and Rajasthan. The salt samples which had a nil iodine content in the states/UTs studied ranged from 0 to 6 per cent with the excepti on of Rajasthan (31.9 per cent) and Goa (48.9 per cent). The majority of the states had more than 80 per cent of the salt samples with an iodine content of 15 ppm and more. The UIE levels were in the acceptable range (between 10 to 20 mcg/dl).

Conclusions

The current salt iodisation level of 15 ppm recommended in the country is appropriate to maintain the iodine nutriture of the population.

MODELLING THE EFFECT OF MALARIA ANDEMICITY ON SPATIAL VARIATIONS IN CHILDHOOD FEVER, DIARRHOEA AND PNEUMONIA IN MALAWI

Lawrence N Kazembe Adamson S Muula Christopher C Appleton Immo Kleinschmidt

Background / Aims

Co-morbidity with conditions such as fever, diarrhoea and pneumonia is a common phenomenon in tropical Africa. However, little is known about geographical overlaps in these illnesses. Spatial modelling may improve our understanding of the epidemiology of the diseases for efficient and cost-effective control.

Methods

This study assessed subdistrict-specific spatial associations of the three conditions (fever, diarrhoea and pneumonia) in relation to malaria endemicity. We used data from the 2000 Malawi demographic and health survey which captured the history of childhood morbidities 2 weeks prior to the survey date. The disease status of each child in each area was the outcome of interest and was modelled using a trivariate logistic regression model, and incorporated random effects to measure spatial correlation.

Results

The risk of fever was positively associated with high and medium malaria endemicity levels relative to low endemicity level, while for diarrhoea and pneumonia we observed marginal positive association at high endemicity level relative to low endemicity level, controlling for confounding covariates and heterogeneity. A positive spatial correlation was found between fever and diarrhoea (r = 0.29); while weak associations were estimated between fever and pneumonia (r = 0.01); and between diarrhoea and pneumonia (r = 0.05). The proportion of structured spatial variation compared to unstructured variation was 0.67 (95% credible interval (CI): 0.31–0.91) for fever, 0.67 (95 % CI: 0.27–0.93) for diarrhoea, and 0.87 (95% CI: 0.62–0.96) for pneumonia.

Conclusions

The analysis suggests some similarities in subdistrict-specific spatial variation of childhood morbidities of fever, diarrhoea and pneumonia, and might be a result of shared and overlapping risk factors, one of which is malaria endemicity.

DRINKING WATER IN REDUCING DIARRHOEAL INFECTION AMONG CHILDREN DURING DROUGHT

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Background

Previous studies by the authors (1,2) demonstrated significant reductions in diarrhoeal infections, and subsequent collaborative studies have supported these findings. Drought areas of Maasailand, Southern Kenya show high levels of water contamination.

Aims

We hypothesized that the use of solar disinfection will reduce rates of diarrhoeal infection in children < 7 years old.

ANTIMICROBIAL SUSCEPTIBILITY OF ENVIRONMENTAL ENTEROHAEMORRHAGIC ESCHERIA COLI 0157 ISOLATED IN EGYPT

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Background

The bacterium enterohaemorrhagic Escherichia coli 0157 is associated with a wide range of illnesses in humans, especially children and animals. The clinical manifestation of such infections includes mild diarrhea, hemorrhagic colitis and hemolytic uraemic syndrome. The pathogen has been isolated from different environmental sources, including different kinds of foods, fresh and sea waters, waste water, as well as environmental and clinical specimens.

Methods

This work includes a study of the resistance/sensitivity pattern of 73 entereohaemorrhagic Escheria coli 0157 strains isolated from human, animal, ready-to-eat foods, fresh and sea waters, as well as sea foods Cefetazidime, Ceftriaxone, Cephalothin, Erythromycin, Chlooramphenicol, Ciprofloxacin, Gentamicin, Sulphametoxazole, Streptomycin, Sulphisoxazole, Tetracyclin, and Trimethoprim using the disk diffusion method.

Results

The results indicated that different patterns of sensitivity were obtained, which depend on the source of these strains. For example, most of the strains isolated from human sources were resistant to Streptomycin, Penicillin, and Sulphisoxazole. However, those of animal sources were resistant to all the aforementioned types of antibiotics plus Chloramphenicol, Ciprofloxacin, Cefetazidime, and Ceftriaxone. However, 22 of them were sensitive to all the tested antibiotics.

