

International

G01 DETECTION OF LOW BIRTH WEIGHT NEWBORNS BY FOOT LENGTH AS PROXY MEASURE OF BIRTH WEIGHT

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Background: The majority of births in rural areas of developing countries take place at home. Lack of weighing facilities make early and reliable identification of low birth weight (LBW) babies difficult.

Aims: To find out the correlation between birth weight and foot length. To detect LBW newborns by using foot length measurement as proxy measure of birth weight.

Methods: One thousand live newborns of gestational ages 26–44 weeks were studied at a hospital in Nepal. The foot length, crown-heel length, head circumference, chest circumference, and birth weight were recorded within 24 hours of birth.

Results: Foot length measurement showed the highest correlation ($r=0.92$) among various anthropometric measurements with birth weight. The correlation between foot length and other anthropometric parameters were higher in preterms than in term babies. The formula, length = (foot length \times 6.5) \pm 20 mm correlated positively. The mean birth weight of newborns was 2931 (SD 464) g. The incidence of LBW babies was 12.6%. The results showed a sensitivity of 70.6%, a specificity of 98.5%, and a positive predictive value of 89.7% for identifying LBW newborns. For very LBW newborns the sensitivity, specificity, and positive predictive value were all 100%.

Conclusion: If implemented on a larger scale, this low cost technology of foot length measurement can significantly enhance the yield of identification of LBW babies born at home and babies can be managed thereafter accordingly. When it is difficult to weigh or measure the length accurately, foot length can serve as a useful measurement to assess a baby quickly, especially in preterms nursed in incubators.

G02 AFRICAN SCHOOLS RESPOND TO HIV

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Aims: Education has been dubbed "the social vaccine" against HIV. The school age years, encompassing the fraction of a population with lowest prevalence, have been called "the window of hope". But HIV destroys education, for example through absence and death of teachers and lack of access to school for the growing numbers of orphans and vulnerable children (OVC). The HIV pandemic needs approaches that are not confined to the health sector. We aim to assist the education sector to plan timely responses in order to play this crucial part in limiting the pandemic and its effects.

Method: The Inter-Agency Task Team (IATT), a grouping of UN agencies with major funding from the World Bank, has initiated *Accelerating the Education Sector's Response to HIV/AIDS in Sub-Saharan Africa*. Since 2002, sub-regional workshops have been held in Kenya, Gabon, Nigeria (1 federal, 3 for groups of states), Mozambique, Ethiopia, Ghana, Zambia, and Senegal. Knowledge is exchanged in these workshops, but the principal product is planning, with detailed measurable educational plans at sub-regional, national, provincial, and district level. Our group organises and runs these workshops. Facilitated thematic groups, organised as desired by ministries of education but typically around planning for (1) increased staffing needs; (2) HIV prevention through curriculum design and teaching; (3) increasing OVC access; and (4) school policies on staff treatment and employment protection deliver prioritised aims, objectives, activities, and identified resources. These are then incorporated into specific plans for each state, province, or district.

Results: The administrators of education at all levels have identified their priorities, objectives, and means of obtaining them. These always include one immediate task to be achieved within a few months. This process has led to the first incorporation of plans for OVC to access education and for collaboration with social welfare on this, also with health on preventive life skills in the curriculum. There has also been an increase in education sector use of Multi Country HIV/AIDS Program (MAP) funds allocated to governments but previously left untapped. Nevertheless, we have so far been able to show few tangible results in educational provision, for example for the OVC.

Conclusion: African school systems are responding to the enormous HIV threat, but still not fast enough.

G03 INCIDENCE AND CONSEQUENCES OF CONGENITAL ABNORMALITIES AMONG HOSPITAL BORN INFANTS IN ENTEBBE, UGANDA

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Aim: Relatively little is known about the health burden of congenital abnormalities in sub-Saharan Africa. This study aims to examine the incidence of congenital abnormalities and their association with other adverse perinatal outcomes among hospital born infants in Entebbe, Uganda.

Method: Information was recorded with regard to the pregnancy, delivery, and birth outcome for all women delivering at Entebbe General Hospital between February and July 2003. All newborns, whether live or stillborn, were examined externally after delivery for the presence of congenital abnormalities, which were then classified using the 10th edition of the *International classification of diseases*. Late foetal and early neonatal deaths were recorded and perinatal mortality calculated according to WHO definitions.

Results: Records were entered for 1026 deliveries (1115 newborns). The crude perinatal mortality rate was 54.6/1000 total births (56/1026) and the prevalence of low birth weight (LBW) infants (<2.5 kg) was 9.9% (104/1049). LBW was strongly associated with increased perinatal mortality (OR 11.4 (95% CI 6.0 to 20.3), $p<0.0001$) and was a contributing factor in 47% of all perinatal mortalities. The presence or absence of a congenital abnormality was recorded for 999 (89.6%) newborns. The incidence of congenital abnormalities among the study population was 17/1000 total births. Major and multiple congenital anomalies occurred in 8.1/1000 births and 2.0/1000 births, respectively. Abnormalities affecting the musculoskeletal system were the most frequently seen, followed by those of the nervous system. Perinatal mortality among infants with a congenital abnormality was more than twice that seen among those without (117.6 v 54.4 per 1000 births) but this association was not found to be statistically significant (OR 2.5 (95% CI 0.5 to 11.3), $p=0.24$). No significant association between congenital abnormalities and LBW was seen (12.5% v 9.6%, OR 1.35 (95% CI 0.3 to 6.1), $p=0.69$).

