Infectious Disease Updates 2017
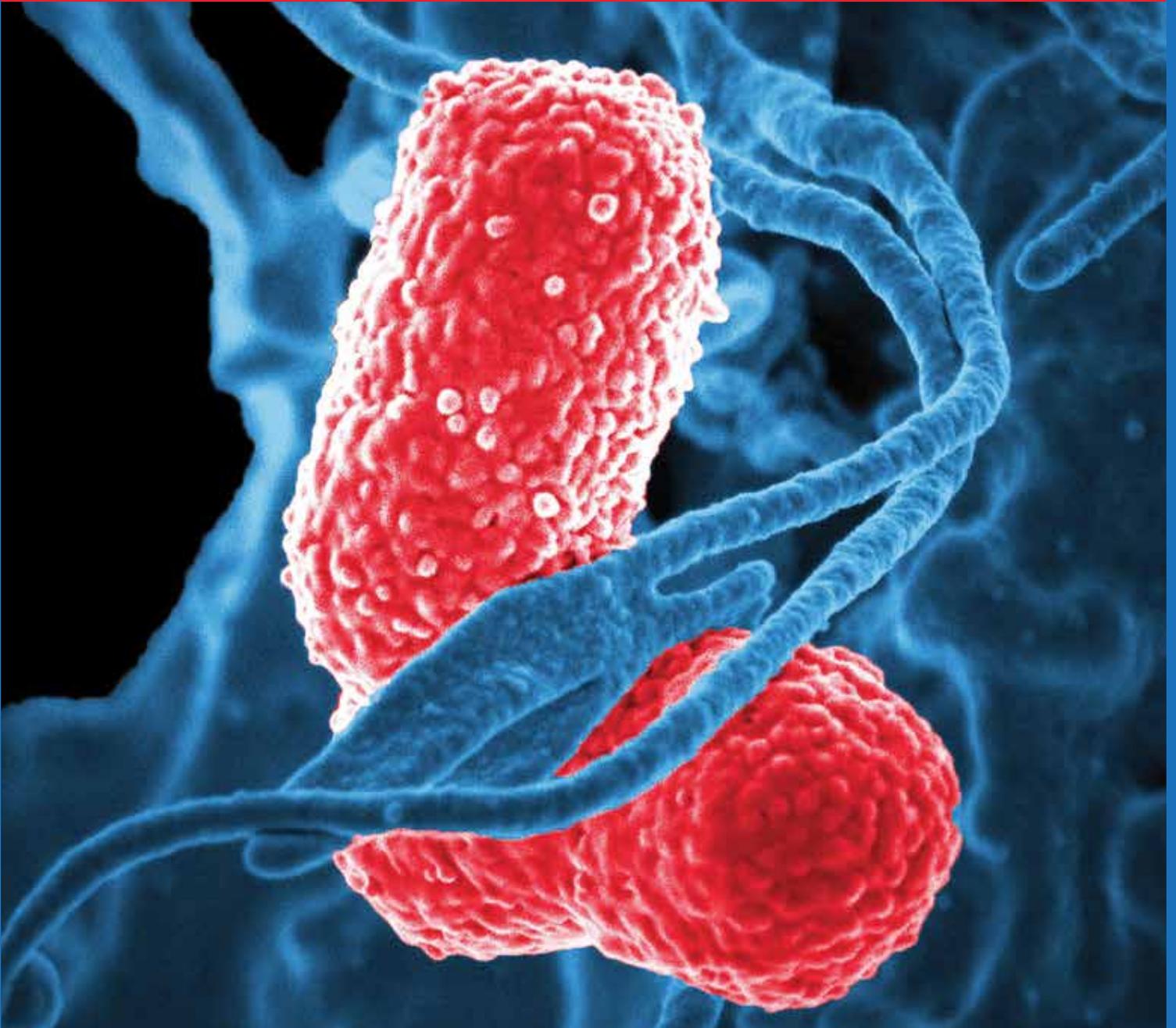
Biennial Infectious Disease Conference

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ABSTRACTS

Contents

ANTIMICROBIAL RESISTANCE

Oral presentation: Increasing multidrug and fluoroquinolone resistance among Salmonella typhi from sporadic outbreaks in Kenya

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Background: Typhoid fever (TF) caused by *Salmonella typhi* remains a major public health problem in Kenya. A systematic surveillance in two slum areas in Nairobi, revealed a crude incidence of TF of 247 cases per 100,000 person-years of observation (pyo), with highest rates in children 5–9 years old (596 per 100,000 pyo). Currently over a third of *S typhi* isolates are multidrug-resistant (MDR), and show reduced susceptibility to fluoroquinolones - the drugs of choice for treatment of MDR cases. The situation is worrying especially for resource-limited settings where the few remaining effective antimicrobials are either unavailable or too expensive for the general public to afford.

Objectives: To determine the epidemiology and trends in antimicrobial resistance patterns among *S typhi* isolated from patients requiring treatment in four clinics in Nairobi in the last 5 years.

Methods: We assessed the susceptibility to commonly available antimicrobials of 225 *S typhi* isolates from 5 years of study (2009-2014) from sporadic outbreaks in clinics around Nairobi.

Results: *S typhi* outbreaks were due to a single haplotype H58, which is the main cause of epidemics in South East Asia. Over the last 5 years only 17.9% were fully sensitive. The majority (60.5%) were multiply resistant to commonly available drugs - ampicillin, chloramphenicol, tetracycline (minimum inhibition concentration (MIC) > 256µg/ml) and co-trimoxazole (MIC > 32µg/ml). Nalidixic resistance was observed in 10% of isolates in 2009 and 18% of isolates in 2014 while resistance to ciprofloxacin susceptibility increased from 5% to 10% in 2014.

Conclusion: The rate of increase in MDR over the last 5 years is worrying as more *S typhi* have become less susceptible to fluoroquinolones. Improved hygiene and sanitation and use of World Health Organization-recommended vaccines should be considered for effective management of MDR TF.

Poster presentation: Antibiotic prescribing practices among pediatric inpatients at Nyeri County Referral Hospital, June to October 2015

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Background: Irrational antibiotic prescribing is a major public health problem especially in resource-limited countries. Kenya has guidelines that govern pediatric practice and these have been shown to affect the antibiotic prescribing patterns. Drug prescribing is a pivotal step in antibiotic utilization. Our objective was to describe antibiotic prescribing practices among pediatric inpatients at Nyeri County Referral Hospital between June and October 2015.

