



About the Asian Conference on Diarrheal Disease and Nutrition (ASCODD)

Since its launch in February 1981 in Dhaka, Bangladesh, the Asian Conference on Diarrhoeal Diseases (ASCODD) was being hosted every two years in an Asian country. The first-ever ASCODD was held in Dhaka and was hosted by the International Centre for Diarrhoeal Disease Research, Bangladesh, (ICDDR,B), which organization later became the secretariat for this prestigious scientific meeting.

The first conference had a limited geographical scope and it was decided during that meeting the need to extend the scope of the conference Asia-wide to encourage international participation. The second conference was held in Calcutta, India and was hosted by the National Institute of Cholera and Enteric Diseases (NICED).

Subsequently, eleven equally successful Conferences were held in seven different Asian countries. Later on, the name of the conference was changed to Asian Conference on Diarrhoeal Disease and Nutrition, while keeping the same acronym ASCODD. In 2009, the 12th ASCODD was held in Yogyakarta, Indonesia.

On January 10-12, 2012, the 13th ASCODD again made history by bringing together a broad range of stakeholders in a lively and interactive sharing of ideas and knowledge with the aim of re-focusing and doubling the efforts to prevent and manage diarrhea, coupled with preventive nutrition interventions. It was the first time that this scientific meeting was held in the Philippines. Other highlight of the conference included the following: 1. Formal launching of the inclusion of the rotavirus vaccine in the Philippine national Immunization Program with Secretary of Health Ona with the approval from Congress and the Budget department; 2. Updates on Improved ORS and rational use of Antidiarrheals and Antimicrobials; Strategies to Improve Breastfeeding and Infant Nutrition; Emerging Diarrheal Pathogens; and Vaccines Against Diarrheal Diseases.

The poster presentations were on display on all three days of the conference, with a poster judging and poster walk on January 11. Drs. N.K. Ganguly, Pornthep Chanthavanich and Germana Gregorio contributed their time and expertise to serve as judges for the poster contest. The excellent research which was victorious was the paper entitled "Clinical Trial Of Liposome-Based Oral Rehydration Solution (Ors) In Children With Acute Watery Diarrhoea" presented by Pradip K. Bardhan from the International Centre for Diarrhoeal Disease Research, Bangladesh.

The 13th ASCODD Organizing Committee is composed of the Section of Infectious and Tropical Disease in Pediatrics (INTROP) and the Section of Gastroenterology and Nutrition, both from the Department of Pediatrics at the Philippine General Hospital, University of the Philippines Manila, and the International Society of Tropical Pediatrics-Philippines (ISTP-Philippines). They aimed to make this meeting a platform for global collaboration and knowledge sharing on the pressing issues of the burden of diarrheal disease and of nutrition interventions and to provide a networking forum for the attendees in an interactive and dynamic environment.

The ASCODD Secretariat is located in ICDDR,B Dhaka. The Council of ASCODD convenes during each ASCODD. Currently, the ASCODD International Officials are the following: Dr. N.K. Ganguly (President); Dr. Yati Soenarto (Immediate Past President); Dr. K.M.S. Aziz (Secretary General). Advisors for ASCODD XIII are the following: Dr. Alejandro Cravioto (ICDDR,B), Prof. Yushifumi Takeda (Japan), Dr. B.K. Nair (NICED, India), Prof. Zulfiqar Bhutta (Pakistan), Dr. Nils-Kare Barkeland (Bergen University, Norway).

ABSTRACTS OF POSTER PRESENTATIONS AT ASCODD

I. Infant and Child Nutrition

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

Presenting Author: Gulshan Ara

Co-Authors: Dr. S. K. Roy, Senior Scientist,

Dr. Iqbal Kabir, Prof. Michael J Dibley,

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Background: In Bangladesh, 48% of under-5 children are underweight, and 43% are stunted. Review of data of the past 5 years on dietary intake and growth revealed substantial decrease in the food intake and growth faltering of children. Impact of services of the National Nutrition Project (NNP) after the intervention period has not earlier been evaluated.

Objective: To examine the changes in the nutritional status of children under two years over the period of three years, who were surveyed during the baseline survey of National Nutrition Programme.

Methodology: The Baseline Survey of the NNP was conducted in 2004, covering 113 upazilas (44 NNP intervention upazilas, 16 NNP comparison upazilas, and 53 Bangladesh Integrated Nutrition Project upazilas) under 6 divisions in 2007. Data on the nutritional status were collected from a sample of households drawn from 708 primary sampling units. Out of 9,217 under-2 children from baseline survey, 2,124 were followed up.

Results: The proportion of stunting increased in 2007 compared to 2004 (39.5% vs 55%, $p < 0.001$) in the programme area (NNP and BINP area) as well as in the control area (37.6% vs 48.3%, $p < 0.001$). Similarly the proportion of underweight children also increased in 2007 compared to 2004 (34.1 % vs 42.6%, $p < 0.001$) in the programme area. However, the proportion of wasted children decreased in 2007 compared to baseline survey (9.3% vs 14%, $p < 0.001$) in both Programme and control areas (10.5% vs 17.5%, $p < 0.001$).

Conclusion: Proportion of stunted and underweight children increased but significantly

less wasted children were observed after three years operation of NNP.

HOSPITAL MALNUTRITION AT THE MEDICAL CITY FROM JANUARY–DECEMBER 2009 USING THE PEDIATRIC NUTRITION ASSESSMENT FORM (PNAF)

Presenting Author: Merlyn Monterozo M.D.

Co-Authors: Mary Jean V. Guno, Jacqueline O. Navarro

The Medical City, Philippines

Background: Statistical data for children admitted at the Medical City from January 2009 to December 2009 have shown that the prevalence of malnutrition was high, with highest number noted among preschool age group. Also, this study showed the relationship between Body Mass Index (BMI) and Subjective Global Assessment (SGA) and length of hospital stay. The physician's compliance to the recommendations of the Nutrition Management Services (NMS) was also obtained.

Introduction: Malnutrition is common at hospital admission and tends to worsen during hospitalization. The purpose of this study is to assess the prevalence and severity of disease related malnutrition at a tertiary hospital; the correlation of body mass index (BMI) with the Subjective Global Assessment (SGA); the diagnosis and length of hospital stay and physician compliance to the recommendations of the Nutrition Management Service.

Methodology: This is a Cross-sectional Study. A Chart review of all children age 0-18 years admitted from January to December 2009 were included in the study. The Pediatric Nutrition Assessment Form (PNAF) was utilized to obtain the nutritional data. Descriptive statistics were used to analyze the data. Chi square test were used to test the relationship of BMI and Subjective global assessment (SGA); BMI and Diagnosis and BMI with Length of Stay.

Results: The Prevalence of disease-related hospital malnutrition was 36%.17% underweight, 4%

overweight and 14% obese, with the highest prevalence in the preschool age group at 14%. BMI correlated well with the SGA ($p < 0.001$). Based on the SGA, 39% were considered high nutritional risk. There was no correlation between the BMI and the diagnosis. There was no sufficient evidence to correlate BMI with length of hospital stay. Sixty-six (66) percent of physicians complied with the recommendations of the Nutrition Management Service (NMS).

Conclusion: The study stressed the high prevalence of disease-related hospital malnutrition, the relationship between BMI and SGA. Also, the importance of increased physician compliance for nutrition support to optimize clinical outcomes among admitted children.

RANDOMIZED, CONTROLLED CLINICAL CARE OF DAY-CARE BASED AND HOSPITALIZED MANAGEMENT OF SEVERE PNEUMONIA WITH SEVERE ACUTE MALNUTRITION IN CHILDREN IN DHAKA, BANGLADESH

Presenting Author: Dr. Hasan Ashraf

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International Centre for Diarrhoeal Disease
Research, Bangladesh

Background and objectives: Both severe childhood pneumonia and severe acute malnutrition (SAM) require hospitalized management but inadequate pediatric beds limits hospital-care in Bangladesh. Therefore, it is important to provide some alternate institutional care for those children. Two earlier prospective observational studies showed that day-care facility-based management of severe pneumonia and SAM were successful as alternatives to hospitalization, so a RCT was conducted.

Methods: A randomized hospital versus day-care (The Radda Clinic equipped with oxygen, suction, pulse oximeter, nebulizer, glucometer) comparative study was carried out to evaluate the safety and effectiveness of the day-care model. Children aged 2-59 months having severe pneumonia with SAM attending either facility were randomized to day-care or hospital-care. Parents brought children at 08:00 at day-care clinic and back home at 17:00 daily after receiving antibiotics, diet, micronutrients, and oxygen therapy, if needed. The

day-care management continued daily until improvement, discharged and followed-up. For hospital-care, children stayed overnight at hospital and received similar treatment with antibiotics, diet, micronutrients, and oxygen therapy daily until improvement, discharged and followed-up.

Results: In total, 340 children were randomized to either day-care or hospital-care management. Successful management was possible in 136/170 [80% (95% CI 73.4-85.3%)] day-care children and 144/170 [84.7% (95% CI 78.5-89.3%)] hospital-care children. Of remaining 34 day-care children, 29 [17.1% (95% CI 12.1-23.4%)] were referred to hospital and 5 [2.9% (95% CI 1.3-6.7%)] discontinued treatment. Of remaining 26 hospital-care children, 18 [10.6% (95% CI 6.8-16.1%)] were referred to specialized hospitals and 6 [3.5% (95% CI 1.6-7.5%)] discontinued treatment.

Conclusion: Children with severe pneumonia with SAM could be treated safely and effectively on a day-care basis at established day-care clinics, similar to hospital management, if required logistic support is available.

IMPROVING BREASTFEEDING AND CHILD NUTRITIONAL STATUS BY NUTRITION EDUCATION

Presenting Author: Mansura Khanam

Co-authors: Dr. S. K. Roy, Senior Scientist,
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Background: In Bangladesh, nearly 43% of children below the age of 5 years are underweight and 41% of stunted and 13% of them are severely underweight. Evidence in Bangladesh suggests that nutrition education can improve the nutritional status and weight gain equally with supplementary feeding in moderately malnourished child.