Conclusions: Few studies to date have looked at the incidence of congenital abnormalities in sub-Saharan Africa. This study's findings are likely to reflect a conservative estimate of the incidence of congenital anomalies in this population and suggest that these abnormalities may represent a significant contribution to infant morbidity and mortality in this setting.

G04 PREVALENCE AND PERCEPTIONS OF ANAEMIA IN SCHOOL AGE CHILDREN IN A RURAL POPULATION IN NICARAGUA

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Introduction and Aim: Population prevalence of anaemia for children <5 years, adolescents, pregnant women, and adults has been internationally well researched. There are very little published data, however, on children aged 5–11 years.¹ International strategies for addressing anaemia and iron deficiency in children have had little impact to date. This study aims to quantify the level of anaemia in the school aged child in the village of San Cayetano, rural Nicaragua, and also to qualitatively investigate community conceptions of anaemia and approaches to its management.

Method: Cross sectional point prevalence of haemoglobin level, for children in the study area, using the HemoCue system. Group discussions and individual structured interviews for relevant community members and randomly selected parents with thematic analysis of perceptions of anaemia, iron deficiency, diet, nutrition, and prevention/management strategies were done.

Results: 121 children participated; 56.5% of possible study population (age range 5.2–11.9, median 8.7; male 49%, female 51%; height Z score mean -0.44 , SD 0.99; weight Z score mean -0.51 , SD 1.04). Prevalence of anaemia (haemoglobin <11.5 g/dl²) is 14.8% and significant risk factor for anaemia was adverse social factors. A total of

20 community members participating in the interviews advocated a variety of medicinal and health promotional strategies, combined with environmental change for prevention and management of anaemia in children.

Conclusions: This study shows that prevalence of anaemia in normal children in Nicaragua is relatively low,² but significant. Management needs to be moved beyond the individual biomedical model to address community localised nutritional, environmental, and social factors for more effective management of this condition.

Ethical approval: Ministry of Health, Nicaragua; Warwick University, UK.

1. **WHO review of the health needs of the older child.** Blood disorders. I Bates. Liverpool School of Tropical Medicine. In press.
2. **Iron Deficiency Anaemia, Assessment, Prevention and Control.** WHO 2001.

G05 THE SPECTRUM AND INCIDENCE OF NEURAL TUBE DEFECTS IN BABIES BORN IN OMDURMAN, SUDAN

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Background: While the incidence births of babies with open neural tube defects (NTDs) is falling in the USA and Western Europe, these congenital abnormalities remain a significant cause of morbidity and mortality in Africa. Before looking at the use of folic acid supplementation, we have attempted to define the magnitude of the problem in a hospital based population in Sudan.

Study Design: Prospective study of all patients born with open NTDs over a 12 month period in one hospital in Sudan. Index cases were compared with a consecutive group of deliveries of babies born without NTDs (control group = ~2 × index group).

Research Tools: Maternal questionnaire completed after delivery. Formal examination of all infants and follow up questionnaire for surviving infants at one year. Verbal consent to participation was obtained in all cases. Questionnaires were completed by a medical practitioner asking the mother the designated questions (many mothers illiterate).

Results: In the year from Feb 2003 to Jan 2004 there were 64 babies born with open NTDs. This gave an incidence of 3.5/1000 deliveries. NTDs were the most common abnormality note at birth, the incidence of all other abnormalities coming to just 2.5/1000 deliveries. 24 babies had anencephaly. 33 were stillborn and there were 20 early neonatal deaths. Young maternal age ($p < 0.0001$), low maternal educational level ($p = 0.0012$), low paternal educational level ($p < 0.0001$), and a previous history of stillbirths ($p < 0.0001$) were all associated NTD births. No index case mothers or control mothers received pre-conceptual folic acid supplements. Thirteen of 14 index patients who were stillborn or suffered early neonatal death were delivered by caesarian section.

Conclusion: Delivery of babies with open NTDs remain a significant problem in Sudan. Poor socioeconomic status and a previous history of stillbirths are indicators of high risk. The lesions seen were at the severe end of the spectrum of NTDs. Interventive studies looking at the benefit of folic acid supplementation and antenatal ultrasound in this population are indicated.