Results

The high prevalence of multiple drug resistant strains observed in both clinical and bovine isolates indicates the need for monitoring the antimicrobial susceptibility of this pathogen in a number of countries, especially throughout the continent of Africa. Also, the phenomena of transmission of the gene of resistance between the bacterial cells should be well studied. Meanwhile, antibiotics should be obtained and prescribed with care, especially for children.

COUNSELING ON MASHING LOCAL FOODS FOR INFANTS INCREASES NUTRIENT INTAKES BUT LESS THAN SUPPLEMENTATION WITH A FORTIFIED SPREAD IN RURAL ZIMBABWE.

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Background

Fortified spread, Nutributter® (NB), is promoted as a supplement to prevent childhood malnutrition.

Methods

Prior to a community based trial, we conducted formative research to see how local diets of 6-12 month olds in rural Zimbabwe could be improved, and then if they could be further improved with NB. We carried out 2 sets of Trials of Improved Practices (TIPs), with and without NB. The first set identified feeding problems and acceptable improved practices using behavior change and available foods (n=16 mother/infant dyads). The second set was similar to the first, but it also assessed the acceptability of NB (n=16 dyads). TIPs included 5 interviews over 2 wk and 24-hr dietary recalls (2 pre- and 2 post-counseling).

Results

Poor variety was the major feeding problem due to little awareness about what foods infants could eat. Recommendations to mash local foods such as vegetables, fruits, insects, and seeds were most frequently accepted, tried, and practiced. Nutributter was well accepted when added to the new foods tried by the mothers. While intakes from complementary foods of energy, protein, Vitamin A, and calcium increased regardless of NB (p<0.05), intakes of fat, folate, iron, and zinc increased only (fat) or more so (all others) with the provision of NB (<0.05).

Conclusions

Significantly increasing nutrient intake using local food is possible in Zimbabwe, but provision of NB helps ensure adequate intake, especially of micronutrients.

NOVEL LIPID-BASED READY TO USE FOODS FOR THE MANAGEMENT OF MALNUTRITION IN RESOURCE-POOR SETTINGS.

Victor O. Owino

Background

Ready to Use Therapeutic Foods (RUTF) have been widely used in Community-based Therapeutic Care (CTC) to treat severely malnourished children in resource-poor settings. The intensive use of milk in the formulation of RUTF makes them too expensive for sustainable use in resource-poor settings. There is lack of evidence on whether RUTF with none or minimal amounts of milk powder may have similar treatment effects among acutely severely malnourished children. Recent evidence from Ghana and Malawi show that lipid-based ready to use food (RUF) pastes may be used to prevent or treat moderate malnutrition with positive effect on growth among infants. Existing evidence on benefits of RUFs on prevention/treatment of moderate malnutrition is not adequate and more work is needed to better inform policy.

Valid Nutrition (VN) is registered as a charity in Ireland, and runs as a commercial food business with no shareholders so all profits are re-invested. VN focuses on local production using a diversity of local crops in countries affected by malnutrition, allowing economic benefits go back to local industry. The creation of market for local produce links nutrition with food security and greatly increases the cost efficiency of aid.

Aims

To present research work currently being undertaken by Valid Nutrition on development of lipid-based ready-to-use foods for the management of malnutrition in resource poor settings.

Results

VN has since 2008, with funding from the Irish Aid, developed 4 new alternative corn-soya-sorghum recipes including milk-free ready-to-use therapeutic food for treatment of SAM (RUTF), ready-to-use supplementary(RUSF) and ready-to-

use complementary food (RUCF) with very little milk, and a milk-free RUTF specifically designed for HIV-infected adults (RUTF-HIV). To date, we have conducted successful acceptability trials for RUTF, RUTF-HIV and RUSF and are just getting the final acceptability results for RUCF. These new recipes have all proved to be highly acceptable among target populations. Four post-acceptability efficacy trials to evaluate the benefits of the new RUF recipes on child and HIV-infected adult nutritional status are set to begin in Kenya, Zambia and in the Democratic Republic of Congo in early 2009.

Conclusions

With low or absent milk and no peanuts, all these new products will be considerably cheaper than the current peanut milk-based formulations and their potential use could contribute immensely to improvement of health in resource poor settings.