Methods: This was a retrospective descriptive study carried out between 12th October and 4th December at Nyeri County Referral Hospital. Data were extracted from an existing database and analyzed using SPSS.

Results: A total of 794 pediatric patients were admitted to the pediatric ward between June and November 2015. The median age of the patients on antibiotics was 18 months with a range of 30 months. Majority of the patients were male (61%) with 464 (58.3%) of them having been prescribed at least one antibiotic. Six hundred and six courses of antibiotics were prescribed to the 464 patients and 190 (40.5%) patients were prescribed more than one antibiotic. Popularly prescribed antibiotics were amoxicillin (36.8%, n= 223); penicillin (15.5%, n=94) and ceftriaxone (12.9%, n= 78). Among the patients prescribed antibiotics, 62 (13.4%) had a primary diagnosis of pneumonia. The parenteral route was prescribed in 272 (44.8%) of the prescriptions. Mean duration of hospitalization was 4.56 (±3.726) days among those prescribed antibiotics and 4.39 (±3.728) days among those not on antibiotic therapy. Thirty three clinicians admitted the patients. Twelve (37.5%) were medical officer interns and 20 (62.5%) were clinical officer interns. Of the 190 patients prescribed more than one antibiotic, 163 (85.8%) were admitted by medical officer interns, 25 (13.2%) by clinical officer interns.

Conclusion: Antibacterial agents were the most commonly prescribed drugs with penicillin being the most popular drug choice.

CHANGES IN DISEASE MANAGEMENT

Oral presentation: Characterization of drug resistance tuberculosis cases - Kenya, 2012 to 2016

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Background: Drug resistant tuberculosis (DR-TB) is a global health problem, due to its impact on the effectiveness of treatment regimens. DR-TB are classified in categories based on drug susceptibility testing (DST), these are: Monoresistance, Polydrug resistance (PDR-TB), Rifampicin resistant (RR), Multi-drug-resistant (MDR-TB) and extensive drug resistance (XDR-TB). Globally 580,000 people had DR-TB by end of 2015 and 190,000 died. In Kenya 2,750 people are infected with DR-TB every year.

Objective: To describes the burden and demographic characteristic of DR-TB patients in Kenya 2012 to 2016.

Methods: Retrospective data review of the national DR-TB data was done. Variables analyzed included demographics, clinical characteristics and resistance patterns. Data was analyzed using MS excel and Epi info. Means were calculated for continuous variables, frequency and proportions for categorical variables and Chi square corrected test for association between DR-TB and HIV.

Results: A total of 1466 DR-TB records were reviewed. The mean age was 35(SD12), with 643(44%) in age group of 30-45 years. Men were 908 (62%). Most of the cases, 1293 (88%), were treated in public facilities. Nairobi south reported the highest number of cases followed, 268 (18%). Newly diagnosed patients were 433 (30%) and 242 (17%) were DR-TB Relapse. MDR TB accounted for 818 (55.8%), RR 568 (39%) and XDR 4 (0.27%). HIV co-infected were 631 (58%). A total of 304 (21%) completed treatment, 60 (4%) defaulted and 166 (11%) died. Of the dead, 115 (70%) were HIV co-infected. The number of MDR-TB patients decreased from 154/173 (89%) in 2012 to 171/423 (40%) in 2016 whereas monoresistant/RR increased from 2/173 (0.04%) in 2012 to 239/423 (56%) in 2016. HIV positive patients had 2 times odds of having MDR TB as compared to Mono/RR (P<0.001)

Conclusion: There is an increase in the number of new cases of DR-TB over the years and majority are monoresistance/RR TB. HIV co-infection was associated with drug resistance.

EMERGING AND RE-EMERGING INFECTIONS

Oral presentation: The duty to treat: a reflection on a private hospital's Ebola preparedness response in Kenya

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Introduction: The Nairobi Hospital is a multi-specialty center located in Eastern Africa whose load of international patients is 30%. It is situated in Nairobi the capital city of Kenya which is considered a regional business hub. It is with this background that the hospital was considered to be at high risk of receiving patients who would be at risk of having Ebola or Ebola-like symptoms. The Ebola outbreak in Africa was noted in March 2014 and the Kenyan Ministry of Health reached out to various institutions to ensure preparedness. This involved: policy formulation to cover front line healthcare providers including laboratory teams and even the mortuary services. Guidelines and protocols were also developed and education on the same shared with institutions to ensure preparedness.

Methods: TNH was part of the national team involved in the preparedness and also made internal preparations including isolation; protective gear, training and sensitization of all staff; sanitizers at every point of contact. The purpose was to ensure: benefits of response were clear to the teams, obligations to self and family were highlighted; non-maleficence was assured; and respect, fairness and solidarity were enshrined. The staff of on duty was vetted to ensure that the following were considered: reduced risk; social protection; social support; appropriate self-care; dedicated response.

Results: 14 patients came through the hospital that fit the case definition of Ebola. Despite the intense preparation and continuous training of the front line teams, the following remained to be a challenge: anxiety due to separation and fear of death; physical strain due to long unanticipated hours; the burden of proper observation of infection prevention procedures; the barrier to the patient and inhumanity accompanied; the strain of affected working ratios; anxiety of duty allocation; the feeling of stigmatization during isolation for both staff and the patients next of kin; the unacknowledged hero. The responses to the various cases were characterized by excitement: at being the first to pick the diagnosis. This was appreciated in the younger members of staff who had no social obligations. Apprehension was also noted due the isolation period that ranged between 12-24 hours especially when the staff could not tell their next of kin the real reason of their absence. Fear was palpable due to the immensity of the situation.

Conclusion: Healthcare workers have a duty to treat by virtue of their express (duty to employer) and implied consent, specialist training, reciprocity (social contract view, benefits of licensure and autonomy), professional oaths and codes: duty to humanity. However, the institutions they work in have a responsibility to ensure availability of resources; ensure social protection and express respect, fairness and solidarity with the healthcare workers. This will go a long way in motivating the healthcare workers to be courageous and find beneficence in responding to emergencies of public health interest.