G06 BREASTMILK ANTIBODIES THAT INHIBIT SECONDARY PROCESSING OF PLASMODIUM FALCIPARUM MEROZOITE SURFACE PROTEIN-1 IN NIGERIAN MOTHERS

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Previous work by others and ourselves has shown that in animal models as well as in natural human infections antibodies that inhibit the secondary processing of merozoite surface protein-1 (MSP-1) also inhibit erythrocyte invasion by merozoites. Thus, MSP-1 is an important vaccine candidate. We have also shown that the human antibodies do cross the placenta. In the present study, we have looked for processing inhibitory antibodies in the breast milk of Nigerian mothers. After obtaining informed consent, 5 ml blood and 5–10 ml expressed breast milk (EBM) were collected from 52 non-parasitaemic mothers whose babies were 4–16 days old. Ten such blood EBM pairs were randomly selected for this laboratory study. For the ELISAs, the plates were coated with a recombinant MSP-119 expressed in *Pischia pastoris* and purified on a nickel column. Bound human antibody was detected by horseradish peroxidase (HRP) conjugated anti-human IgG, visualised using o-phenylenediamine dihydrochloride and read at 492 nm. For the

processing inhibition assay, aliquots of *P falciparum* (3D7 clone) merozoites were incubated with 10% EBM, with appropriate controls, to allow secondary processing to occur. The products were analysed by SDS-PAGE and western blotting. The blots were probed with biotinylated X509 monoclonal anti-MSP-133, to detect processing and the peptide bands were visualised by enhanced chemiluminescence, followed by autoradiography. Quantitation of the autoradiograph bands was by the Scion Image software. For each lane (blood or EBM sample) the extent of processing C was calculated thus: $C = B / (A + B)$, where A and B were the densities of the MSP-142 and MSP-133 bands, respectively. Processing inhibition was defined as <30% of the positive control lane. In 1 of these 10 mothers inhibition of processing was present in blood and milk and in 1 other mother, in her blood only. These rates were to the 6/50 we found earlier in children age 1 month to 15 years ($p 0.44$; Fisher's) and in 2/11 mother-neonate pairs. ELISA titres did not correlate with processing inhibitory activity in blood or EBM. A larger and detailed study is needed to determine whether milk antibodies cross the neonatal bowels, with implications for vaccination practices when MSP-1 vaccines get to clinical trials.

Nwuba RI, Sodeinde O, Anumudu CI, et al. (2002).

G07 THE TRADITIONAL PRACTICE OF SWADDLING: DOES IT HARM OR BENEFIT THE INFANT? RESULTS OF A RANDOMISED CONTROLLED TRIAL IN MONGOLIA

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Aims: Annually, an estimated 4 million infants are traditionally tightly swaddled for many hours a day. This RCT investigated impacts including acute lower respiratory infection (ALRI), crying, sleep, and mental and motor development in Mongolian infants.

Methods: In autumn 2002, 1274 healthy newborns were randomly allocated to swaddled (SW) and non-swaddled (NSW) groups within 48 hours after birth. Excluded were infants with <36 week gestation, <2500 g, significant morbidity, residing in very warm apartments. The study gave clothes to NSW babies for warmth in the winter and were recommended not to swaddle at all, while the SW group followed the traditional tight swaddling style entailing over 20 hours/day swaddling in the first 2–3 months and then gradual reduction in duration and intensity at the family's discretion. Over 90% of the SW group continued swaddling at least 12 hours/day until 7 months. Trained fieldworkers collected data, especially on illnesses, by home visits every 3 weeks through 7 months. ALRI outcome was defined using x ray, pulse oxymetry, and WHO criteria. It was assessed by trained doctors. Mothers provided crying and sleep data by completing 4 day diaries (validated in other studies). The Bayley Scales of Infant Development (BSID-II) were administered by trained Mongolian assessors at 13 months. Quality control ensured accuracy of data and an assessment of compliance.

Results: Both groups were similar on all socioeconomic characteristics except for slightly higher father's education in the NSW group. Participant attrition was generally due to relocation and did not differ on the bases of sample characteristics. 1231, 1008, and 1097 completed follow up at 5, 7, and 13 months, respectively. On an intention to treat analysis, the groups did not differ in rates of ALRI (child clustered Cox hazard ratio 1.2, 95% CI 0.7 to 2.1) or severity of ALRI (child clustered OR 1.2, 95% CI 0.8 to 1.7). Data by age and sensitivity analysis using grading of certainly of ALRI diagnosis and severity definitions confirmed these findings. At 6 and 12 weeks, there were, respectively, 38 (95% CI 13 to 64) and 46 (95% CI 13 to 79) minutes extra mean sleep in 24 hours in the SW group. At these three ages, groups were not significantly different in crying duration in 24 hours. Swaddling was unrelated to development at 13 months with a scaled mean group difference in motor scores of -0.25 (95% CI -1.7 to +1.2) and in mental scores of -0.54 (95% CI -1.6 to +0.5). Mean scaled BSID-II scores for the sample were 99.9 (95% CI 99 to 101) for motor and 105.5 (95% CI 104 to 107) for mental scales. For all outcomes, findings were similar when looking at exposure to swaddling in both groups.

Conclusions: Results suggest no relationship between swaddling and ALRI as a significant hazard. The lack of an association with developmental delay raises important questions regarding infant stimuli needs for normal development. The mean scaled BSID-II scores were comparable to the USA norms. The crying and sleep findings imply that swaddling increases infant sleep, but does not improve total 24 hour crying.