NUTRITIONAL STATUS AND INFANT FEEDING PRACTICES AMONG INFANTS IN LEA TOTO: A COMMUNITY BASED HIV CARE PROGRAMME IN NAIROBI, KENYA

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R. Musoke K. Mathei

Background

An evaluation to review implementation of nutrition interventions in Lea Toto (August 2008) recommended an in-depth assessment of infant feeding practices in the programme.

Aims

To assess nutritional status and infant feeding practices of infants enrolled in a community based HIV programme targeting HIV positive women in low income areas in Nairobi, Kenya.

Methods

Mothers were interviewed regarding infant feeding practices using a structured questionnaire, and anthropometric measurements (weight, height and mid upper arm circumference) of the infants were taken.

Results

The majority of mothers (88%) make decisions on how to feed their babies before delivery. Among infants 0 – 5 months, more mothers were breastfeeding (47%) compared to those giving replacement feeds (35%). This is attributed to improved counselling support for exclusive breastfeeding for mothers who cannot afford a suitable replacement feed. However, initiation of breastfeeding was delayed with only 10.3% of caregivers having breastfed within the first hour after delivery. Giving pre-lacteal feeds was practiced by 12.6% of mothers. Mixed feeding remains a challenge and was practiced by 18% of mothers with infants 0 – 5 months. Women mostly resorted to mixed feeding because of concerns regarding adequacy of breastmilk. Close to half of infants surveyed (103, 47.2%) had been ill two weeks prior to the study. Around a third (33%) of children who had been ill two weeks prior to the study had diarrhea. Around half of infants on the replacement feeding option received animal milk (55%) compared to those getting infant formula (45%). The majority of infants aged 6 – 11 months (90.4%) were receiving complementary foods. Overall, the nutrition situation of the study children is poor. The proportion of stunted children was 22.4% (95% C.I 16.4 – 28.5). The prevalence of underweight children was 27.6 % (95 % C.I 21 -34). The prevalence of global acute malnutrition (GAM) was 7.1% (95% C.I 3.3 – 11) while Severe Acute Malnutrition (SAM) i.e., < -3sd Z-Score was 1 % (95% C.I 0 – 2.7).

Conclusions

Mixed feeding, which is a common cause of diarrhoea among infants, remains a challenge among caregivers in the programme. Infants who were acutely malnourished were mostly on mixed feeding.

NUTRITION EDUCATION CAN BE INCREASED BY THE RATE OF EARLY INITATION OF BREASTFEEDING IN URBAN MOTHERS

N. N. Alam S.K. Roy W.Khatun M.Khanam A.Begum S. K. Thaku K. Paul

Background

Breastfeeding is an integral part of the reproductive process with important health implications for mothers and has the potential to make a major contribution to reaching the child survival Millennium Development Goal.   31% reduction in neonatal deaths could be achieved if breastfeeding is initiated within first hour of birth.

Aims

To find out the barriers to early initiation of breastfeeding and to see the impact of nutrition education on early initiation of breastfeeding compared to a control group.

Methods

The study was a randomized survey conducted from three maternity hospitals in Dhaka city. A sample of 192 pregnant mothers above 8 months of pregnancy, divided into intervention (96) and control (96) groups, was obtained by random sampling method. The study period was from the 1st April '08 to 10th October '08. Socioeconomic data was collected from both groups before delivery using the same structured questionnaire. A second visit was made for the intervention group only to give them nutrition education related to the importance and correct technique of initiating breastfeeding within one hour. In the final visit within the first week of delivery, information on breast-feeding and time of initiation were collected.

Results

From the analysis, it was found that mothers in the intervention group were 4.3 times more likely to initiate breastfeeding within 1 hour of birth than the control group. Lack of nutrition education is a barrier to the improvement of EIB rate. Early initiation of breastfeeding was significantly higher for the intervention group (62.5%) compared to the control group (39%) (P<0.001). In the intervention group, we found early initiation was 25% more than that of late initiation. Significant barriers to EIB were complications during pregnancy, poor food intake during pregnancy, no discussion of the importance of breastfeeding, low motivation of family members regarding breastfeeding, and lack of breastfeeding counseling.

Conclusions

Mothers who received family support on breastfeeding were 9 times more likely to initiate breastfeeding within one

hour of birth, and mothers who had complications during pregnancy were 7 times less likely to initiate breastfeeding early than those without complications.