HOSPITAL ACQUIRED INFECTIONS

Oral presentation: Antimicrobial susceptibility patterns of bacterial isolates from patients in medical wards at Kenyatta national hospital in 2015-2016

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Background: There is an emerging worldwide concern of rapidly increasing antimicrobial resistance (AMR). However, there is paucity of resistance surveillance data and up-to-date antibiograms in Kenya, more so in public healthcare. This study was undertaken in Kenyatta National Hospital (KNH) - the largest public tertiary referral centre in East and Central Africa, highlighting local resistance patterns. This would serve to bridge existing knowledge and practice gaps, contributing towards best clinical practice which eventually translate to patient and cost benefits.

Objective: To describe the antimicrobial susceptibility patterns of bacterial isolates from culture specimens of KNH medical ward inpatients.

Methods: A retrospective review of laboratory records capturing antimicrobial susceptibility data for the year 2015 was done, and augmented with a prospective cross-sectional descriptive study of medical ward inpatients over 3 months in 2016 to obtain relevant clinical correlates. Data was analysed using WHONET and SPSS version 20.

Results: Analysis of 823 isolates revealed antimicrobial resistance rates higher than most recent local and international reports. 88% of isolates tested were multi-drug resistant (MDR) whereas 26% were classified as extensively-drug resistant (XDR). The critical World Health Organization antibiotic-resistant 'priority pathogens' claimed majority of the resistance burden, with resistant Gram negative enterobacteriaceae surpassing Gram positive counterparts. 51% of patients were empirically treated with cephalosporins yet we documented cephalosporin resistance rates of concern, such as ceftriaxone resistance of 82%. Inappropriate clinician prescription practices and misuse of antibiotics could possibly be a key driver of AMR which leads to increased morbidity and mortality.

Conclusion: There was overwhelming resistance to commonly used antibiotics, underscoring the need for standard guided empiric therapy where indicated, as well as restricted prescription for reserve antibiotics following culture and sensitivity testing. Strengthening of our antimicrobial stewardship efforts, regular surveillance and further research towards combating AMR is of paramount regional and global importance.

Oral presentation: Bacteremia associated with central venous catheterization, etiology and their antibiogram among patients on hemodialysis therapy at Muhimbili National Hospital – Dar es Salaam

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Background: Since the insertion of the first vascular-access devices that made maintenance hemodialysis practical, vascular-associated infection has remained a major issue.

Objective: To determine the magnitude of bacteremia associated with central venous catheterization (CRB), etiologic agents and antibiogram among hemodialysis patients.

Methodology: A cross-sectional descriptive study was conducted for six months (September 2016 to February 2017) on hemodialysis patients at Muhimbili National Hospital. Two sets of blood samples (simultaneously peripheral and central line) were collected and incubated in an automated blood culture machine. Time difference to positivity was noted and bacteria identification and susceptibility testing was performed according to standard guidelines. Logistic regression model was used to determine association and the p value was set at 0.05.

Results: Out of 109 blood samples, 39 samples gave a positive culture results. Both gram positive (51.3%) and gram negative (48.7%) bacteria were isolated. Gram positive isolates were resistant to penicillin (78.6%), gentamicin (28.6%), ciprofloxacin (14.3%), clindamycin (7%) and cefotaxime (0%). All gram negative isolates were resistant to amoxillin/clavulanic acid, trimethoprim sulfamethoxazole and low resistance to ceftriaxone (20%), ceftazidime (20%) and meropenem (0%) was observed. All pseudomonas isolates were resistant to aztreonam and amoxillin/clavulanic acid and very few were resistant to piperacillin (20%) and meropenem (20%) and no piperacillin/ tazobactam resistant isolates. Catheter duration of ≥30 days (OR 10.2, 95% CI 2.56-40.6) p=0.001 and catheter at femoral site (OR 6.7, 95% CI 3.2-10.8) p=0.042 were the predictors of CRB.

Conclusion: CRB among hemodialysis patients and antibiotics resistance is common. Catheters overstay and catheter site were significant predictors of CRB. Early referral to nephrologists', blood cultures based treatment and femoral site avoidance may reduce CRB related morbidity and mortality among hemodialysis patients.

Oral presentation: Role of serial C-reactive protein in determining duration of antibiotic use for neonates with suspected neonatal sepsis: a randomized controlled trial

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Background: Neonatal sepsis has nonspecific signs and symptoms, studies have shown that C Reactive Protein (CRP) is useful in diagnosis and guiding duration of antibiotic therapy thus preventing prolonged exposure to antibiotics.

Objectives: To determine the utility of serial CRP in determining duration of antibiotic treatment for neonates with suspected neonatal sepsis in New Born Unit at Pumwani Maternity Hospital.

Methods: A randomized controlled trial was conducted and neonates were randomly assigned by block randomization. Patients in the control group were treated with antibiotics according to national health guidelines. Serial CRP was done for patients in the intervention group; antibiotics were stopped once two normal CRP levels 24 hours apart were obtained. Median antibiotic treatment duration was analyzed using Mann Whitney U test, hospital readmission rates one week post discharge was analyzed using Fishers' exact test.

Results: A total of 120 patients were recruited, 60 assigned to each arm. The median duration of treatment in the intervention group was 6 days (IQR 4-7) and 4.5 days (3-7) in the control group (p=0.055). On per protocol analysis the median duration of antibiotic treatment in intervention and control were 6 days (4-8) and 5 days (3-7), respectively (p = 0.075).

There were 4 readmissions within one week of discharge in the control group with none in the intervention group (p=0.119).

Conclusion: There was no statistically significant differences in the duration of antibiotic therapy in both groups. CRP is a safe and useful marker to guide duration of treatment in suspected neonatal sepsis.

IMMUNOCOMPROMISED PATIENT

Oral presentation: Urinary tract infections and antibiotic sensitivity among non-insulin dependent diabetes mellitus patients

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Background: Patients with diabetes mellitus type 2 have been found to be more prone to urinary tract infections (UTI) more than other groups. There is a wide gap of information in developing countries regarding the prevalence and antibiotic sensitivity of the pathogens causing urinary tract infections in diabetic patients.

Objectives: The objective of this study was to determine the prevalence and socio-demographic characteristics of urinary tract infections among diabetic patients. The study also determined the bacterial causative agents of urinary tract infections among diabetic patients and the resistance patterns of bacterial isolates from the diabetic patients. The study was carried out in Kisii Teaching and Referral Hospital in Kisii County, Kenya.