Objectives: Nutrition Education was conducted to find the potential for improvement of breastfeeding and child nutritional status in urban slum areas.

Methodology: An intervention study was conducted on children aged 0-59 months in Lalmatia, Dhaka, Bangladesh. An equal number of subjects ($n=90$) were allocated to the intervention and comparison group. The intervention was

continued for 3 months. Mothers of the intervention groups were counseled on food security, caring practices and disease control for their children.

Results: Before intervention, 67% mothers in the intervention group and 47% mothers in the comparison group fed colostrum to their children. After intervention 100% mothers of the intervention group and 53.3% mothers of the comparison group agreed that child should be fed colostrum immediately after birth ($P<0.001$). Perception on breastfeeding in intervention group was 37% which improved to 51% compared to 35% in comparison group ($P<0.001$). Before intervention 20% of the children were severely underweight but after intervention the proportion of severe underweight significantly reduced to 6.7% in the intervention group ($P<0.006$).

Conclusion: Appropriate nutrition counseling improved perception on breastfeeding and child nutritional status.

RISK OF NON-ACCIDENTAL DEATHS AND NUTRITIONAL STATUS AMONG <5 CHILDREN IN RURAL AREAS BANGLADESH

Presenting Author: Dr. S.K.Roy

Co-authors: Dr. Nurul Alam, Scientist, Wajiha Khatun, Tahmeed Ahmed, David A.Sack, Mansura Khanam, Afroza Begum, Debjani Sarker, Dr.Susmita Das, Saima Kamal Thakur
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Background and objectives: In developing countries, child mortality is a major risk factor to attain the MDG4. The objective was to assess the risk of non-accidental death among under 5 children by nutritional status.

Methods: It was a follow-up survey using multistage random sampling. This survey was conducted in the areas of NNP baseline survey 2004 at 113 upazilas in 6 divisions. A total of 9217 households of under-2 children surveyed and were revisited in this follow-up study.

Result/Conclusion: Out of 9217 index children a total of 75 children died before their fifth birthday. Among them, 49(65.3%) and 26(34.5%) died due to non-accidental and accidental causes respectively. About 23.7% children were

moderately underweight and 16.7% of them died, while 11.9% of the children severely underweight and 35.4% of them died. The proportion of the children with moderate and severe wasting was 11.6% and 3.6% respectively. Among them, the proportions of death were 16.7% and 10.4% respectively. About 24.6% of the children were moderately stunted and among them 22.9% died, whereas about 16% of the children were severely stunted and among them 33.3% died. The relative risk of non-accidental death was 3.83 times and 3.41 times higher among the severely underweight and severely wasted children respectively. Moderately wasted children had 1.67 times more risk of dying. The risk of death was 1.26 times more among the moderately stunted children, while the risk was 2.83 times more among the severely stunted children. The relative risk of mortality was very high among the children with severe undernutrition and severe wasting.

EFFECT OF IMCI STRATEGY ON INFANT AND YOUNG CHILD FEEDING PRACTICES IN BANGLADESH

Presenting Author: Dr Muntasirur Rahman

Co-authors: Team members of Multi Country Evaluation of Integrated Management of Childhood Illnesses (MCE-IMCI) strategy in Bangladesh and International Technical Advisors
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Background and Objectives: Bangladesh has adopted the Integrated Management of Childhood Illness (IMCI) as a key child health strategy. Promotion of IYCF through household counseling is part of community component. To assess the affect of IMCI strategy, a new cadre of CHW was deployed in intervention areas. A national nutrition promotion activity was present in both intervention and comparison areas during the study.

Methods: A cluster randomized trial on effectiveness of IMCI strategy was implemented in Bangladesh from 2002 to 2007. Changes in feeding practices were assessed through baseline, end-line and six-monthly interval surveys.

Results: More children under 6 months of age were exclusively breastfed in IMCI areas than comparison areas and the differences were

statistically significant during first four months. EBF rate was 91% vs. 84% ($p=.032$) during first month, reduced to 81% vs. 66% ($p<0.0001$) during 4th month and was 42% vs. 34% ($p=.087$) during 6th month at IMCI and comparison areas respectively. Frequency of complementary feeding was also significantly elevated in the IMCI areas (70% vs 63% $p<0.0001$). In comparison areas, more women from the lowest wealth quintile practiced EBF at endline (71% vs 64%; lowest vs highest), yet in the IMCI area the difference between wealth quintiles disappeared (76% vs 74%).

Conclusions: The observed positive changes in the IMCI intervention areas at the end of the study were over and above the nutrition promotion activity in comparison areas. Mothers in the intervention areas received additional nutritional counseling through community health workers and at IMCI facilities. Exclusive breastfeeding promotion should emphasize EBF beyond four months of age, and understanding reasons behind discontinuation.

EFFECT OF NUTRITION EDUCATION AND COUNSELING TRAINING ON PEDIATRIC RESIDENTS' KNOWLEDGE AND COUNSELING PRACTICES AND ON CAREGIVERS' KNOWLEDGE AND COMPLEMENTARY FEEDING PRACTICES

Presenting Author: Edilberto B. Garcia, Jr. MD

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Background: There is a need to break down the barriers that prevent health providers from giving nutrition counseling to caregivers.

Objectives: To determine the effect of nutrition education and counseling training on complementary feeding, on the knowledge and counseling practices of resident physicians and on the knowledge and feeding practices of caregivers of 6- 24 months old infant seen at the Outpatient department of St. Lukes Medical Center.

Methods: A non-experimental pre-test and post-test study design was employed with 20 pediatric residents and 60 caregiver-infant pairs selected from the outpatient department of the Institute of Pediatrics and Child Health, St Lukes Medical

Center (IPCH-SLMC). Nutrition knowledge and self-reported counseling practices pre-test and post-test scores for both the residents and feeding practices for the caregivers were obtained. Counseling skills of the residents were video-taped and evaluated by the investigators. The residents attended a six-hour nutrition education and counseling training on complementary feeding. Paired t-test was used to compare pre-test and post-test scores. Satisfaction rate on the outcome of training of residents was also obtained from the residents and caregivers.

Results: Among the residents, statistically significant increases were observed in (a) knowledge scores, 4.7 points (95% CI 3.28 – 6.12) ($p=0.0000$), (b) self-reported practice on complementary feeding, 4.05 points (95% CI 0.6 – 7.5) ($p = 0.0238$). Counseling skills improved by 1.85 points (95% CI 1.06 – 2.64) ($p= 0.0001$). The caregivers' knowledge scores as measured by the nutrition test increased significantly by 1.15 points (95% CI 0.76 – 1.54) ($p=0.0000$), while the self-reported practice score on complementary feeding decreased by 0.25 points (95% CI -1.63 – 1.13) ($p = 0.71$) although this was not statistically significant. Residents and caregivers were both 'satisfied' with the outcome of the consultation after the nutrition education and counseling training of the residents.

Conclusions: Nutrition education and counseling training on complementary feeding among pediatric residents improved significantly their personal knowledge and counseling practices as well as the knowledge of caregivers. The caregivers' feeding practices remained "good" with no significant change from baseline to two weeks after the consultation.

DISPARITIES IN NUTRITIONAL STATUS OF FILIPINO PRESCHOOL AND SCHOOL-AGE CHILDREN BETWEEN INCOME GROUPS

Presenting Author: Ma. Adrienne S. Constantino

Co-authors: Ma. Regina A. Pedro, Pentalpha C. Cabrera
Food and Nutrition Research Institute

Background: Inequalities in nutritional status across income groups and regions, are high. Information on the extent of gap in nutritional status by income will help policy makers and

program implementers fine-tune programs to achieve equity in nutrition.

Objective: The analysis was carried out to examine disparities in nutritional status among Filipino children across income groups.

Method: Data from the 6th National Nutrition Surveys (NNS) in 2003 was used. Master Sample (MS) from the National Statistics Office based on a stratified multi-stage sampling design was utilized with 5,522 households, 4,110 0-5y old and 4,777 6-12y old children. Household food intake was measured by one-day food weighing. Energy and nutrient adequacy were assessed. Weight and height of children were measured and evaluated using the NCHS standards, blood samples were collected by fingerprick, and analysed for serum retinol using the HPLC and hemoglobin using cyanmethemoglobin method, casual urine samples were analysed for urinary iodine by acid digestion. Household income was obtained from the 2003 Family Income and Expenditure Survey in 2003. All analyses were done using SPSS.

Results: There are about 4X more underweight and stunted preschool- and school-age children in households in the poorest income quintile. The highest income group has advantage over the poorest group with vitamin A deficiency and anemia, affecting 1-2 less children in every 10 compared to the poorest group. These gaps are reflections of dietary inequities and disparities in energy and nutrient intakes between rich and poor households. There is also wider gap with iodine deficiency affecting 5X more 6-12 y old children in lowest than in highest income group.

Conclusion: With evidence of disparities in nutrition, programs should pay attention to underlying inequities in the population.

EVALUATION OF KNOWLEDGE AND PRACTICES OF SOCIAL SERVICE EXPECTANT MOTHERS ON BREASTFEEDING POLICY IMPLEMENTATION IN A PRIVATE TERTIARY HOSPITAL

Presenting Author: Dr. Genalyne H. Maroon
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Objective: To evaluate the knowledge and practices of social service expectant mothers on

breastfeeding policy implementation in a private tertiary hospital.

Design: Descriptive Study.

Setting: Private Tertiary Hospital.

Patients/Participants: A total of 62 social service expectant mothers from a private tertiary hospital who attended "Mothers' Class" and who consented to be part of the survey were randomly selected.

Main Outcome Measures: Participants were asked to answer a pretested 25-item questionnaire. Data was analyzed using Microsoft Excel spreadsheet.