OUTPATIENT MANAGEMENT OF ACUTE MALNUTRITION IN A KENYAN URBAN SLUM CONTEXT: CASELOADS AND CHALLENGES

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Background

Kenya has the largest slums in Africa, with the highest poverty, HIV and tuberculosis levels found in Kisumu and Nairobi. A community-based approach to managing severe acute malnutrition (SAM), using Ready-to-Use-Therapeutic-Food (RUTF) and weekly medical check-ups, a new approach to Kenya, was rapidly scaled-up in March 2008 as a response to post-election violence.

Aims

To evaluate the successes and challenges of managing Outpatient Therapeutic Programmes (OTP) in Nairobi and Kisumu urban slums after one year.

Methods

Performance data were analysed from OTPs in four districts operated by Ministry and local community-based organisations. Coverage, community acceptance and systems constraints were also assessed to identify barriers to programme uptake.

Results

A total of 2296 children with SAM aged 6-59 months were admitted from mid-March 2008 to end-March 2009 in Nairobi and Kisumu (1555, 739 respectively), via 35 health facilities. At least 200 children were HIV-seropositive or had tuberculosis, although no systematic referral/testing is in place. The ratio of marasmus to kwashiorkor was 4:1. Rates of cured, died, defaulted and non-response were 55.3%, 4.9%, 40.6% and 1.2% (n=967, 85, 710, 21), which improved over the last quarter to 62.9%, 4.6% , 31.4% and 1.1% after increased emphasis on defaulter tracing. Average length of stay was 48.7 days and weight gain 4.3g/kg/day in a sample of 546 cases. Ministry staff increased their awareness and skills; good acceptance was reported from caretakers. Challenges included high default rates and low coverage rates of 37.7% (95%:19.4-56.0) in Nairobi and 21.8% (96%:0-50.4) in Kisumu East. Qualitative investigation highlighted cost-benefit issues: cost of transport, no supplementary foods, work-time pressures leading to reliance on daycare centres, private clinics and home-help, long waiting times; low recognition of malnutrition; low awareness of OTP; stigma around HIV associated with RUTF and high migration within slums.

Conclusion

It is possible to implement OTP in urban slums using existing health structures. However a more unified approach to management of severe acute malnutrition, paediatric HIV and tuberculosis and increased HIV testing of children in OTP is needed. Barriers to low coverage and high defaulter rates can be addressed when identified during planning and monitoring.

CHANGES IN NUTRITIONAL STATUS OF UNDER-5 CHILDREN IN THE NNP AREA BETWEEN 2004 AND 2007 AND WITH THEIR SIBLINGS IN 2007

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Background

High levels of child malnutrition and mortality are major health challenges in Bangladesh even though a number of initiatives have been taken to reduce the burden of childhood malnutrition. The impact of nutrition services on families has not been measured on the siblings of children receiving NNP services in Bangladesh.

Aims

To examine the changes in nutritional status of children who were under 2 years in the 2004 NNP Baseline Survey after 3 years, and to measure the nutritional status of their younger siblings in 2007.

Methods

The Baseline Survey was conducted in 2004, and covered 44 NNP intervention, 53 BINP, and 16 NNP comparison upazilas of households with under-2 children from the 6 divisions. Out of the baseline 9217 under-2 children from the survey, 2124 (708 PSUs x 3 children per PSU) were randomly selected for the follow-up 2007 survey. 483 younger siblings of the 2124 selected children, who were born after the 2004 Survey, were examined in 2007. Data on anthropometry, dietary intake, SES and morbidity were collected and compared with the 2004 index children.

Results

The proportion of stunting increased in 2007 in index children (55% vs 40%, $p<0.001$), but decreased in their younger siblings (41% vs 42%, $p<0.01$) compared to 2004 data in the intervention area (NNP and BINP area). However, stunting increased in the control area (48% vs 38%, $p<0.001$) in index children and (45% vs 38%, $p<0.01$) in their younger siblings. The proportion of underweight children increased in index in 2007 compared to 2004 (43 % vs 34%, $p<0.001$) and among their siblings (40% vs 37%, $p<0.01$) in the intervention area. Wasting in index children decreased in 2007 compared to 2004 (9% vs 14%, $p<0.001$), but increased in their younger siblings in 2007 (19% vs 17%, $p<0.01$) in intervention area.