Methods: Clean catch mid-stream urine (MSU) was collected from all participants and cultured in Cystine Lactose Electrolyte Deficient (CLED) agar for urinary tract infections diagnosis and later in Mueller Hinton agar for antibiotic sensitivity testing. Classification of a positive culture for urinary tract infection was based on more than 100,000 ($\geq 10^5$) colony-forming units (CFU) of a single bacterial species.

Results: A total of 180 patients were recruited, 106 of the participants were male (58.9%) and 74 (41.1%) were female. 63 participants (35%) showed symptoms of urinary tract infections. The overall prevalence of urinary tract infections was 20% with 37 participants testing positive for UTI. Out of the 37 (100%) isolates, 35 (94.6%) were gram negative and the remaining 2 (5.4%) were gram positive. There were 2 (5.4%) isolates of *Enterococcus faecalis.* Five, three and three of 21 *E. coli* isolates showed resistance to ampicillin, nitrofurantoin and co-trimoxazole respectively. Two, one and two of 10 *K. pneumoniae* isolates were resistant to ampicillin, cephalexin and co-trimoxazole respectively. Out of 4, there were three cases where one strain of *P mirabilis* was resistant to ampicillin, nitrofurantoin and co-trimoxazole. All 21 isolates of *E coli* (100%) were sensitive to gentamicin and cephalexin. All ten *K pneumoniae* isolates (100%) were sensitive to gentamicin and nitrofurantoin.

Conclusion: In Kenya, *E coli* is the most frequent isolate followed by *K pnemoniae.*

Oral presentation: Randomized trial of loop electrosurgical excisional procedure (LEEP) vs. cryotherapy to treat CIN2/3 in HIV-infected women

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Background: Cervical screening and treatment using visual inspection with acetic acid (VIA) and cryotherapy (screen-and-treat) is often implemented in resource-limited settings with high HIV-1 endemicity; however, cryotherapy may be less effective than loop electrosurgical excisional procedure (LEEP) among HIV-infected women. We randomized 400 HIV-infected women to cryotherapy or LEEP and examined the recurrence of cervical disease over a 2-year follow-up.

Methods: From June 2011 to July 2014, HIV-infected women enrolled at the Coptic Hope Center for Infectious Diseases in Nairobi, Kenya underwent cervical screening with Pap smear and confirmatory biopsy. Four hundred women with cervical intraepithelial neoplasia (CIN) 2/3 or carcinoma in situ (CIS) disease were randomized 1:1 to receive cryotherapy or LEEP, and were followed every 6 months with a Pap smear for 2 years. Recurrence was defined as high grade squamous intraepithelial lesions (HSIL) or greater on cytology, and outcomes were compared between arms using Chi-square tests and Cox proportional hazards regression.

Results: Sociodemographic and biological factors were balanced between arms. Median age was 37 years [interquartile range (IQR): 31-43], most women were on ART (89%) at the time of intervention, and median CD4 was 380 cells/l (IQR: 215-524). Among women randomized to cryotherapy: 71 (35.5%) had CIN2 at baseline, 107 (53.5%) CIN3, 11 (5.5%) CIS, and 11 (5.5%) no dysplasia/CIN1. In the LEEP arm: 59 women (29.5%) had CIN2, 116 (58%) CIN3, 10 (5%) CIS, and 15 (7.5%) no dysplasia/CIN1. Median follow-up was 2.1 years in both arms and 341 (85%) women completed all 4 follow-up visits. At 12-months, more women treated with cryotherapy experienced recurrent HSIL than those who underwent LEEP (27% vs 18%; *P*=0.031). At 24 months, HSIL increased in both arms and remained significantly higher in the cryotherapy arm (37% vs 26%; *P*=0.018). Overall, the rate of recurrence of HSIL+ was 21.1 per 100 woman-years after cryotherapy and 14.0 per 100 woman-years after LEEP. Women treated with cryotherapy were 52% more likely to experience recurrence (hazard ratio (HR): 1.52, 95% confidence interval [CI]: 1.07-2.17; *P*=0.020) compared to LEEP.

Conclusion: Treatment with cryotherapy was associated with significantly higher risk of recurrent pre-cancerous cervical disease among HIV-infected women compared to LEEP. In high HIV-burden settings, a screen-and-treat approach coupled with HIV testing and referral for LEEP may be more effective than cryotherapy alone.

ONE HEALTH

Poster presentation: Experience from OHCEA One Health Central and Eastern Africa one health demo-site attachment in Amboseli ecosystem, Kenya: students' perspective

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Background: One health is a multi-disciplinary approach that emphasises the link between human, animal and environmental health and the need for interdisciplinary collaborations. With more than 60% of infectious diseases being zoonotic coupled with the changing disease patterns, there is a need for a new model for medical education. Most institutions of higher learning train their students in total disregard to the multi-disciplinary approach and studies have shown limited knowledge of environmental issues among physicians. One Health Central and Eastern Africa (OHCEA) organised a one health demo-site attachment for a multi-disciplinary team of students from Moi University and the University of Nairobi in Amboseli ecosystem.

Objectives: The demo-site aimed at equipping the students with the skills to identify, prioritise and intervene on the key one health challenges.

Methods: The demo-site was carried out in Amboseli ecosystem, Loitoktok in Kajiado County which was purposively selected. Observation, key informant interviews and secondary data were used. Qualitative data was analysed manually while quantitative data was analysed using MS Excel.

Results: Zoonotic diseases (coenurosis, brucellosis, and rabies), bedbugs, human-wildlife-livestock conflict, poor hygiene and sanitation, HIV/AIDS, poor transport network, and eye infections were the key one health challenges identified. Coenurosis, brucellosis, bedbugs and hygiene and sanitation were prioritized. Health education including demonstration and simulation was carried out by the students 'teams as intervention measures. Evaluation of community members showed a high level of awareness on the one health challenges addressed than before.

Conclusion: The students appreciated the effectiveness and need for a collaborative approach to teaching and development of future health workforce. More demo-site attachments were recommended by the participants as a means of equipping the students with practical one health skills.

RESPIRATORY INFECTIONS

Oral presentation: Pregnancy and neonatal outcomes following influenza-like illness in Western Kenya: methods and preliminary findings, 2015-2016

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Background: Pregnant women and newborn children are considered at high risk of influenza-related complications. There is limited data on the impact of influenza on pregnancy and neonatal outcomes in tropical Africa to inform implementation of maternal influenza immunization policy.