Results: Majority of the mothers were 26 to 35 years old (60%), unemployed (52%), with income below 10,000 pesos (61%). They were aware of the breastfeeding policy campaigns (94%). Sixty one (98%) would practice breastfeeding from birth to 1 year old (31%) and from birth to 2 years old (31%). Most of them would give mixed feeding using infant milk formulas (71%). There were 32 (48%) mothers who were offered breastmilk substitutes by their resident physicians. Mothers were encouraged by their resident physicians (92%) and nurses (8%) to feed their babies with infant milk formula.

Conclusion: The private tertiary hospital where the survey was conducted implements the breastfeeding policy but with some limitations, like inadequate training of health care personnel, unavailable item for lactation counselors and lack of support group.

I. Adult Nutrition

VITAMIN A STATUS IN ADULT MEN IS POSITIVELY ASSOCIATED WITH B-CAROTENE STATUS

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Background and Objectives: Animal studies suggest that vitamin A inhibits intestinal β -carotene 15,15'-monooxygenase, involved in the conversion of β -carotene into retinol. We propose

that higher vitamin A store in healthy adult will have higher β -carotene as well as other provitamin A carotenoids.

Methods: To test this hypothesis, we conducted an 8 wk residential study among 36 healthy Bangladeshi men with low vitamin A stores and used low-carotenoids low-retinol diet sufficient for other micronutrients and energy. Subjects were randomized to receive vitamin A (240 mg in 4 doses) or placebo during study wks 2 and 3. Vitamin A stores were estimated by isotopic dilution at wk 8.

Results: Significantly higher serum β -carotene was detected in vitamin A group compare to placebo ($P < 0.05$). In addition, serum β -carotene was found positively correlated with whole body vitamin A store ($r = 0.506$, $P = 0.001$) and with liver vitamin A concentration ($r = 0.480$, $P = 0.002$). Similarly serum β -cryptoxanthin was found positively associated with whole body vitamin A store ($r = 0.508$, $P = 0.001$) and with liver vitamin A ($r = 0.463$, $P = 0.003$). Although α -carotene was not significantly associated with vitamin A store, it decreased significantly only in the placebo group.

Conclusion: These results and available evidence of the feedback inhibition of key-catalyzing enzyme by vitamin A indicates that high vitamin A status is associated with decreased catabolism of provitamin carotenoids.

II. Food Safety and Foodborne Diseases

PREVENTION OF A DIARRHEA CAUSING AND HEALTH THREATENING PATHOGEN *S. AUREUS* BY A SALAD DRESSING ITEM: EFFECT OF FERMENTED SUMACH ON BACTERIAL GROWTH AND BIOFILM FORMATION AND THE METAL SURFACES USED IN MEDICINE.

Presenting Author: Seyhun Yurdugül

Co-Author: Sahra Kirmusaoglu

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Staphylococcus aureus which is a common cause of foodborne illness is transmitted through food which is contaminated by food equipments and

environmental surfaces. Some strains of *Staphylococcus aureus* cause staphylococcal food poisoning through production of heat-stable staphylococcal toxins. Nausea, vomiting, abdominal cramps, prostration and diarrhea are common symptoms. The increasing numbers of multidrug-resistant Gram-positive pathogens have generated worldwide concern in the medical community. Effective treatment options for these infections are limited. The increasing occurrence, particularly in hospitals, of *S. aureus*' resistance including methicillin and a wide range of antimicrobial agents like all kinds of β -lactams has made therapy more difficult. The fermented sumach (*Rhus coriaria*), widely used as a salad dressing in Southern East provinces of Turkey is proposed as an alternative method to eradicate these organisms as having antibacterial properties and its rich water-soluble tannin content which has an antimicrobial activity, and flavonoids. The influence of varying concentrations of sumach on the formation of biofilms and bacterial growth by 13 strains of *Staphylococcus aureus* was tested by microelisa assay spectrophotometrically. In addition to this the effect of the fermented sumach on the metal surface of syringes was tested. In all of the sumach treated bacteria, a dose-related decrease in their biofilm formations was observed. The most effective concentration is found to be 1.0 microliter/ml. When the effect of the solution of pure fermented sumach (20 mL) was considered to the metal parts of the syringes, no such changes like corrosion, rust, oxidation etc. was observed on these metal-made material. It was found that the slime formation was decreased due to the increased concentrations of the sumach treatments respectively. There will be no such changes on these metal surfaces, as we have tried it on the metal surfaces in the laboratory by impregnating it on the cotton and cleaned up them, so it can be applicable to metal surface cleaning purposes.

HOUSEHOLD FOOD SAFETY AND HYGIENE PRACTICES IN BANGLADESH

Presenting Author: Dr. S K Roy

Co-authors: Frances Ann Warnock, Deon Mahoney, Wajiha Khatun, Saima Kamal Thakur, Susmita Das, Debjani Sarker

International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objectives: A significant proportion of food borne disease occurrences are caused by food prepared in the home. The first national survey of household food safety and hygiene practices in Bangladesh was undertaken to gain an understanding of the actual food handling and hygiene practices in Bangladesh.

Methods: This observational study focused on 780 households in rural, urban and urban slum areas, covering six Divisions, 13 Districts and 26 Upazilas. The respondents were the main food preparers/ cooks in households. Data on hand washing practices, cross contamination, cleaning, cooking, reheating, food storage and usage of water was collected.

Result / Conclusion:

Only 14% of all handwashing occasions during preparation of the family meal, and before eating. The usual handwashing practice involved use of water only, which is ineffective in removing pathogenic microorganisms from hands and preventing cross-contamination. Insects, pests and animals were seen in the food preparation/ kitchen area of about two thirds of households which increased the high risk of food contamination. On average, less than half of the food preparers were observed to wash the cutting knife in between use. Most households cooked food thoroughly (steam and bubbles visible). Just over half (59%) were observed to reheat leftover food properly. Few food preparers (only 16%) were observed to wash raw fruits and vegetables, and fresh herbs before preparation and eating. Insights and knowledge gained through the household survey has provided essential information to inform the future development of a food safety behaviour change communication programme in Bangladesh.

III. Food Science and Innovation

EFFECTS OF FEEDS CONTAINING VEGETABLE OILS ON THE LEVELS OF OMEGA-6 AND OMEGA-3 FATTY ACIDS PRESENT IN FARM-RAISED *OREOCHROMIS NILOTICUS* (NILE TILAPIA)

Presenting Author: Dolores V. Viliran, M.D.

Co-authors: Nico D. Calingacion, M.D.; Ma. Fatima C. Caguete, M.D.

Far Eastern University-Nicanor Reyes Medical Foundation, Institute of Medicine

Aquaculture, particularly Tilapia production, has become a growing industry that Filipinos are in to. *Oreochromis niloticus*, commonly known as Nile Tilapia, is one of the considered aqua culturally important species of *tilapia*. This can be attributed to its adaptability to unfavorable environmental conditions such as low oxygen and salinity, and its ability to utilize nutrients from different sources. However, fish feed technology is one of the under-developed sectors in aquaculture. This led to the development of several studies regarding the improvement of fish industry. In line with this, tilapia, as one of the most abundant farm-raised freshwater fish, gained the attention of the researchers. Since tilapia cannot metabolize its own omega 6 & omega 3 fatty acids, its lipid content is derived mainly from its diet. It has been proven that lipid component of feeds, especially vegetable oil, increases the growth of the tilapia. In this study, the researchers sought to identify the effects of incorporating vegetable oil in feeds to the level of omega-6 and omega-3 fatty acids of tilapia. *O. niloticus* were collected from three top producers of Tilapia in the Philippines, namely Laguna, Nueva Ecija and Cavite. Components of the different feeds were noted from farm-raisers. It was identified that feeds from Laguna and Nueva Ecija contain vegetable oils (corn oil, soybean oil and coconut oil) while tilapia from Cavite has none. After the collection, the samples were filleted and skinned. Next, these were subjected to lipid extraction using Bligh and Dyer method. These were then brought to Industrial Technology Development Institute (ITDI), Department of Science and Technology (DOST) in Bicutan. The

samples underwent conversion of lipids to Fatty Acid Methyl Esters (FAME), and Fatty Acid contents were quantified using Gas chromatography. Nine fatty acids were identified in samples from Cavite and Nueva Ecija, while there were ten in Laguna. Based on the consolidated results, it was shown that tilapia given with feeds which contain vegetable oil has lower amounts of omega-3 fatty acid. The difference in the level of omega-6 fatty acids between the samples was insignificant. It was also found out that tilapia given with vegetable oil-containing feeds has a higher omega-6:omega-3 ratio (1:0.21), while tilapia which were not given with vegetable oil-containing feeds has a healthy ratio of 1:1.15.

IV. Epidemiology of Diarrheal Diseases

ENTERIC PATHOGENS ASSOCIATED WITH NEONATAL DIARRHOEA IN BANGLADESH: A HOSPITAL BASED RETROSPECTIVE OBSERVATION 2009-2011

Presenting Author: Dr. A M Khan

Co-author: M A Malek, MJ Chisti, A S G Faruque
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Background: Data on enteric pathogens from neonates presenting with diarrhea are very limited from developing countries including Bangladesh.

Objective: Examine enteric pathogens associated with neonatal diarrhoea

Methods: A retrospective observation from electronic database was conducted to examine enteric pathogens associated with diarrhoea in neonates. We extracted data of all neonates enrolled in the Diarrhoeal Disease Surveillance System (2009-2011) of International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b). Stool specimens of the neonates on admission to the Dhaka Hospital of icddr,b were collected and sent to the laboratory for direct plating onto taurocholate tellurite gelatin agar (TTGA), Salmonella-Shigella (SS) agar and MacConkey's agar.

Results: Stool specimens of 168 neonates of either sex enrolled in the Surveillance System were examined. Bacterial pathogens were recovered from the stools of 41 (24%) neonates. Different pathogens were observed and they include *V. cholerae* O1 ElTor Inaba (n=3), *V. cholerae* O1 ElTor Ogawa (n=9), *V. fluvialis* (n=1), *Salmonella* spp (n=2), *Shigella* spp (n=1), *Shigella Flexneri* (n=1), *Shigella boydii* 7-11 (n=1), *Aeromonas hydrophila* (n=3). *Aeromonas sobria* (n=2), *Aeromonas caviae* (n=7) and *Campylobacter jejuni* (n=11).