Conclusions

Stunting and underweight status of children of 2004 increased in 2007, but their wasting decreased significantly. However, younger siblings in 2007 appeared to have increased stunting, underweight and wasting compared to their elders in 2004.

HOSPITAL MORTALITY BEFORE AND AFTER IMPLEMENTATING WHO GUIDELINES FOR MANAGING SEVERE CHILD MALNUTRITION: A 6 YEAR REPORT FROM LUANDA.

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Background

WHO case-management guidelines for severe malnutrition aim to improve the quality of hospital care and reduce mortality. At the Hospital Divina Providencia (a district hospital in Luanda) a nutritional programme was implemented in 2002 and WHO guidelines were fully adopted as standard routine from 2006.

Aims

To assess mortality rate of malnourished hospitalised children prior and after the implementation of WHO guidelines.

Methods

WHO guidelines were implemented by an expatriate paediatrician and trained local nurses. The mean case fatality rate prior and after implementation of WHO guidelines was calculating using data from two parallel computerised databases (hospital and expatriates), which prospectively recorded number of hospitalised children, baseline characteristics and outcomes.

Results

During a 6 year period (January 2003 to December 2008), 1477 children with severe malnutrition were treated as inpatients at HDP. Fatality rate was 20.4% (135/660), before the guidelines were introduced (2002-2005), with little variation in the annual rate, and 9.9% (81/817; OR=2.3 95% CI 1.7 to 3.1, p< 0.0001) after implementation of WHO guidelines (2006 to 2008), again with little annual variation. Risk of death was higher in children less than 6 months of age (7/33 (21%), OR= 2.4 95% CI 1.0 to 5.8, p=0.03).

Conclusions

These data show that mortality from malnutrition has declined when WHO guidelines were introduced. Although fatality rate is still suboptimal, these results are encouraging, and proved to be stable on long term despite high turnover of local staff. Care of infants less than six months needs particular attention.

ACTIVITY REPORT OF A COMMUNITY-BASED THERAPEUTIC FEEDING PROGRAM WITH MUAC AS EXCLUSIVE ADMISSION CRITERIA

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Background

Despite the objective of extending treatment to a larger number of children with community-based nutritional programs, MUAC<110mm most often remains the least sensitive anthropometric criteria among those currently in use thus excluding from treatment a greater number of children in need.

Objective

In September 2007, MSF-France implemented a large-scale TFP for the treatment of SAM in Burkina Faso.

The objectives of the program are to:

- Treat cases of SAM through a community-based approach
- Admit to treatment children through an exclusive MUAC criteria and/or edema
- Validate the admission criteria and develop an adapted criteria for discharge

Method

Individual patient charts are entered into a database used for program monitoring and in-depth analysis. Admission criteria to treatment was MUAC<120mm and/or edema. Children were considered as recovered when weight exceeded 15% of admission weight.

Results

Results are based on the analysis of 23108 records, of which only 3.8% had edema. 94.4% of children admitted with MUAC had a mean WHZ<-3 z-score (WHO standards). The female to male ratio was 1:1 for all admissions and the median age was 14 and 24 months for children admitted with MUAC and edema, respectively. The vast majority of children admitted by MUAC were admitted directly in outpatient units (>92.2%) and treated exclusively at home (82.2%).

The response to treatment of children with a higher MUAC at admission was substandard as they needed more time to gain +15% of their weight at admission compared to those with severe wasting. MUAC response to treatment seems to meet satisfying level with a gain of 0,4 to 0,5mm/day.

Conclusions

For its simplicity and predictive value of death, MUAC-based detection on a fixed cut-off represents an interesting opportunity to reach the younger children who are more vulnerable to morbidity and mortality. The community-based approach together with a larger inclusion criterion helps to identify wasted children earlier, when they can be treated easier and more effectively. To address the problem of long lengths of stay, particularly among those children with the least wasting, the discharge criteria have been adapted to a MUAC>=124 mm.