Objective: We assessed pregnancy and neonatal outcomes following influenza-like illness (ILI) among pregnant women in Kenya.

Methods: Pregnant women ≤20 weeks gestation were enrolled and followed up weekly (telephone or home visit), up-to 12 weeks post-partum and assessed for ILI symptoms; defined as subjective fever or cough within the past week. Newborns were assessed upto 12 weeks of age. Nasopharyngeal/oropharyngeal (NP/OP) swabs were collected from symptomatic women and newborns, and tested by real-time RT-PCR for influenza A and B viruses. We compared pregnancy and newborn outcomes among women with laboratory-confirmed influenza and those without ILI using logistic regression.

Results: From January, 2015–February, 2017 we enrolled 1,833 pregnant women, 802 (43.7%) reported ILI during pregnancy, with 1,295 NP/OP swabs collected; 1240 (95.75%) were tested for influenza, 73 (5.9%) were positive. There were 22 miscarriages. Among 1,085 deliveries, 1,053 were live births; of those 241 (22.89%) were preterm (<37 gestational weeks). Among 1192 enrolled infants, 547 (45.9%) had ILI, with 634 swabs collected. 589 specimen were tested, 6 (1.01%) were positive. Pregnant women who had laboratory-confirmed influenza had increased odds of having a miscarriage (odds ratio (OR), 2.68 [95% confidence interval (CI), 0.30-24.32)]), and their neonates had increased odds of suffering from respiratory distress syndrome (OR, 4.70 [95% CI, 0.84-26.22]) and having neonatal deaths (OR, 2.14 [95% CI, 0.25-18.59]) compared to pregnant women with no reported ILI.

Conclusion: Preliminary findings indicate that influenza may be associated with adverse pregnancy and neonatal outcomes. We continue with data collection for another 2 years to enable us assess the magnitude of this association.

Oral presentation: Incidence of pulmonary tuberculosis and cohort retention among adolescents in Western Kenya

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Background: Karemo division, Siaya County, Western Kenya, has the highest TB notification rates in Kenya (400/100,000)

Objective: To determine the incidence of pulmonary tuberculosis (PTB) and one year cohort retention in 12–18 year adolescents, in preparation for Phase III TB vaccine trials.

Methods: Adolescents were enrolled and followed up for 1-2 years to determine TB incidence. Adolescents who had a positive tuberculin skin test, history of cohabitation with a TB case within the previous 2 years, or at least one TB symptom received a clinical examination, sputum examination, and a chest x-ray. TB cases were defined as definite if bacteriologically confirmed and clinical if diagnosed by a clinician based on a suggestive chest x-ray scored using Chest Radiograph Review System (CRRS) and having at least one clinical symptom. Risk factors were explored using Poisson regression.

Results: Among 4934 adolescents without TB at baseline, 26 TB cases (definite and clinical) were found during follow up with a corresponding incidence density of 4.4 (95% CI, 3.0-6.4) events per 1000 person years of observation, 12 were confirmed culture positive (definite TB cases); incidence density of 2.0 (95% CI, 0.9-3.1). Having previous tuberculosis (RR= 12.5, CI 1.8, 100) and presence of TST conversion (RR=3.4, CI 1.5, 7.7) were significantly associated with higher risk of incident TB. Overall (4086/4925) 83.0% of adolescents were retained in the study after 1 year of follow up. Being female, older, out of school and being orphaned were significant risk factors for loss to follow up.

Conclusion: The tuberculosis incidence in adolescents will help inform future TB vaccine trial sample size calculations for this setting. The predictive factors for incident TB and retention can be further explored in future trials to better characterise them.

Poster presentation: Non tuberculous mycobacteria in adolescents: in Western Kenya

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Introduction: The risk of tuberculosis (TB) disease following infection begins to increase in adolescence making this high risk population a target for new TB vaccines. Adolescent diagnosis of tuberculosis is based on two sputum smears positive by microscopy, culture positive confirmed as mycobacterium tuberculosis (MTB) by speciation or clinical diagnosis. In order to contribute to the design and implementation of future TB vaccine trials, we sought to determine the incidence and prevalence of TB infection and disease among adolescents in Western Kenya.

Methods: A prospective cohort study of adolescents aged 12-18 years is being conducted by KEMRI/ CDC in Western Kenya. Adolescents are enrolled and followed for 1-2 years. TB Suspects identified by clinical criteria or a positive tuberculin skin test are investigated for pulmonary tuberculosis (PTB) through sputum examination (microscopy and culture), and chest radiography. An early morning and spot sputum specimens are collected and processed for fluorescent smear microscopy, MGIT and Lowenstein Jensen cultures. Positive cultures are speciated using Capilia and Hain genotype tests.

Results: Out of 4189 adolescents enrolled, 2013 (48.3%) were female, mean age 14 years. 1670 (39.9%) were identified as TB suspects. 365/1670 (21.9%) of TB suspects had at least one culture positive sputum by solid or liquid culture, confirmed as mycobacterium by ZN smear. On speciation with Capilia and Hain genotype only 13 definite PTB cases (MTB) were identified reflecting crude prevalence estimates of 310/100,000. The rest of the positive cultures were identified as non tuberculous mycobacteria (NTM). 3 of the TB suspects whose cultures were identified as NTMs also had one sample positive by fluorescent microscopy.

Conclusion: A large number of samples collected from adolescent TB suspects were culture positive but identified as NTMs through speciation. Three of these were also positive by fluorescent microscopy. The identification of TB patients through smear microscopy in an area with high NTMs might inaccurately classify these subjects as having MTB. Other strategies are needed to exclude NTMs when making a diagnosis of PTB in programmatic settings.

Oral presentation: Estimating the annual risk of infection with Mycobacterium tuberculosis among adolescents in Western Kenya in preparation for TB vaccine trials.

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Background: Siaya District, Western Kenya, has the highest TB notification rates in Kenya (400/100,000)

Objective: To determine the prevalence and annual risk of infection with *M. tuberculosis (*ARTI) among adolescents aged 12-18 years

Methods: Adolescents aged 12-18 years were enrolled in an area under continuous health and demographic surveillance in 2008-2009. At enrolment, clinical and demographic data were collected and study participants screened for tuberculosis (TB) and for tuberculous infection using tuberculin skin tests (TST).