Conclusions: The results of the study indicate that infection by *V. cholerae* is common in neonates in Bangladesh. Other enteric pathogens causing neonatal diarrhea include *Shigella*, *Salmonella*, *Aeromonas* and *Campylobacter jejuni*.

A SURVEILLANCE STUDY ON ROTAVIRUS GASTROENTERITIS AMONG CHILDREN AGED 0-5 YEARS ADMITTED AT THE MEDICAL CITY

Presenting Author: Kristine Alonzo, M.D.

Co-author: Emelita Leh, M.D

The Medical City

Background: Acute Gastroenteritis is one of the leading causes of morbidity and mortality worldwide. Surveillance of the rotavirus gastroenteritis serves to determine its prevalence among pediatric population that could assist the health workers in identifying the coverage of the available vaccines, enabling them to recommend ways on how to prevent the said disease.

Objectives: To determine the prevalence and symptom patterns of Rotavirus gastroenteritis among children aged 0 – 5 years.

Study Design: Descriptive (Cross-Sectional) Study

Setting: Tertiary Hospital

Participants: A total of two hundred fifty subjects were included in the study. It included all pediatric patients aged 0 – 5 years admitted for acute gastroenteritis.

Interventions: Stool specimens were collected from the subjects who fulfilled the inclusion criteria. These specimens were tested for rotavirus antigen test.

Main Outcome Measure: Rotavirus antigen test revealing either positive or negative.

Statistical Analysis: Descriptive Analysis

Results: Of the 250 subjects, 140 turned out to be positive for rotavirus antigen test whereas 110 turned out to be negative. Almost all subjects had loose watery stools, vomiting and fever. Majority of patients seen were unvaccinated prior to the illness.

Conclusion: The study showed that majority of the subjects presented with loose watery stools and vomiting and that most of them were not vaccinated prior to the illness. The vaccine coverage is not reflective of true prevalence. Thus, further study on the type and number of doses of the vaccine is recommended.

CHANGING TREND IN PERSISTENT DIARRHEA OVER TWO DECADES: OBSERVATION IN A LARGE DIARRHEAL DISEASE HOSPITAL IN BANGLADESH

Presenting Author: Sumon Kumar Das

Co-authors: Abu Syed Golam Faruque, Mohammad Jobayer Chisti, Mohammad Abdul Malek, Mohammed Abdus Salam

International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objectives: There has been impressive reduction in the case fatality from childhood acute diarrhea; however, persistent diarrhea (PD) remains an important public health problem. We studied changing trend of persistent diarrhea (PD) over the last two decades and the factors contributing to the change in Bangladesh.

Methods: We analyzed data on 2% systematic sample of patients under the Diarrheal Disease Surveillance (DDS) system of the Dhaka Hospital of icddr,b during 1991-2010.

Result/ Conclusion: Prevalence of PD significantly reduced from 11% to 1% in 2010. The prevalence of wasting (30% to 22%), stunting (44% to 28%), and underweight (61% to 31%) were also significantly reduced. Moreover, there was increased breastfeeding practices (83 to 94%); measles vaccination (72% to 92%); vitamin A supplementation among 12-59 months (26% to 78%), and maternal literacy (47% to 74%). The rate of pathogen isolation were significantly dropped: *Shigella* spp. (13% to 3%), *Campylobacter jejuni* (10% to 2%) and, rotavirus increased from 18% to 42%; however, *Giardia intestinalis* remained

same (<1%). Pathogen isolation rates were: rotavirus 14%, *Shigella* spp. 6%, *Campylobacter* spp. 5% and *Giardia intestinalis* 1%. Wasting, age, *Shigella* and rotavirus infections, and monthly family income negatively correlated with PD; and measles vaccination, signs of vitamin A deficiency, presence of blood or mucus in stool, and duration of breastfeeding positively correlated. In logistic regression analyses, wasting, measles vaccination, duration of breastfeeding, stool characteristics, signs of vitamin A deficiency *Shigella* and rotavirus were significantly association with PD. We observed a significant reduction in the prevalence of PD over the last two decades. However, predictors of PD remained same during the same period, indicating PD as a leading public health burden still in Bangladesh.

ABUNDANCE OF GEOHELMINTH AND GIARDIASIS AMONG CHILDREN OF HAOR AREAS IN HABIGANJ, BANGLADESH

Presenting author: Zahid Hayat Mahmud

Co-authors: Ripon C. Dhar, Partha S Gope, Md. Shafiqul Islam, Hamida Khanum, Hubert P. Endtz, Md. Sirajul Islam

International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objectives: Parasitic infection is a global health problem especially in developing countries including Bangladesh. It persists and flourishes wherever poverty, inadequate sanitation, natural disasters etc. make situation worse. The aim of the study was to investigate faecal contamination in soil and prevalence of geohelminths and giardiasis in Haor-dwelling children of Bangladesh, where the infection is considered as endemic.

Methods: A cross sectional study was carried out in 40 households having child with ≤ 5 years of age where the households were equally grouped into two, based on sanitary /non-sanitary latrine usage. Forty stool specimens from children and 120 soil samples from the courtyard (3 samples per household) were collected. Faecal coliforms and faecal streptococci were enumerated from soil using drop plate technique and intestinal parasites were detected under microscope from soil and faecal specimens. To detect *Giardia lamblia*, samples

positive of *Giardia* spp. were also subjected to PCR.

Results: Among stool specimens, 57.5% samples were positive for parasites of which *Ascaris lumbricoides* was the highest (35%), followed by *Giardia* spp. (25%). Twenty percent of soil specimens were found contaminated of which abundance of *Giardia* spp., *A. lumbricoides* and *Trichuris trichura* were 20%, 7.5% and 7.5% respectively. *G. lamblia* was detected in 6 soil samples of which 5 were non-sanitary and 1 was from the sanitary household. Intestinal infection and courtyard soil contamination were observed higher in non-sanitary latrine user group.

Conclusion: Age of children, sewage disposal habit and latrine usage pattern influences soil contamination in haor areas. The study implies that, children were susceptible to both geohelminth and giardiasis infection and they might get infected with giardiasis through soil contamination.

SURVEILLANCE OF PATIENTS ATTENDING A DIARRHEAL DISEASE HOSPITAL IN BANGLADESH: A REVIEW OF THREE DECADES.

Presenting Author: Abu Syed Golam Faruque
Co-authors: Sumon Kumar Das, Mohammad Abdul Malek, Roger I Glass, Barbara J Stoll, [Alejandro Cravioto](#)
International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objective: In October 1979, a surveillance system was established at the Dhaka Hospital of icddr,b, Dhaka, Bangladesh to study a sample of the patients attending this facility with diarrheal illnesses.

Methods: Uniform collections of epidemiologic and clinical data on a 2% systematic sample of all patients attending the hospital were the key elements. Stool specimens are collected for culture to isolate and identify major enteric pathogens and microscopic examinations to identify parasites and helminthes.

Results/conclusion: 88,123 patients have been enrolled in the surveillance system, representing a sample of 3.1 million patients who attended the hospital over the last 30 years. In the earliest years (1979-80) of study (Period I), a recognized

diarrheal pathogen was identified from 66% of the sampled patients, which reduced to 56% by 2010 (Period III). The enteric pathogens detection rates in Period I and III for *Shigella* (12% vs. 3%), enterotoxigenic *E. coli* (20% vs. 8%), *Campylobacter jejuni* (14% vs. 9%), *E. histolytica* (6% vs. 1%), *G. lamblia* (6% vs. 1%) and all helminthes fell markedly, while that of *Salmonella* remained unchanged. During this period, the detection rates for rotavirus antigens increased from 19% to 23%, and that of *V. cholerae* dramatically increased from 7% to 20%. The age and the sex distributions, and clinical presentations associated with major enteropathogens did not change over time, although patients enrolled during 2009-2010 were more likely to have some or severe dehydration than in 1979-80. Case fatality rates remained low (< 0.5%) and most deaths were attributed to causes other than diarrhea. Assuming that all severely dehydrated and a proportion of cases of some dehydration patients who at the beginning received ORS and later hydrated with I.V. saline would have died without care provided at the hospital, we estimate that between 565,000 to 881,701 deaths due to dehydrating diarrhea were prevented over this 30-year period – a remarkable public health benefits offered by the hospital. The surveillance system remained a unique source of important data for clinicians, epidemiologists, laboratory investigators and trainees, and has also served as a valuable source for developing research ideas such as describing novel enteric pathogens, testing new therapies, and to design strategies for disease prevention. This system can serve as a model for hospitals that are interested to collect valid epidemiologic, clinical and laboratory data in a resource constraint setting, serving large number of patients through sampling of a very small fraction of the total patients.

PATTERNS AND RISK FACTORS FOR HELMINTHIASIS IN RURAL UNDER TWO CHILDREN IN BANGLADESH

Presenting Author: Dr. Eliza Roy
Co-authors: K.Zahid Hasan, A.K Siddique, R. Bradley Sack
International Centre for Diarrhoeal Disease Research, Bangladesh

Background: Soil transmitted helminthic diseases are common in tropical and subtropical countries and are influenced by socioeconomic status, poor environmental sanitation, lack of personal hygiene, use of unsafe water.

Objectives: To obtain knowledge on the burden of soil transmitted helminthic (STH) infestation from birth in under 2 year old rural children.

Methods: Household level visits were made bi-weekly to enrolled newborns to collect stool samples routinely every month for 2 years. Stools were additionally collected during diarrhoeal episodes, and when STH's were identified, a single dose of pyrantel pamoate was administered to patients with diarrhoea. All stool samples were examined by formalin-ether sedimentation technique.

Results: About 70% children had STH infestation by 2 years, and approximately 80% had STH ova identified on more than one occasion. The mean (SD) age at first acquisition was 14 ± 4 months (range 1 – 24 months). Microscopic examination revealed ova of *Ascaris Lumbricoides* (9%), *Trichuris.Trichiura* (0.6%), *Hook-worm* (0.06%) or mixed infestation (0.4%). In 41 of the 178 children infested with STH, the first identification of STH was associated with diarrhoea. Following pyrantel pamoate deworming, 66% of subjects were re-infested within 3 months at a mean interval (\pm SD) of 90 ± 79 days.