STUDY ON APPROPRIATENESS OF HOSPITAL DIETS FOR PATIENTS OF DIABETES MELLITUS, CORNONARY HEART DISEASE, KIDNEY DISEASE, AND LIVER DISEASES IN SELECTED HOSPITALS OF BANGLADESH

Dr.S.K.Roy, N. N. Alam, M. Khanam, A. Begum, N. Alam, S.K. Thakur, K. Paul, W. Khatun, Debjani Sarker

Background

Diet plays an important role in the treatment or recovery process in many diseases. Diet therapy is the process by which food is used to help manage disease and build good health.

Aims

To assess appropriateness of hospital diets received by patients and their intake in four specific disease conditions - diabetes mellitus, coronary heart disease, renal failure and liver diseases - compared to their therapeutic recommendation in some hospitals in Bangladesh.

Methods

We conducted cross-sectional study using stratified random sampling. A total of 250 patients, aged 30-65 years, of both sexes were selected from six divisions from all socio-economic groups. The diet was measured for amount of carbohydrate, fat, and protein intake by the patients.

Results

In this study it was found that 75% of the RDA for carbohydrate was supplied in specialized hospital for diabetes mellitus. The intake was 60%, which was only 45% of the RDA. It was revealed that the supply of carbohydrate was more than RDA (18% and 3%) in only two divisional hospitals among all the divisional and district level hospitals, but the intake was much lower than RDA (58% and 76%). The fat supplied was 27% more than RDA in specialized hospitals for heart disease. It was found that 50% of divisional and district hospitals provided less fat while the other 50% provided more. In specialized hospitals for kidney diseases, 63% more protein was supplied than RDA. However, the intake was 28% of the supplied protein, which was only 73% of the RDA. Most of the divisional hospitals supplied more protein than RDA while protein intake was lower.

Conclusions

The macronutrient content in therapeutic diets were not adequate compared to RDA in any of the studied hospitals in Bangladesh. The government should take steps to appoint a well-qualified nutritionist and dietician in every hospital in Bangladesh.

POST INTERVENTION GROWTH OF MALAWIAN CHILDREN WHO RECEIVED 12-MONTH DIETARY COMPLEMENTATION WITH A LIPID-BASED NUTRIENT SUPPLEMENT OR MAIZE-SOYA FLOUR.

John C Phuka, **Kenneth Maleta Chrissie Thakwalakwa Yin Bun Cheung André Briend Mark J Manary**

Per Ashorn

Background

Therapeutic feeding with micronutrient fortified lipid-based nutrient supplements (LNS) has proven useful in the rehabilitation of severely malnourished children. We recently reported that complementary feeding of 6-18 month-old infants with an LNS called FS50 was associated with improved linear-growth and a reduction in the incidence of severe stunting during the supplementation period.

Aims

To assess whether a reduction in stunting seen with 12-month LNS supplementation is sustained over a subsequent 2-year non-intervention period.

Methods

182 six-month-old, healthy, rural Malawian infants were randomized to receive daily supplementation for 12 months with either 71g of maize-soy flour (Likuni-phala, LP) (control-group, 282 kcal), 50g of FS50 (264 kcal, main intervention-group), or 25g of FS25 (130 kcal). Main outcome measures were incidence of severe stunting and mean changes in weight-for-age (WAZ), length-for-age (LAZ), and weight-for-length (WHZ) during a 36-month-long follow-up.

Results

The cumulative 36-month incidence of severe stunting was 19.6% in LP, 3.6% in FS50 and 10.3% in FS25 groups (p=0.03). Mean WAZ change was -1.09, -0.76 and -1.22 (p=0.04), mean LAZ change was -0.47, -0.37, and -0.71 (p=0.10), and mean WHZ change was -1.52, -1.18, and -1.48 (p=0.27). All differences were more marked among individuals with baseline LAZ below the median. Differences in length developed during the intervention at age 10-18 months, whereas weight differences continued to expand after the intervention.

Conclusions

12-month-long complementary feeding with 50g / day FS50 is likely to have a positive and sustained impact on the incidence of severe stunting in rural-Malawi. Half-dose intervention may not have the same effect.

DEVELOPMENT OF A MAIZE-SOYA-SORGHUM RUSF AND TESTING OF MESSAGES FOR ITS USE IN A TRIAL IN MODERATELY MALNOURISHED CHILDREN AGED 6 MONTHS TO 5 YEARS WITH ACUTE INFECTION

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Background

Ready to use supplementary foods (RUSF) are being designed for use in different contexts. Here, we describe the development of a locally made RUSF for a randomized controlled trial of an outpatient strategy of supplementary feeding in moderately malnourished children with acute infection.