Results: Of 5004 adolescents enrolled, 4808 (96%) came for TST readings. Of these 2327(48.4%) were female, 861 (17.9%) had no BCG scar, and 23 (0.5%) were HIV positive. The overall prevalence of tuberculous infection was 32% (95% CI 29-35%) with a corresponding ARTI of 2.6% (95% CI 2.2-3.1%). Male gender (OR 1.3, 95%CI 1.2,1.5), having a BCG scar (OR 1.4,95%CI 1.3,1.7) and not being enrolled in school (OR 1.8, 95%CI 1.4,2.3) were independent predictors of a positive tuberculin skin test.at baseline.

Conclusion: We found a high ARTI indicating very high TB transmission rates, suggesting that in this population prevention studies including TB vaccine trials would be both highly relevant and efficient.

Oral presentation: Occurrence and transmission patterns for viruses causing respiratory tract infection within Kilifi County

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Background: Acute respiratory infection (ARI) is a major cause of morbidity and mortality globally. With the introduction of vaccines against the main bacterial agents for ARI, the burden of severe disease from respiratory viruses has become more prominent. Currently, licenced vaccines are available to prevent influenza, while vaccine development for other leading viral pathogens such as RSV are in advanced stages of clinical trials. Prediction of utility and delivery of intervention strategies such as vaccines requires clear understanding of the occurrence and transmission patterns of these viruses.

Methods: A surveillance to collect clinical data and respiratory specimens from individuals regardless of age was conducted in Kilifi County within the Health and Demographic Surveillance System (KHDSS) area. Participants self-presented to the outpatient of 9 selected health facilities with symptoms of acute respiratory infection between December 2015 and October 2016.

Samples were screened using RT-PCR for identification of influenza viruses, RSV, human coronaviruses, rhinoviruses and other respiratory pathogens. Chi square test and descriptive statistics were used in analyses.

Results: A total of 4952 participants were recruited within a period of 11 months of the surveillance. They were equally distributed by sex (P=0.3) across all 9 facilities but varied with age from 0 to 87 years. 54% (2679) of participants were children <5 years. 2104 samples were virus positive. The most common occurring viruses were rhinovirus 42.9%(904), influenza type B virus 11.4%(239), RSVB 201(9.6%), coronavirus-OC43, 8.43%(173), parainfluenza type 3 virus(PIV3) 5.6%(118), adenovirus 4.2%(89), HMPV 2.2%(47) while, RSV A, influenza type A virus, influenza type C virus, coronavirus nl63, PIV1, PIV2, PIV4 had less than 2% of the total number of virus positive samples. Samples positive for viruses among young children were significantly higher compared to adults (P=0001). 77% (1625) of all virus positive samples were from children <10 years with children <5 years contributing to 64% (1347) of the total virus positive samples. Of the 1347 viruses from 0-5yrs, 90% (1225) of these were from infants and children not yet in school. The most common virus among the elderly (>60 years) was rhino virus and influenza type B virus. Frequency of virus occurrence was similar in all facilities.

Conclusion: Preliminary analysis shows that the highest burden of Acute Respiratory Infection is predominant among infants and children <5 years of age. Rhinoviruses, RSV, coronaviruses, influenza viruses and parainfluenza viruses are common pathogens of these infections. Further analysis of this data using both mathematical modelling and phylogenetic analysis is needed to understand how the viruses spread within Kilifi County.

SURGICAL INFECTIONS

Oral presentation: Rational use of surgical antibiotic prophylaxis at Moi Teaching and Referral Hospital, Kenya

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Background: Over 230 million operations are performed worldwide annually. Surgical site infections (SSIs) are one of the most important causes of healthcare-associated infections. Although antibiotic prophylaxis (AP) is beneficial in prevention of SSIs, it is characterized by inappropriate practices such as use of broad spectrum antibiotics, wrong dosage/time of administration, and long duration of use.

Objective: To evaluate rational use of surgical AP, cost and prevalence of SSI at Moi Teaching & Referral Hospital.

Methods: This was a longitudinal observational study. Four seminars were held with healthcare providers to discuss AP policy development, procedures required for its delivery and sustainability. All eligible inpatients in the surgical wards with clean or clean/contaminated wounds during the study period were included. Data was collected from hospital records. Approval for the study was sought from the hospital management and ethics committee.

Results: Out of 936 participants, 624 (66.7%) were males, mean age was 34.6 yrs, and general surgery was the most common procedure with 394/936 (42.1%) patients. All the patients received pre-operative AP, with Ceftriaxone [652/936 (69.7%)] being the most common. Only 76/936 (8.1%) did not receive post-operative AP. Wound infection occurred in 23/936 (2.5%) patients.

Infection was significantly higher during the period before implementation of the single dose policy than after [11/230 (4.8%) vs. 12/706 (1.7%), p = 0.01]. *Staphylococcus aureas* and *Escherichia coli* were isolated from 10/12 (83.3%) and 2/12 (16.7%) wound swabs respectively. Augmentin [13/23 (56.5%) was the most common antibiotic used for treatment of the infections. No laboratory antibiotic sensitivity test results were available. Post operative prophylaxis increased antibiotics expenditure by KES 209,640.

Conclusion: More efforts are required to strengthen rational use of surgical AP as a strategy to reduce emergence and spread of antimicrobial resistance.

Oral presentation: Determinants of the effectiveness of antimicrobial prophylaxis among neurotrauma patients at a referral hospital in Kenya: a prospective cohort study

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Background: Surgical site infections in neurosurgical patients can occur despite use of antimicrobial prophylaxis. The study aimed at measuring the incidence of surgical site infections and identifying factors that influence the effectiveness of antimicrobial prophylaxis.

Methods: A prospective cohort study was conducted from April to July 2015 in the Neurosurgical ward of Kenyatta National Hospital. Adult patients with contaminated wounds were recruited by universal sampling. Data was collected on prophylactic antibiotics and the occurrence of surgical site infections. Risk factors for infection were identified by logistic regression. Data analysis was done using STATA version 13 software.

Results: Eighty four patients were recruited, and 83.3 % (n=70) underwent surgery. The incidence of surgical site infections was 37.7% (n=26). The most common antibiotic used for prophylaxis was ceftriaxone. Patients on prophylaxis were less likely to be infected than those who did not receive prophylaxis (RR 0.87, 95% CI 0.40-1.893). The presence of epidural haematoma was a risk factor for development of surgical site infection (Crude RR 2.456, 95% CI 1.474-4.090). Antimicrobial prophylaxis was effective only in patients who had undergone evacuation of hematoma by craniotomy (risk reduction, 62.5% (CI, 29.0% -96.0%).