Risk behaviours like disposal of child faeces in open space, open field defaecation by adult family members, and use of common source surface water for washing clothes and utensils was practiced by 62%, 83% and 50% of the cohort families. Bivariate analysis shows disposal of child faeces in closed space resulted in a 35% reduction (OR 0.65, 95% CI 0.49-0.87), use of tube well water 48% reduction (OR 0.52, 95% CI 0.29-0.93, $p < .02$) and breast feeding 16% reduction (OR.84,95%CI 0.64-1.10, $P < 0.2$) of helminthic infestation.

Multivariable analysis adjusted with risk variables shows 5.06 times higher odds of recognising STH infestation during diarrhoea (OR 5.06, 95% CI 3.8-6.69, $P < .0001$).

Conclusion: Awareness building programmes and periodic deworming are crucial to prevent acquisition, re-infestation and spread of STH.

ETIOLOGIC STUDIES OF PATIENTS VISITING DIARRHEAL DISEASE FACILITY IN A RURAL SITE IN BANGLADESH AND COMPARISON WITH OTHER SITES

Presenting Author: Abu Syed Golam Faruque

Co-authors: Sumon Kumar Das, Shahnawz Ahmed, Mohammad Abdul Malek, Firdaus Qadri, Kaiser Ali Talukder, Md. Mustafizur Rahman, Yasmin Ara Begum, [Mark Arthur Charles](#) Pietroni, Ann-Mari Svennerholm, [Alejandro](#) Cravioto International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objectives: In initial analysis of data from young children with moderate-to-severe diarrhea, *Shigella* and rotavirus were the leading pathogens in Mirzapur, rural Bangladesh. However, there is lack of information on the etiology and disease burden due to milder diarrhea, and compare the findings with that of urban Dhaka Hospital, rural Matlab Hospital, and urban Mirpur Treatment Centre.

Methods: All patient coming from the Demographic Surveillance Area of Mirzapur irrespective of age, sex and severity of diarrhoeal illness were enrolled in the study from January-December 2010.

Results/Conclusion: Overall, *Shigella* was most commonly detected in Mirzapur (15%) followed by Matlab (6%), Dhaka (3%) and Mirpur (3%). Isolation of rotavirus antigen was highest (27%) in Mirzapur, subsequently in Dhaka (22%), Matlab (19%) and Mirpur (17%). *V. cholerae* was highest in Dhaka (18%), Mirpur (14%), Matlab (13%), and Mirzapur (3%). In Mirzapur, 58% of *Shigella* isolates were susceptible to ciprofloxacin, while 56% to mecillinam. In Dhaka it was 69% and 48%, Matlab 64% and 88%, Mirpur 68% and 90% respectively. 10%-41% were susceptible to ampicillin, TMP-SMX, and nalidixic acid. *V. cholerae* isolates in Mirzapur, susceptibility accounted for tetracycline (90%), ciprofloxacin (97%) and azithromycin (90%). However, in Matlab, tetracycline (78%) and TMP-SXT (19%); however, in Mirpur tetracycline (69%), and none was susceptible to erythromycin or TMP-SXT. For *V. cholerae* O1 isolates from Dhaka, 63% were susceptible to tetracycline. Moreover, all isolates were susceptible to ciprofloxacin in Dhaka, Matlab

and Mirpur. 76% of the ETEC isolates in Mirzapur were susceptible to norfloxacin and ciprofloxacin, ceftriaxone (73%), streptomycin (73%), azithromycin (58%), tetracycline (52%), and TMP-SXT (52%). There were wide variations in isolation of common enteric pathogens and their drug susceptibility patterns in different sites in Bangladesh.

V. Management of Diarrheal Diseases

EFFICACY COMBINATION OF PROBIOTICS AND WHO STANDARD THERAPY IN CHILD WITH ACUTE DIARRHEA

Presenting Author: Fajar Hendra Perdana, M.Sc, MD

Co-author: Prof. Sri Suparyati Soenarto, Prof. SoetjiningasihI, Gusti Ngurah Sanjaya Putra
Department of Child Health, Medical School, Udayana University

Background and Objective: Acute diarrhea in children is still a major health problem that results in high morbidity and mortality. Adequate intravenous or oral fluid rehydration still can't shorten diarrhea duration. WHO recommends new principles in treating childhood diarrhea, include: oral rehydration with low osmolarity oral rehydration solution, continued feeding (including breastfeeding), zinc supplementation, antibiotic in selected cases and education. Probiotic supplementation in prior studies found to be able in shortening diarrhea duration. This research was aim to compare efficacy between combination of probiotic-WHO standard therapy with placebo-WHO standard therapy in child with acute diarrhea.

Methods: This study was double-blind randomized controlled trial of 6-59 months old hospitalized children with acute diarrhea with mild-moderate dehydration. Subject was randomized to probiotic-WHO standard and placebo-WHO standard group. Study was held on pediatric ward, Sanglah Hospital, Denpasar, Bali, March to July 2010. Primary outcome was diarrhea duration and the secondary outcome was diarrhea frequency.

Results/Conclusion: As many as 60 subjects was eligible and randomized to 30 subjects each group. Median diarrhea duration in probiotic-WHO standard group was 83.0 hours (IQR 35-121) and placebo-WHO standard group was 81.5 hours (IQR 25-132) ($Z = -1.133$, $P = 0.459$). The median of diarrhea frequency was 9 times (IQR 5-15) and 9.5 times (IQR 3-15) in probiotic-WHO standard group and in placebo-WHO standard group subsequently ($Z = -0.209$, $P = 0.84$). There were no differences in median of diarrhea and diarrhea frequency between probiotic-WHO standard and placebo-WHO standard group. This study supports WHO standard therapy remains relevant for children with acute diarrhea.

CLINICAL TRIAL OF LIPOSOME-BASED ORAL REHYDRATION SOLUTION (ORS) IN CHILDREN WITH ACUTE WATERY DIARRHOEA

(Awarded Best Poster at 13th ASCODD)

Presenting Author: Pradip K. Bardhan

Co-author: Shafiqul A. Sarker, David A. Sack
International Centre for Diarrhoeal Disease Research, Bangladesh

Background and Objective: The standard clinical intervention in acute watery diarrhoea is the use of oral rehydration solution (ORS). However, the present ORS formulation has limitations - it does not reduce the volume, frequency or the duration of diarrhoea. Delivering ORS in liposomes, to stimulate faster and more efficient intestinal absorption of water and electrolytes, may improve the efficacy of ORT. Preliminary experimental results suggest that use of Liposomal ORS is associated with a high level of water absorption. We aimed to study whether incorporation of ORS components into liposomes improves clinical responses in children suffering from acute diarrhea.

Methods: A hospital-based exploratory clinical trial was conducted amongst 135 children aged 6-36 months suffering from acute watery diarrhoea. The patients were randomly distributed into four groups to receive either glucose syrup-soyabean Liposomal-salt ORS (Gr-1), glucose syrup- rice liposome ORS (Gr-2), glucose syrup ORS (Gr-3) or the standard reduced-osmolarity ORS (Gr-4).

Stool output and ORT success were evaluated and compared between the four groups.

Results: The number of patients in each group were 32 (Gr-1), 35 (Gr-2), 36 (Gr-3) and 32 (Gr-4). The median stool outputs (ml) in the period 0-24 hours were 381 (Gr-1), 553 (Gr-2), 554 (Gr-3), and 635 (Gr-4), ($p=0.023$, Kruskal-Wallis test). The median stool outputs (ml) in the period 0-48 hours were 917 (Gr-1), 1,127 (Gr-2), 1,261 (Gr-3), and 1,181 (Gr-4), ($p=0.042$, Kruskal-Wallis test). The number of patients with ORT failures were 0, 1, 1, and 6 in the groups 1, 2, 3, and 4 respectively ($p=0.005$, X^2 test).

Conclusion: The use of liposome-based ORS was associated with significantly decreased stool output and ORT failure rate among children suffering from acute watery diarrhea.

PAPERLESS HOSPITAL IN THE MANAGEMENT OF DIARRHEAL DISEASES

Presenting Author: Dr. Azharul Islam Khan

Co-authors: Khandoker Tamirul Islam, Lutfe Ara, Dr. Mark Pietroni

International Centre for Diarrhoeal Disease Research, Bangladesh

Background and Objectives: Paper records require huge room and data extraction is time consuming. There is often less accountability, including missing files. In contrast, computerized HMS stores data electronically and provides accurate data for patient management, and research. The icddr,b introduced a computerized and paperless Hospital Management System (HMS), in 2009. Quantitative and qualitative indicators defined by all users were identified for observation, analysis and documentation over a period of time. Policy for continuous monitoring & evaluation was adopted. Strategies evolving at different stages were tested for sustainability. The aim was to ensure availability of accurate information for providers to better manage patients and communicate with clinical governance in formulating innovative applications to improve quality of care.

Methods: A team approach was adopted to design programmes for data recording. Quality indicators agreed by all stakeholders were documented as base line at the start of the monitoring process.

Results: Providers are responsible for ensuring patient care soon after arrival. HMS showed a baseline time gap of 60 min \pm SD 3 min. Strategies were developed to reduce time gap to < 30 minutes. Currently it is 20 \pm SD 3.2 min. Consumption of Intravenous fluid and Oral Rehydration Saline are two key indicators for monitoring and evaluation of dehydration status. Appropriate strategy implementation for accuracy shows increase from 75% to 98% over nine months. Patients not seen within one hour have decreased from 14% to that of 6%. Inappropriate use of antibiotics has come down significantly from 60% to 30% in some dehydration.

Conclusion: Paperless Hospital patient management system is an evolving process of improving Quality indicators of care. This process is participatory and shows accountability of all stakeholders.