Aims

To test the acceptability of a maize-soya-sorghum RUSF in moderately malnourished children aged 6 months to 5 years and to develop messages for caretakers on how to administer it at home.

Methods

The setting was a Kenyan district hospital outpatients department. For the acceptability study, 25 underweight children were recruited from MCH clinic attenders. The children were observed for their reactions to RUSF and caretakers were asked for their comments on the taste and consistency. The caretakers were issued jars of RUSF and asked to provide a dose of 25g/kg body weight of the child per day. They were followed-up at 3, 7 and 14 days to assess the amount eaten by the children and asked how they gave the food at home. A pilot study to refine messages on use of RUSF was later carried out on 31 moderately malnourished children with mid-upper arm circumference (MUAC) <12.5cm who presented for outpatient care with acute infection.

Results

The RUSF was acceptable to carers and children, but most caretakers (18/25) said that it was too sweet and some (8/25) commented that it was too granular. Seventeen out of 22 children (77%) ate three quarters or more of the RUSF ration by 14 days. Mothers mixed the RUSF with porridge if the children were unable to eat it on its own. The recipe was modified to reduce the sugar content and make the consistency finer. The final version also contained added vitamins and minerals. Messages were changed to emphasize that the RUSF was prescribed as a treatment. We modified the advice on sharing with siblings.

Conclusions

Pretesting of the product and messages on its use enabled us to detect potential obstacles to its use in the home and to make modifications before the start of the main trial.

MALNUTRITION AND ENTERIC DISEASE

Professor Mark Manary

Multinational Study of Enteric Infections and its Relation to Malnutrition, Growth, Development and Vaccine Response: The MAL-ED study

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Malnutrition is considered one of the most prevalent risk factors for morbidity and mortality in children under five affecting an estimated 20% of children in the developing world and linked to more than half of all child deaths worldwide. Malnutrition in early childhood may lead to cognitive and physical deficits and may cause similar deficits in future generations as malnourished mothers give birth to low birth weight children. In addition, malnutrition increases susceptibility and incidence of infections and is associated with diminished response to vaccines.

Understanding the complex and synergistic relationships between enteric infections and malnutrition is fundamental to the design of better intervention strategies. Despite great therapeutic advances, enteric infections causing diarrhea remain the primary cause of an estimated 17-20% of all deaths (up to ~2.1 million deaths) per year in children under five years of age. Although mortality due to enteric pathogens has decreased worldwide over the last three decades, it is estimated that the global burden of morbidity due to diarrhea actually increased.

The root of malnutrition in early childhood is complex with a variety of direct and underlying contributors related not just to food intake, including insufficient breastfeeding and food, but also to catabolic states due to infection, and to inadequate response of the host and the host's gut microbiome to caloric deficit. Pathogenic bacteria, viruses, and parasites in the gut appear to impact nutritional status by damaging the absorptive capacity of the intestine, and by compromising the intestinal barrier, resulting in increased intestinal permeability to pathogens, endotoxins, and other macromolecules that can result in chronic stimulation of the immune system. Both micronutrient deficiencies and chronic immune stimulation have been found to impair growth and increase susceptibility to infectious diseases. Altered gut flora and pathogens may also impact the effectiveness of vaccines delivered orally. While it is likely that enteric infections can lead to malnutrition, existing data on enteropathogen etiologies are limited by small sample sizes, limited geographic locales, and robustness of diagnostic tests.

We have initiated a multi-site study in areas with high pathogen and malnutrition prevalence to determine the impact of enteric infections/diarrhea that alter gut function and impair children's nutrition, growth and development in order to develop new intervention strategies that can break the vicious enteric infection-malnutrition cycle and reduce its global burden. The eight field sites will use shared and harmonized protocols during the critical early years of life, to determine factors that impact early childhood health and development. Epidemiologic, microbiological, physiological, immunological and psychological assessments will be conducted to study:

a. If specific enteric pathogens or combinations of pathogens have stronger associations with malnutrition than others.

b. Is there a particularly vulnerable period in infancy/early childhood during which specific enteric infections cause greater morbidity?

c. Can results from one locale be extrapolated to other populations based on common environmental and biological determinants?