Conclusion: Evacuation of haematomas through craniotomy increased the effectiveness of prophylaxis.

SEXUALLY TRANSMITTED INFECTIONS

Poster presentation: High risk sexual behaviors and knowledge on HIV/ AIDS among inmates in Nakuru Prison

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Background: High risk sexual behaviour is a lifestyle activity that places a person at increased risk of suffering a particular condition, illness or injury. Individuals in high risk sexual behaviours are more likely to contract Human Immunodeficiency Virus (HIV) and Sexual Transmitted Infections (STIs) due to practicing unprotected sex or involving themselves in unprotected sex with multiple partners. Globally the number of cases of HIV infection in prisons is greater than the general population with a prevalence ranging from six to fifty times more than the general population. When inmates are released back into the general population, they pose a threat to the population as they could serve as a reservoir of HIV infection. Objective: The aim of the study was to determine the practice of high risk sexual behaviors and HIV knowledge among inmates in Nakuru male G.K. prisons.

Methods: A descriptive cross-sectional study design was used. The study was carried out at Nakuru male G.K. prison. A total of 295 inmates in Nakuru male G.K. Prison were interviewed. Simple random sampling technique was used to select the participants. The study findings were analyzed using statistical package for social science SPSS version 22 and data was presented in form of charts, tables, histogram, frequency distribution charts and graphs.

Results: The study found out that the level of awareness of HIV was high with 92.8% of the respondents being aware of HIV infection however knowledge on the modes of transmission was low. Sexual practices in the prison included Homosexuality (21%, oral sex (27%) and masturbation (46%) and observing ladies (6%). Majority of the respondents 97% were not aware that HIV can be transmitted through oral sex whereas 41.4% were not aware that HIV can be transmitted through homosexuality. 21% of the inmates reported that they still practiced homosexuality in the prison despite majority of the respondent 58.6% having the information that HIV can be transmitted through homosexuality. 75% of the respondents practicing homosexuality reported that were forced by the fellow inmates. 33% of the men practicing homosexuality had multiple partnership while 46.3% of the respondents were not aware of their HIV status despite the availability of HIV testing and counseling services in the prison and 81.8% of respondents knew someone who was HIV positive in the prison.77.6% of the respondent were aware of HIV protection measures of HIV. All the respondent reported that condoms were not available in Nakuru G.K. prison due to prohibition by the prison authority.

Conclusion: The prisoners are at risk of transmission of HIV as there is practice of high risk sexual behaviors despite some of the inmates being infected with HIV/ AIDs. Myths and misconception on HIV transmission exist among prisoners which could contribute to new infections. There is need for education of the inmates on HIV to reduce the myths and misconceptions and practice of high risk sexual behaviors.

INFECTIOUS DISEASE SURVEILLANCE

Oral presentation: Cholera outbreak on the Kenya-Ethiopia border of Moyale Sub-County, Kenya, 2015-2016: Laboratory analysis of *Vibrio cholerae* strains

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Background: Cholera is an acute infection caused by *Vibrio cholerae* bacteria. Cholera has been endemic in Kenya since December 2015. By the end of 2016, 30 of 47 counties in Kenya experienced cholera outbreaks. Moyale Sub County had a cholera outbreak from 1st December 2015 to March 2016, with an index case from Ethiopia.

Objective: To determine the magnitude and identify the environmental factors that led to cholera outbreak along the Kenya-Ethiopia border.

Method: We conducted a cross-sectional study of the outbreak. A suspect case was person of any age with profuse, effortless watery diarrhea with onset between 1st December and March 2016. Stool specimens were collected and first examined on microscopy for ova and cyst, then cholera rapid diagnosis testing (RDT) was done. Positive RDTs were subjected to culture and sensitivity testing. Water samples were taken from shallow wells around affected villages and sent to a national reference laboratory for culture. An environmental investigation was done through transects walk and observation. Data were entered and analyzed using MS-Excel and Epi-Info.

Result: A total of 596 cases were reviewed and 120 cases admitted at cholera treatment unit with case fatality rate of 0.2%. The mean age was 15±9 years, 303(51%) were male, and 272 (46%) were children <5 years old. Cases were predominately from Biashara Street 164 (28%), Ethiopia 113 (19%), and Sessi 65 (11%). Laboratory testing confirmed 36% positive by RDT of which 39/76 (51%) was found to be serotype Ogawa on culture and found susceptible to doxycyline 2 (7%), tetracycline 2(7%), and ciprofloxacin 22 (79%). Nine samples of water collected showed coliforms >180 in 100ml and *E.coli* are 14 in 100ml of water. The environmental assessment revealed poor latrine coverage with an estimated 63% of the resident lack latrine.

Conclusions: Moyale town and its surrounding villages who's main water sources are traditional wells located on the dry river bed (laga) along Kenya/ Ethiopia Border "Nomans land" are contaminated coupled with poor latrine coverage and uncoordinated surveillance system between Kenya and Ethiopia therefore there is need to increase latrine coverage, improve water treatment, and strengthen surveillance through coordination between two country

Oral presentation: National burden of hospitalized and non-hospitalized influenza-associated severe acute respiratory illness in Kenya, 2012-2014

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Background: Influenza-associated respiratory illness was substantial during the emergence of the 2009 influenza pandemic. However, national estimates of influenza burden in the post-pandemic period are unavailable to guide influenza vaccine policy in Kenya.

Objectives: To update estimates of the burden of hospitalized and non-hospitalized influenza-associated severe acute respiratory illness (SARI) during a post-pandemic period (2012-2014) and describe the incidence of influenza-associated SARI by narrow age categories.

Methods: We used data from Siaya County Referral Hospital to estimate age-specific base rates of SARI. We extrapolated these base rates to other regions within the country by adjusting for regional risk factors for acute respiratory illness (ARI), regional health-care utilization for ARI and the proportion of influenza positive SARI cases in each region, so as to obtain region specific rates of influenza-associated hospitalized and non-hospitalized SARI.

