

of the checkerboard for AZ+TX indicated synergy for only 2 of the 15 strains (FICI: 0.16 and 0.5). The mean FICI of all strains was 0.64 (0.16–1.01). Adding AZ to TX could not lower the TX MIC below 0.25 for one TX resistant strain (MIC for TX alone: 2).

Conclusion The recommended combination therapy against Ng (AZ+TX) showed no *in vitro* synergy using either the Etest or the agar dilution method. Other combinations of antibiotics from various groups showed no indication of *in vitro* synergy using the Etest method.

021.5 UNDERSTANDING THE MOLECULAR MECHANISM OF MTRR IN THE REGULATION OF ANTIMICROBIAL RESISTANCE IN NEISSERIA GONORRHOEAE USING *IN VITRO* AND *IN SILICO* STUDIES

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Background *Neisseria gonorrhoeae*, a major STD causing pathogen, tends to pose high burden of morbidity that is borne disproportionately by women and infants with approximately 2/3rd of cases from developing countries. In the absence of appropriate vaccine and rapid, easy, economical test, antibiotic therapy is recommended for treatment on the basis of clinical symptoms. This has led to the emergence of antibiotic resistant strains. Since increasing antimicrobial resistance makes *Neisseria* as super bug, we have tried to elucidate the mechanism of development of antibiotic resistance.

Methods Mutational analysis of *mtrR* gene and its DNA binding site was carried out for 28 clinical isolates resistant to multiple drugs. Wild type and mutant *mtrR* were cloned, expressed and purified. Fluorescence assay and electrophoretic mobility shift assay (EMSA) were carried out to study the effect of mutations in *MtrR* on its biological activity. Using discovery studio, structure of *MtrR* was modelled *in-silico* to understand how mutations affect its interaction with DNA.

Results Mutations in DNA binding domain (G45D) and dimerization domain of *MtrR* (H105Y) as well as in promoter region of *MtrR* (A/T deletion) were observed in clinical isolates (n = 28). EMSA and fluorimetric results suggest decreased binding of mutant *MtrR* with its promoter. *In silico* modelled structure of wild type and mutant *MtrR* proteins suggest altered conformation of the mutant protein. Altered conformation leads to difference in the posture of homodimer formed and increased centre to centre distance of helix 1 and helix 1' in two monomers of *mtrR*. *In silico* analysis of protein-DNA complex suggest that this increased distance cause altered binding of the mutant with DNA.

Conclusions Mutations in *mtrR* result in altered conformation of the protein leading to its decreased binding to DNA. This leads to enhanced expression of *MtrCDE* efflux pump resulting in increased efflux of drug.

021.6 A TALE OF TWO CITIES: *TREPONEMA PALLIDUM* MACROLIDE RESISTANCE IN COLOMBO (SRI LANKA) AND LONDON (UNITED KINGDOM)

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Background The bacterium *Treponema pallidum* (*T. pallidum*) causes syphilis. Penicillin is effective treatment, but azithromycin (a macrolide) is a single-dose oral alternative for those with allergy. Unfortunately, macrolide resistance secondary to one of two 23S

ribosomal RNA (rRNA) point mutations (A2058G and A2059G) is now wide-spread. Molecular strain-typing suggests that epidemics and macrolide resistance are unlikely the spread of single clones.

We present typing and macrolide resistance data from two geographically distinct populations: Colombo, Sri Lanka and London, UK.

Methods Cross-sectional studies were conducted at the Colombo District STD clinics and St Mary's Hospital, London. Ulcer exudate and/or blood were collected from patients with microbiologically confirmed syphilis. Presence of *T. pallidum* DNA (*tp047* gene) was confirmed with PCR. Next, using published techniques, the 23S rRNA gene was PCR-amplified for a point-mutation assay and *tp0548*, *arp* and *tpRE*, G&J amplicons were used for strain-typing.