PREDICTORS OF FATAL OUTCOME IN DIARRHOEAL CHILDREN WITH HYPERNATREMIC DEHYDRATION ADMITTED TO AN URBAN HOSPITAL IN BANGLADESH

Presenting Author: Mohammad Jobayer Chisti

Co-Authors: Mark Arthur Charles Pietroni, Tahmeed Ahmed, Jonathan Harvey Smith, Shafiq Ali Sarker, Hasan Ashraf, Pradip Kumar Bardhan, Sharifuzzaman, Mohammed Abdus Salam

Background: Hypernatremia is often associated with a high case-fatality. However, data are very limited on the risk factors for death in diarrhoeal children with hypernatraemia.

Objective: To identify factors associated with fatal outcome in diarrhoeal children with hypernatremic dehydration.

Methods: From the Hospital Management Information System (SHEBA) of the Dhaka Hospital of icddr,b we identified all diarrheal children ($n=360$) younger than 15 years who were admitted to its Longer Stay Ward and Intensive Care Unit between March 2009 and August 2011 with serum sodium concentration of ≥ 150 mMol/L. We compared the clinical features on admission, management with various fluids and their ramifications among children who died ($n=69$) and who survived ($n=291$).

Results: Children who died more often had higher mean \pm SD admission serum sodium (mMol/L) than the survivors (169.9 \pm 14.2 vs. 162.2 \pm 11.1; $p < 0.001$). In logistic regression analysis, after adjustment for potential confounders such as convulsion on admission, hyperglycaemia, use of only IV fluid for the correction of hypernatremia, the risk of death significantly increased in associated with admission serum sodium ≥ 170 mmol/L (OR 3.42, 95% CI 1.73–6.75, $p < 0.001$) and absent peripheral pulses even after full hydration (OR 34.91, 95% CI 9.67–125.97, $p < 0.001$), and significantly reduced with use of only ORS (OR 0.17, 95% CI 0.08–0.37, $p < 0.001$) or use of ORS followed by IV fluid only for an absolute indication (OR 0.23, 95% CI 0.10–0.53, $p = 0.001$) in the management of hypernatremia.

Conclusions: Results of this analysis indicate that the risk of deaths from hypernatraemia in diarrhoeal children may be reduced by using only ORS or ORS followed by IV fluid for an absolute indication in their management.

CLINICAL FEATURES, MANAGEMENT AND OUTCOME OF HYPERNATRAEMIC DEHYDRATION IN DIARRHOEAL CHILDREN ADMITTED TO AN URBAN HOSPITAL IN BANGLADESH.

Presenting Author: Mohammad Jobayer Chisti
Co-Authors: Mark Arthur Charles Pietroni, Tahmeed Ahmed, Jonathan Harvey Smith, Shafiq Ali Sarker, Hasan Ashraf, Pradip Kumar Bardhan, Sharifuzzaman, Mohammed Abdus Salam
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Background: Hypernatraemia is a well-recognised, life threatening complication of diarrhoeal diseases. Its laboratory diagnosis is straightforward; however, there is serious lack of information on the choice of the fluid for management of hypernatraemic dehydration.

Objective: To investigate the magnitude, clinical features, treatment and outcome of the treatment in children with hypernatraemic dehydration.

Methods: From the Hospital Management Information System (SHEBA) of the Dhaka Hospital of icddr,b we identified all diarrheal children (n=360) younger than 15 years who were admitted to its Longer Stay Ward and Intensive

Care Unit between March 2009 and August 2011 with serum sodium concentration of ≥ 150 mMol/L. We carefully reviewed their records to collect information as stated under the objective.

Results: The peak incidence of hypernatraemia was observed in the months of January and February. The median (inter-quartile range) age of the children was 6.0 (4.0, 9.95) months, their mean \pm SD serum sodium concentration was 163.7 \pm 12.7 mMol/L, and 19% of them died. Analysis of the trend of deaths in association with administration of the current, WHO-recommended hypo-osmolar oral rehydration salt (ORS) solution, or hypertonic IV fluid, or hypotonic IV fluid, or no additional fluid revealed significantly lowest trend with use of only ORS and highest when no additional fluid was used for correction of hypernatraemic dehydration (Chi Square for linear trend=33.23, $p < 0.001$). During correction of hypernatraemia, neither the overall rapid fall (≥ 0.5 mmol/L.h) nor the slow fall (< 0.5 mmol/L.h) in serum sodium influenced development of seizures (21% vs.16%, $p = 0.466$) or on fatal outcome (15%vs.16%, $p = 0.950$).

Conclusions: Results of this analysis confirms the earlier report that using ORS solution is an effective and safe way to manage hypernatremic dehydration.

Acknowledgement: We gratefully acknowledge the SHEBA personnel for their support.

PREDICTORS OF FATAL OUTCOME IN DIARRHOEAL CHILDREN WITH HYPERNATREMIC DEHYDRATION ADMITTED TO AN URBAN HOSPITAL IN BANGLADESH

Presenting Author: Mohammad Jobayer Chisti
Co-Authors: Mark Arthur Charles Pietroni, Tahmeed Ahmed, Jonathan Harvey Smith, Shafiq Ali Sarker, Hasan Ashraf, Pradip Kumar Bardhan, Sharifuzzaman, Mohammed Abdus Salam
International Centre for Diarrhoeal Disease Research, Bangladesh

Background: Hypernatremia is often associated with a high case-fatality. However, data are very limited on the risk factors for death in diarrhoeal children with hypernatraemia. **Objective:** To identify factors associated with fatal outcome in

diarrhoeal children with hypernatremic dehydration.

Methods: From the Hospital Management Information System (SHEBA) of the Dhaka Hospital of icddr, we identified all diarrheal children (n=360) younger than 15 years who were admitted to its Longer Stay Ward and Intensive Care Unit between March 2009 and August 2011 with serum sodium concentration of ≥ 150 mMol/L. We compared the clinical features on admission, management with various fluids and their ramifications among children who died (n=69) and who survived (n=291).

Results: Children who died more often had higher mean \pm SD admission serum sodium (mMol/L) than the survivors (169.9 ± 14.2 vs. 162.2 ± 11.1 ; $p<0.001$). In logistic regression analysis, after adjustment for potential confounders such as convulsion on admission, hyperglycaemia, use of only IV fluid for the correction of hypernatremia, the risk of death significantly increased in associated with admission serum sodium ≥ 170 mmol/L (OR 3.42, 95% CI 1.73–6.75, $p<0.001$) and absent peripheral pulses even after full hydration (OR 34.91, 95% CI 9.67–125.97, $p<0.001$), and significantly reduced with use of only ORS (OR 0.17, 95% CI 0.08–0.37, $p<0.001$) or use of ORS followed by IV fluid only for an absolute indication (OR 0.23, 95% CI 0.10–0.53, $p=0.001$) in the management of hypernatremia.

Conclusions: Results of this analysis indicate that the risk of deaths from hypernatraemia in diarrhoeal children may be reduced by using only ORS or ORS followed by IV fluid for an absolute indication in their management.

Acknowledgement: We gratefully acknowledge the SHEBA personnel for their support.

ZINC THERAPY FOR CHILDREN WITH ACUTE DIARRHEA VISITING KUMUDINI HOSPITAL, MIRZAPUR, BANGLADESH

Presenting Author: Shahnawaz Ahmed

Co-authors: Abu Syed Golam Faruque, Sumon Kumar Das, Ali Miraj Khan, Mohammad Abdul Malek

International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objectives: Zinc is an effective adjunct to the treatment of childhood diarrhea. World Health Organization recommends routine zinc therapy for acute childhood diarrhea. The study aimed to evaluate the correlation between acceptability and adherence to zinc tablet therapy with clinical and socio-demographic characteristics in rural Bangladesh.

Methods: 439 children of either sex, aged 6-59 months, visiting rural Kumuduni Hospital from Demographic Surveillance System area with acute diarrhea were enrolled. Children's parents were given one blister packet consisting 10 zinc tablets (20 mg/tablet) and administer one tablet on each day for consecutive 10 days. The mothers were intensely counseled and demonstrated. Mothers were informed about a follow-up visit after 2-3 weeks at the household.

Result/Conclusion: About 83% of the children had received ORS and 36% zinc before attending the hospital. Children received the standard dose was 99%, and 61% of them completed the full 10-day course. The completion rate for children was 67% in 6-11 month, 57% in 12-23 month, and 61% in 24-59 month old children. Compliance of zinc by nutritional status was 62% by the underweight, 66% by the stunted and 61% by the wasted children. Overall compliance of zinc in watery diarrhea and dysentery was 62% and 58% respectively. Compliance to zinc therapy was negatively associated with fever, not use of zinc and ORS prior to hospital visit and delayed recovery of the illness. 94% of the 439 caretakers perceived that compared to other medications, zinc tablet was equally or even more acceptable to their children. The acceptability and more importantly adherence to zinc-therapy were reasonably higher in our study compared to earlier reports, which could be attributed to intense counseling provided to the mothers in our study.

CHANGES IN CARE-SEEKING AS A RESULT OF IMCI AND COMMUNITY CASE MANAGEMENT

Presenting Author: Dewan Md. Emdadul Hoque

Co-authors: Team members of Multi Country Evaluation of Integrated Management of

Childhood Illnesses (MCE-IMCI) strategy in Bangladesh and International Technical Advisors International Centre for Diarrhoeal Disease Research, Bangladesh

Background and objectives: Bangladesh has adopted the Integrated Management of Childhood Illness (IMCI) as a key child health strategy. In addition to improving services at facilities, community component of IMCI aims to reinforce appropriate care-seeking in the families, community case management and referral by community health workers (CHWs).

Methods: A cluster randomised control trial to assess the effect of IMCI strategy was conducted in the Matlab sub-district in Bangladesh that ended in 2007. The implementation of facility based IMCI began in February 2002 whilst C-IMCI interventions were introduced in phases thereafter. Assessments included repeated six-monthly household coverage surveys on childhood morbidity and care-seeking.