Results: The mean annual incidence of hospitalized influenza-associated SARI among all ages was 21 (95% CI 19-23) per 100,000 persons, while incidence of non-hospitalized influenza-associated SARI were approximately 4 times higher at 82 (95% CI 74– 90) per 100,000 persons. Mean annual incidence of influenza-associated SARI were highest in children <2 years of age. For the period 2012-2014, there were between 8,153-9,751 cases of hospitalized influenza-associated SARI and 31,785-38,546 cases of non-hospitalized influenza-associated SARI per year.

Conclusions: Influenza virus was associated with substantial disease burden in Kenya, especially among very young children, <2 years of age. The 6 month-2 year age group could be considered for annual influenza vaccination.

Poster presentation: Rotavirus group a genotype circulation patterns in Kilifi county pre-and post – vaccine introduction in Kenya, 2010-2016

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Background: Rotavirus group A (RVA) is the most common cause of acute diarrhoea in children worldwide. However, its burden is rapidly reducing since the introduction of rotavirus vaccines into the childhood immunization programmes of most countries worldwide. Kenya began RVA vaccination with ROTARIX® (attenuated G1P [8] strain) in July 2014.

Objective: To monitor the temporal occurrence and genotype composition of RVA in paediatric admissions to Kilifi County Hospital (KCH) before and after vaccine introduction.

Methods: Active surveillance of RVA was undertaken in children <5 years in KCH since January 2010. A total of 3,288 samples were collected between 2010-2016 (1.5 years before and 4.5 years post vaccine introduction). RVA antigen testing was done using ELISA (Prospect™ kit) and positive samples were partially sequenced for VP7 (G) and VP4 (P) genome segments. Sequence data were used to infer G and P types.

Results: RVA was detected in 646 samples (19.64%) with peak periods observed between June and September over the study period. Seven G genotypes: G1, G2, G8, G9, G10, G12, G29 and four P genotypes P[8], P[4], P[6], P[14] were detected. The dominant G types were G1 (54%) followed by G8 (16%), G2 (12%), G9 (10%) while P genotype were P[8] (68%) and P[4] (30%). Uncommon G and P genotypes were also detected. The prevalent G/P combinations were G1P [8] (53%), G8P[4] (15%), G2P[4] (13%), G9P[8] (10%). For the period before vaccine introduction G1P[8] was the major combination followed by G8P[4] while for the period after vaccine introduction G1P[8] was the most dominant, followed by G2P[8]. Data two-years post vaccine introduction showed G8P[4] and G9P[8] combinations are not in circulation.

Conclusion: This study provides preliminary data on genotype distribution required for evaluation of the performance of the vaccine. Continuous monitoring of genotypic data and additional phylogenetic comparisons within genotypes will inform on the full potential of the vaccine against circulating variants.

Poster presentation: Detection of Enteric Human Adenoviruses among Children in Kibera Informal Settlement, Nairobi, Kenya

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Background: The greatest burden of infectious diseases occurs in developing countries with over 10 million child deaths occurring globally. It is estimated that more than one billion diarrhea episodes occur yearly, with 700,000 deaths among children younger than 5 years. Most of these childhood deaths occur due to infectious diseases. Adenoviruses have increasingly been recognized as significant viral pathogens, with high morbidity and mortality in children under the age of five. This is second to rotavirus in both symptomatic and asymptomatic cases. In this study, we aimed to establish prevalence of Adenoviruses among children below five years in Kibera, Kenya.

Methodology: This was a retrospective laboratory based study. Three hundred and seventy eight (378) archived stool samples collected between 2007 and 2015 were extracted for total nucleic acid (TNA) by a modified QIAamp Fast DNA Stool Mini Kit. Detection of adenoviruses was done using PCR techniques; Taqman array card (TAC) for initial testing and confirmation of positives by wet assay RT PCR.

Results: Out of the 378 stool samples, 81 (21.4%) tested positive using Taqman array card (TAC). Of the 81, 48 (59.3%) were confirmed as positives by wet assay RT-PCR, with 11/81 (13.58%) not being amplified. Analysis by age, <6 months had zero detections, with 6-12 months 5 (1.3%),1-2 years at 23 (6.08%) and > 2 years at 20 (5.29%). Detection of HAdv was 12.7% among both asymptomatic and symptomatic cases.

Conclusion: The prevalence of HAdv among children in Kibera is comparable to other African regions with high prevalence between age's brackets of 1-5years. Screening of human adenovirus among these age groups is recommended with efforts geared to vaccine development.

VIRAL INFECTIONS OTHER THAN HIV

Poster presentation: Burden of congenital cytomegalovirus infection in Western Kenya, 2015 - 2016

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Background: Pregnant women are at risk of CMV reinfections and reactivations. Higher maternal CMV seroprevalence increases birth prevalence of congenital CMV infection. Congenital CMV infection may lead to adverse fetal and neonatal outcomes. There is paucity of data on birth prevalence of congenital CMV infection in Africa.

Objective: We assessed the burden of congenital CMV infection among newborns enrolled in a cohort study of influenza-associated illness in pregnant women in Siaya County.

Methods: The cohort study enrolls pregnant women ≤20 weeks gestation, follows them up weekly until delivery, and their infants up-to 12 weeks post-partum. We approached the mothers at 1-2 weeks post-partum, to have their newborns enrolled in the CMV study. Blood (on Dry Blood Spot (DBS) cards) and saliva swabs were collected from infants within 1-2 weeks of life. DBS specimens were tested by ELISA to assess maternal CMV IgG seroprevalence. DBS and saliva swabs were tested by PCR to assess the birth prevalence of congenital CMV infection. Using univariate and multivariate logistic regression, we assessed demographic, maternal and newborn characteristics associated with CMV infection.

Results: We enrolled 447 newborns between November, 2015–December, 2016. 80 (17.9%) mothers were HIV positive; median length on HAART of 660.5 days (IQR, 200.5-1691.5), (n=60). 13 out of 423 saliva swabs tested positive for CMV, giving a prevalence of 3.1%. 162 of 175 randomly tested DBS specimens were positive for CMV IgG giving a maternal seroprevalence of 92.6%. HIV exposure (odds ratio (OR), 3.15 [95% confidence interval (CI), (1.00-9.92)]) and prematurity (<37 gestational weeks) (OR, 3.62 [95% CI, (1.18-11.06)]) were associated with CMV infection.

Conclusion: There was significant burden of CMV in Siaya. Congenital birth prevalence of CMV was associated with HIV exposure and prematurity. We continue follow-up of CMV infected infants until 24 weeks to assess their neurological and sensory development.

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