Results Sri Lanka: 24 *T. pallidum* PCR-positive samples were collected. Patients were men (45.9% MSM) and 91.6% Sinhalese with a mean age of 28 (range 29). None were HIV-1 infected. Two strain types were discovered (14b/f and 13b/f), neither harbouring macrolide resistance.

London: 43 men were recruited, 18 in 2006–8 and 25 in 2011–12. Mean age was 37.5 (range 43); 95.2% were MSM and 62.8% were HIV-1 infected. Half (22/43) were white British. A total of 5 full and 14 partial strain types were identified, of which 6 were unique. Macrolide resistance increased from 66.7% (12/18) in 2006–8 to 80% (20/25) in 2011–12.

Conclusion Colombo *T. pallidum* strains have limited diversity with no macrolide resistance. London strains are more varied and increasingly macrolide-resistant. Ethnic diversity in London exceeds Colombo's and may explain increased strain diversity. In contrast to Sri Lanka, azithromycin is widely used to treat Chlamydia and non-specific urethritis in the UK thus selection pressure may be driving macrolide resistance.

0.22 - Alternative screening tools and screening sites

022.1 EVALUATION OF SYPHILIS POINT OF CARE TESTS CONDUCTED BY MIDWIVES AT PRIMARY HEALTH FACILITIES IN GHANA

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Background Globally, over two million pregnancies are affected by syphilis annually, resulting in adverse pregnancy outcomes and severe sequelae in the newborn. Cost-effective strategies exist, which prevent vertical transmission. Ghana's Policy recommends antenatal (ANC) syphilis screening and treatment of positive clients, but pregnant women were often not tested especially in areas where laboratory services are unavailable. The study examined the performance of point-of-care (POC) tests for screening ANC attendants for syphilis conducted by midwives at the primary level health facilities in Ghana.

Methods The study was conducted from March to September 2010. In all, 1249 pregnant women attending ANC in 8 sites were recruited and tested using Determine® Syphilis TP (POC) and results compared with *Treponema pallidum* Haem-Agglutination Test (TPHA) and Rapid Plasma Reagin test (RPR).

Results The sensitivity of tests conducted by midwives was 25%, 60% and 75% when compared with TPHA, active syphilis (reactive to TPHA and RPR) and High titre active syphilis (HTS) (greater than 1:8) respectively. A higher sensitivity was noted in detecting active syphilis and high titre infections. The prevalence of syphilis using POC test on whole blood conducted by midwives was 5.5% (70/1282), at the district laboratory on serum samples was 10.1%

(126/1248) and at the reference laboratory using TPHA was 7.7%. Active syphilis was found in 1.6% of the samples.

Conclusion Midwives can conduct POC testing for syphilis for ANC clients in rural settings in Ghana even in primary level health facilities. The ability of midwives to identify, treat 75% of HTS and provide a high coverage of syphilis screening in a rural setting makes this a suitable strategy for resource-constrained settings.

The low sensitivity compared to TPHA and active syphilis, should be addressed with training, effective supervision and monitoring of health personnel and instituting quality assurance systems for testing.

022.2 DIRECT AND INDIRECT EFFECTS OF SCREENING FOR CHLAMYDIA TRACHOMATIS ON THE PREVENTION OF PELVIC INFLAMMATORY DISEASE: MATHEMATICAL MODELING STUDY

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Background Pelvic inflammatory disease (PID) results from the ascending spread of microorganisms, including *Chlamydia trachomatis*, to the upper genital tract. The timing of ascending infection is unknown. Screening can prevent PID either by identifying and treating infections before they progress (direct effect) and/or reducing chlamydia transmission (indirect effect). We did this study to examine the contributions of direct and indirect effects of a screening intervention, using different assumptions about the timing of progression from chlamydia infection to PID.

Methods We developed a compartmental model of chlamydia transmission in a heterosexual population of 16–25 year olds with two sexual activity classes. The model explicitly incorporates the progression from chlamydia to clinical PID. Behavioural parameters are informed by a British population-based. We studied the effects of chlamydia screening introduced at low levels but with coverage increasing to 40% after ten years. We estimated the numbers of PID cases prevented and the proportions prevented by direct and indirect effects.