Results: Village doctors (village practitioners or sellers of allopathic medicine) continued to be the major provider as first choice in the IMCI intervention areas 42% in 2000, 40% in 2007 ($p=0.442$) while their market share increased considerably in comparison areas 42% to 54% ($p<0.0001$). In IMCI areas preference for first level Health facilities increased (4% to 7%, $p=0.004$) while at comparison areas it remained constant at 3%. CHWs under Community-IMCI became a major choice of appropriate provider (15% in 2007) following their introduction in 2005. Living more than two kilometers far from a first level facility influenced care seeking from village doctors compared to those who lived within half kilometer (46% vs 25%).

Conclusion:

Up-scaled implementation of IMCI resulted in increased care-seeking from trained providers. Preference for village doctors, who generally have no formal medical training, is a challenge. Strategies need to target village doctors as a supply-side strategy given that they are the preferred care-seeking option amongst caretakers in Bangladesh.

FOLIC ACID-SUPPLEMENTED TREATMENT OF ACUTE NON-BLOODY DIARRHEA AMONG CHILDREN AGED 6 MONTHS TO 5 YEARS OLD AT FEU-NRMF MEDICAL CENTER: A QUASI-RANDOMIZED STUDY

Presenting Author: Dr. Norlie Reynoso

Far Eastern University- Nicanor Reyes Medical Foundation

Objective: To compare the efficacy of folic acid supplemented therapy versus Oral Rehydrating Solution (ORS) plus zinc sulfate in the treatment of acute non-bloody diarrhea among pediatric patients aged 6 months to 5 years old

Study Design: A Quasi - Randomized Study

Setting: FEU - NRMF Medical Center, OPD (December 2010 - September 2011)

Subjects: 6 months to 5 years old children diagnosed with acute non - bloody diarrhea

Method: Alternate random assignment was done as to control and experimental groups. In the control group, subject aged ≥ 6 months received 20mg/day of zinc sulfate for 14 days and an ORS. In the experimental group, in addition to ORS and zinc sulfate, subject aged ≥ 1 year old received 5mg/day of folic acid while those < 1 year old received 0.5mg/day both for 7 days. Demographic characteristics between the two groups were tabulated.

Results: 116 subjects were included in the study equally divided into two groups. The results showed that there was no significant difference in the different demographic characteristics as proven by all p values > 0.05 . Frequency of diarrhea was significantly shorter in the experimental group than the control group (mean 1.57 ± 0.72 vs. 1.91 ± 0.53 $p < 0.01$). Shorter duration of diarrhea by 7.2 hours was noted in the experimental group than in the control group (mean 4.16 ± 0.52 vs. 3.86 ± 0.71 $p < 0.01$). No side effect was noted.

Conclusion: Folic acid supplementation for 7 days at 0.5mg/day in < 1 year old to 6 months and 5mg/day in ≥ 1 to 5 years old children with acute non-bloody diarrhea shortened the duration of diarrhea by 7.2 hours as compared to treatment without folic acid supplementation. It reduced the frequency of diarrhea by 0.34 day. No side effect of folic acid was noted.

VI. Bacterial Diarrheal Diseases

CAMPYLOBACTER JEJUNI GENE POLYMORPHISM: A DETERMINANT FOR THE DEVELOPMENT OF GUILLAIN-BARRÉ SYNDROME IN BANGLADESH

Presenting Author: Zhahirul Islam

International Centre for Diarrhoeal Disease Research, Bangladesh

Background: *Campylobacter jejuni* is the most frequent cause of Guillain-Barré syndrome (GBS) in Bangladesh. Molecular mimicry between *C. jejuni* lipo-oligosaccharides (LOS) and peripheral nerve gangliosides plays a crucial role in the pathogenesis of the GBS. In this study, we determined the genetic polymorphism of the *C. jejuni* that determines autoantibody reactivity, and clinical phenotype of GBS.

Methods: *C. jejuni* strains were isolated from 54 patients with GBS and enteritis in Bangladesh. We determined the frequency of *cst-II* gene and polymorphism (Asn/Thr51) in relation with the bacterial ganglioside epitopes, and autoantibody reactivity.

Results: LOS biosynthesis locus class A/B was more frequent (14/15; 93%) in GBS as compared to enteritis (21/54; 38%). *C. jejuni cst-II* (Thr51) was more frequently present in GBS-related strains than did enteritis ones (67% vs 3%; $p < 0.001$). Strains with *cst-II* (Thr51) frequently expressed the GM1/GD1 epitope (67%), whereas those with *cst-II* (Asn51) had the GA2 and GD3 epitopes. The presence of these bacterial epitopes in GBS patients corresponded to autoantibody reactivity. Most patients infected with *C. jejuni* (Thr51) had an anti-GM1 antibody response (83% vs 17%; $p < 0.001$). All *C. jejuni* (Thr51) infected had motor weakness. All patients infected with *C. jejuni* (Asn51) had anti-GQ1b antibody response, and had ophthalmoparesis and ataxia.

Conclusions: This is the first report demonstrating *cst-II* polymorphism in GBS in Bangladesh. Our results support the hypothesis that the genetic polymorphism of *C. jejuni* modifies the substrate specificity of the LOS biosynthesis enzyme and that autoantibody reactivity determines the clinical presentation of GBS.

SURVIVAL OF VIBRIO CHOLERAE O139 WITH ANABAENA SP. AND DETECTION OF TOXIGENIC VIBRIO CHOLERAE FROM THE AQUATIC ENVIRONMENT OF MATLAB, BANGLADESH

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Background and objectives: Cholera epidemics, causing high mortality in Bangladesh have been associated with toxigenic strains of *Vibrio cholerae* O1 and O139. It has been established that blue-green algae play an important role for long time survival of *V. cholerae* O1. Therefore, the present study investigated the association of *Vibrio cholerae* O139 with a blue-green alga, *Anabaena* sp. in microcosms.

Methods: *V. cholerae* was counted and detected using culture and immunological techniques. Detection of *ctx* gene containing *V. cholerae* from various environmental samples was also carried out by using PCR and dot blot hybridization techniques following standard procedures.

Results: *V. cholerae* O139 survived in association with alga, control water and water where *Anabaena* sp. was floating as culturable form up to 23, 20 and 10 days respectively. Viable but nonculturable cells persisted for 60 days only in association with *Anabaena* sp. This result was supported by PCR followed by dot blot hybridization. Out of 449 environmental samples, 5 were found to be PCR positive for *ctxA* gene but 41 were positive by dot blot hybridization. Four of the five *ctx*-positive samples were found to contain *V. cholerae* O139 when amplified with *V. cholerae* O139 specific primers to observe the relative abundance of this novel serotype.

Conclusion: These results demonstrated the significant role of aquatic environment in the persistence and survival of toxigenic *V. cholerae* O139.

ANTIMICROBIAL RESISTANCE AND VIRULENCE GENES OF *ESCHERICHIA COLI* ISOLATES FROM PUBLIC WATER SUPPLY IN DHAKA, BANGLADESH

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Background: Contaminated water has been implicated as an important source of infection caused by various enteropathogens including pathogenic *Escherichia coli*. The objective of the study was to characterize the *E. coli* isolated from tap water samples collected from Dhaka city.

Methods: A total of 233 *E. coli* isolates were tested for virulence genes by multiplex PCR assays. Antibiotic susceptibility was determined by disc diffusion method and ESBL production was detected by double disc diffusion. PCR was done to detect antibiotic resistance genes in ESBL-producing isolates. Plasmid patterns were analysed and presence of transferable resistance plasmids were determined by conjugation assays.

Results: Multiplex PCR analysis showed that 16 (7%) isolates were positive for virulence gene(s) of which 11 contained either *lt* or *st* or both and were classified as enterotoxigenic *E. coli*, and 5 contained *bfp* and *eae* and were classified as enteropathogenic *E. coli*. 73 (31%) isolates were multi-drug resistant (MDR) (≥ 3 antibiotics) of which 22 (30%) were ESBL-producing. Of the ESBL-producers, 20 were positive for *bla*_{CTX-M-1} and *bla*_{CTX-M-15}, 7 were positive for *bla*_{OXA-1} and *bla*_{OXA-47} and 2 were positive for *bla*_{CMY-2}. Quinolone resistance genes, *qnrS* and *qnrB* were detected in 6 and 2 isolates, respectively. All MDR isolates carried multiple plasmids (2 to 8) of varying sizes ranging from 2 to 120 MDa. Ampicillin and ceftriaxone resistance were co-transferred in plasmids of 70 to 100 MDa in size, while ampicillin, SXT and tetracycline resistance were co-transferred in plasmids of 50 to 90 MDa.

Conclusion: MDR pathogenic *E. coli* are widespread in public water supply of Dhaka city, which is a matter of great concern. Transmission of antibiotic resistance plasmids carried by water *E. coli* isolates poses serious threat to the public health.

COMPARISON OF *VIBRIO CHOLERAE* O1 ISOLATED FROM PATIENTS AND WATER SOURCES USING CULTURE AND MOLECULAR TECHNIQUES IN MATLAB, BANGLADESH

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Background and objectives: Cholera, caused by *Vibrio cholerae* O1 and O139, is a major health problem in developing countries, including Bangladesh, where outbreaks occur in a regular seasonal pattern. The study was carried out to investigate whether the *V. cholerae* O1 strains isolated from clinical and environmental sources in Matlab, Bangladesh are of the same origin.

Methods: Twenty suspected cholera patients of the Matlab Hospital of ICDDR,B were selected, and their rectal swab samples were collected. Patients were interviewed about water-use pattern by structured questionnaire. *V. cholerae* O1 was isolated from rectal swab and water samples using conventional culture technique. Phenotypic and genotypic methods, including mismatch amplification mutation assay (MAMA)-PCR, were employed to characterize the isolated strains. Antibigram was performed using commonly-used antibiotics by disc-diffusion method.

Results: All the 20 (100%) rectal swab samples and 5 (25%) water samples yielded *V. cholerae* O1 biotype El Tor serotype Ogawa. It was found that all the 25 isolates possessed *rfbO1*, *ompW*, *ctxA*, *zot*, *ace*, *tcpA* (El Tor), *blyA*, *toxR*, *rstR2* genes but *tcpA* (classical), *rstR1*, *rstR3*, and *rstR4* genes were lacking. All the strains were classified as altered variant of *V. cholerae* O1 El Tor Ogawa but carrying haemolysin gene (*blyA*) for both El Tor and classical biotypes. All the isolates were sensitive to ciprofloxacin, azithromycin, ampicillin, and chloramphenicol but resistant to tetracycline, nalidixic acid, penicillin G, and trimethoprim-sulphamethoxazole.

Conclusions: *V. cholerae* O1 strains isolated from the patients and from the surrounding environmental water sources were similar in

phenotypic and genotypic characteristics, which indicate that the patients acquired cholera from the environment as *V. cholerae* O1 is the autochthonous member of the aquatic environment.

VII. Diarrhea in the Immunocompromised Patient

MICROBIOLOGICAL SPECTRUM OF DIARRHOEA IN HIV INFECTED PATIENTS. – A 2 YEAR STUDY FROM A RURAL COHORT POPULATION IN MANIPAL, KARNATAKA, SOUTH INDIA

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Background & Objective: Human Immunodeficiency Virus (HIV) is the most devastating plague facing us in this 21st century. India has the distinction of having the largest number (approximately 22.7 lakh) of people living with HIV in the world. Karnataka is one of the third highest HIV prevalence state in India. The state has seen a steady increase in the number of HIV infected individuals during the last decade with diarrhoea as one of the most common presenting complaints.

The present study aimed at determining the microbiological spectrum of pathogens causing diarrhoea in HIV patients from Kasturba Medical College Hospital, Manipal during the period from Sept 2009 till Sept 2011.

Methods: Stool samples were received from HIV infected patients with diarrhoea and processed for the investigation of bacterial, parasitic and opportunistic protozoan pathogens according to WHO standard protocol. For the detection of bacterial pathogens, culture was done. Parasitic etiology (protozoan trophozoites, cysts and helminthic eggs and larva) were detected by direct wet mount preparation (saline and iodine). For the detection of opportunistic coccidian parasites, smears of stool samples were prepared and stained with modified acid fast stain.

Results / Discussion: A total of 73 stool samples were examined of which 26 (36%) intestinal

pathogens were detected. *Candida* species (53.8%) was most commonly found followed by *Isospora belli* (19.2%). The other isolates detected were *Cryptosporidium* spp., *Fasciolopsis buski*, *Entamoeba* spp., *Taenia* spp. and *Aeromonas hydrophila* (confirmed by CDC, Atlanta). Since opportunistic infections are a major cause of mortality and morbidity in HIV patients, an early diagnosis and effective treatment are required to contain the infection.

A RETROSPECTIVE STUDY OF DIARRHEA AND MALNUTRITION AMONG AIDS/HIV INFECTED PATIENTS IN PEDIATRIC WARD DR. SAIFUL ANWAR GENERAL HOSPITAL

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Background: diarrhoea and malnutrition remains major causes of morbidity and mortality in AIDS/HIV infected children, however, we have lack of supporting data about the prevalence

Objective: to study the prevalence of diarrhoea and malnutrition among AIDS/HIV infected children hospitalized in dr. Saiful Anwar General Hospital.

Methods: we conduct a hospital based retrospective study to collect data from AIDS patients, HIV infected patients and infants whose mothers were HIV positive. The diagnosis of AIDS/HIV patients were confirmed by clinical and laboratory testing according to national guideline of HIV management in pediatric. We use SPSS v.17 to analyze the data.

Results: there were total 68 data collected during February 2008 to August 2011. Of 68 patients, 53% are suffered from AIDS/HIV infected, however, 47% patients could not be determined yet, mostly because their age were under 18 month old, born from infected mother, and/or can not afford PCR. There were thirty six (53%) boys and 47% girls. Diarrhoea accounted for 32 (47%) patients, which 19 of those 32 patients (59%) had persistent diarrhoea, 3% had prolonged diarrhoea and 38% had acute diarrhoea. Those who suffered from persistent diarrhoea, are suffered from stadium 4 HIV/AIDS (79%). Stool specimens showed 40%

Klebsiella oxytoca, 20% *E. coli*, 10% each for *S. marcescens*, *Proteus mirabilis*, *Enterobacter gergoviae*, *S. robiae*. Thirty one patients (45%) were severely malnourished, 12 or 39% were marasmic-kwashiorkor, 48% were marasmic and 13% were kwashiorkor, 13 (19%) patients were undernourished, and 24 (35%) patients were well nourished (19 of these 24 are undertermined patients).

Conclusions: diarrhea and malnutrition were responsible of morbidity of most of HIV/AIDS cases. Approximately half of HIV/AIDS patients suffered from diarrhea and malnutrition.

VIII. Complications of Diarrheal Diseases

ECONOMIZATION OF TREATMENT FOR GUILLAIN-BARRE' SYNDROME: A PILOT STUDY IN BANGLADESH

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Background: Guillain-Barre' syndrome (GBS) is a post-diarrheal auto-immune polyneuropathy. *C. jejuni* is the main triggering agent of this disease. The treatment costs are substantial due to disease severity and long-term disability in developed countries. However, economic costs of GBS from developing countries is not documented. We estimated the direct an average cost per patient (treated and non-treated) in Bangladesh.

Methods: The cost-of-illness method was used to determine the direct costs of medical care for GBS patients in Bangladesh. Data were obtained from the four largest tertiary hospitals in Dhaka, and a telephone survey of 32 GBS patients. This study compared the cost of intravenous immunoglobulin (IVIg), conventional plasmapheresis and small volume plasma exchange with regard to illness and prognosis.

Result: We estimated the mean expenditure for therapy with IVIg (n=11) and conventional plasmapheresis (n=4); direct average costs was

\$6268 and \$4474 respectively. The total expenditure including hospital bill, cost for physiotherapy and specific treatment was \$9315 and \$11565 for IVIg and conventional plasmapheresis, respectively. Prognosis (F-score) at 3 months was better in patients received IVIg. We also determined the average costs of small volume plasma exchange (n=6), which was \$520, and the total illness related expenditure was \$2236. Therapy with small volume plasma exchange states that prognosis was almost similar to IVIg at 3 months. Most of the GBS patients (77%) in Bangladesh did not receive specific therapy; however, patients received no specific therapy (n=11) spent about \$3815 for their illness related expenditure.

Conclusion: The economic cost of GBS was substantial in Bangladesh considering the per capita income (\$700). Small volume plasma exchange is affordable and effective therapy for GBS patients in developing countries. Future studies will improve the cost estimation by examining the additional costs.

IX. Diagnostic Aids for Diarrheal Diseases

EVALUATION OF POTASSIUM HYDROXIDE WET MOUNT SMEAR FOR DETECTION OF INTESTINAL HELMINTHS IN HUMAN STOOL SPECIMENS

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Background and Objectives: Intestinal helminths are widely prevalent as the cause of diarrhea especially among children and often associated with morbidity and mortality in under developed countries. Use of appropriate technique plays an important role in the detection of the parasitic infections. The study evaluated the use of 10% potassium hydroxide (KOH) in wet mount smear of fresh stool specimens for detection of intestinal helminths and compared to wet mount

smear using saline and iodine at three different time intervals.

Methods: Wet smears of fresh stool specimens were examined for ova or larvae of intestinal helminths using KOH, saline and iodine at 0 hour, 30 minutes and 1 hour of preparation of smears.

Results: Out of 772 specimens, 74 ova and larvae of helminths were found in saline wet mount; whereas iodine wet mount showed 74, 67 & 67 helminths at 0 hour, 30 min & 1 hour respectively. On the other hand, 100, 108 & 114 stool specimens were positive by KOH preparation at 0 hour, 30 min & 1 hour for intestinal helminths which is diagnostically significant than other two wet smears.

Conclusions: KOH effectively lysed faecal debris, masses and other artifacts without affecting ova and larvae. It provides clear background for which the helminthic ova and larvae were easily visualized. Detection and identification rates of intestinal helminths were increased significantly at 1 hour smear of KOH compared to saline and iodine wet mount as well as 0 hour and 30 minutes smear. KOH for wet mount smear in examining the stool samples for detection of intestinal helminths may be routinely used which is simple, cost-effective and could be afforded in resource poor setting.

X. Vaccination for Enteric Diseases

COST-EFFECTIVENESS ANALYSIS OF ROTAVIRUS VACCINATION IN THE PHILIPPINES

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Background and Objectives: Rotavirus diarrhea is very common in children, though the benefit of vaccination is well established. This study evaluates the cost-effectiveness of a two-dose rotavirus vaccine in the Philippines.

Methods: A decision tree model simulated the disease management in 10,984,800 children 0-5 years old in the Philippines. It consisted of four health states: mild, moderate, and severe diarrhea,

and death. It assumed that mild diarrhea is cared at home, moderate needs a clinic visit, and severe needs hospitalization. For the base case analysis, 100% vaccine coverage and vaccine price of 866 peso per course were considered. Costs and outcomes were analyzed from payer and societal perspectives. Life years gained was discounted with 5%. Epidemiological and costs data were obtained from literature and experts opinion; vaccine efficacy from literature. One way sensitivity analysis was performed.

Results: Compared with no vaccination, a two-dose vaccine is expected to prevent 723,323 mild, 160,498 moderate, 17,448 severe diarrhea cases, and 4,438 deaths gaining 93,138 quality-adjusted life years (QALYs), and costing 1,461,853,052 pesos more in a payer perspective. Compared with a three-dose vaccine, at vaccine parity price per course and equivalence in overall vaccine efficacy, there is a cost benefit for the two-dose vaccine: less vaccine administration cost and earlier protection after 1st dose leads to a cost saving of 1.9 million pesos. Sensitivity analysis shows that the results are most sensitive to the probability of disease incidence rates.

Conclusion: With the assumptions used in the model, a two-dose rotavirus vaccine is projected to be very cost-effective versus no vaccination in the Philippines.