Results At baseline, the cumulative probability of developing PID by age 25 years was 3.1%. After five years, screening prevented a total of 187 PID cases per 100,000 women. Most PID cases were initially prevented by interruption of progression to PID (direct effect). The indirect effect produced a small net increase in PID cases early on, which was outweighed by the effect of reduced chlamydia transmission after 2.2 years. The later that progression to PID occurs, the greater the contribution of the direct effect.

Conclusion The ratio of direct to indirect effects depends on the timing of progression from chlamydia infection to PID. Mathematical modelling has helped to understand the mechanisms of chlamydia screening programmes by showing that there are separate roles for direct and indirect PID prevention and potential harms of screening, which could not have been observed by empirical studies.

022.3 TEXTING IMPROVES NOTIFICATION OF SEXUALLY TRANSMITTED INFECTION RESULTS AFTER EMERGENCY DEPARTMENT VISITS

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Background Failure to communicate sexually transmitted infection (STI) results to emergency department (ED) patients is a barrier to appropriate STI treatment. We aimed to improve the

proportion of female adolescent ED patients who are notified of positive STI tests (gonorrhoea, Chlamydia, or trichomoniasis) using mobile phone calls and texting.

Methods A randomised intervention among 14–21 year-old females using a 2X3 factorial design with replication to improve patient notification, defined as the proportion of STI-positive females notified within 7 days of STI testing. We evaluated six combinations of two factors: (1) method of notification (call, text message, or call + text message) and (2) provision of an STI information card with or without an ED phone number to obtain test results. Covariates for logistic regression included age, empiric STI treatment, days until first contact and documentation of a confidential/mobile phone number.

Results Of 386 patients, 51% were 18–21 years, 35% were 16–17 years and 14% were 14–15 years old. Successful notification was significantly greater for call + text message vs. call only (Odds Ratio [OR] 3.1, 95% confidence interval [CI] 1.4 – 6.7). There was no significant interaction between card and method of notification. Texting only or type of STI information card was not significantly associated with patient notification. Documenting a confidential phone number was independently associated with successful notification (OR 3.3, 95% CI: 1.6–6.9). In total, 94% of those with a documented confidential phone number who received call + text message were notified of their positive STI results within 7 days of their ED visit.

Conclusions A combination of call + text messaging improved our ability to successfully notify adolescent women of their positive STI results after an ED visit. Documentation of a confidential phone number is also an important strategy to notify adolescent women of their STI results.

022.4 WHAT ARE YOUNG PEOPLE'S PERCEPTIONS OF USING ELECTRONIC SELF-TESTS FOR STIS LINKED TO MOBILE TECHNOLOGY FOR DIAGNOSIS AND CARE (eSTI2)?

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Background UK rates of sexually transmitted infections (STI) are sustained or rising, particularly among young people aged 16–24, despite decreases in patient waiting times within traditional services. Modern advances in communication and diagnostic technologies offers the potential of electronic self-testing and diagnosis for STIs (eSTI2), linked to Internet/mobile-App based clinical management and support, which could be accessed wherever people find convenient and safe. We aimed to explore opinions on using eSTI2 among a sample of potential users.

Methods Twenty-five semi-structured interviews were conducted with a purposive sample of sexually active young people aged 16–24 years enrolled in London further education colleges. Analysis was based on the Framework method.

Results Participants were 64% male (n = 16), 36% female (n = 9). Mean age was 19. They described their ethnicity as Black 84% (n = 21), mixed race 12% (n = 3), Asian 4% (n = 1). Including those screened via the National Chlamydia Screening Programme (NCSP), the majority of participants (92%, n = 23) had previously screened for STIs at least once. The young people in our sample were highly conversant in mobile technology but had limited experience of using it to access health-related services. Participants reported struggling between desire to access services out of concern for their sexual health and repercussions from being discovered by family and peers at testing centres. These barriers were seen to be mitigated by using eSTI2. Participants expressed the importance of