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Sexually transmitted diseases in Ulaanbaatar, Mongolia

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Summary

Although human immunodeficiency virus (HIV) rates are increasing rapidly in Asia, a full understanding of the extent of other sexually transmitted diseases (STDs) in many of these areas is lacking. There have been anecdotes of rising rates of STDs in Mongolia, a country thus far relatively unaffected by HIV. To further the understanding of STDs, a prevalence study was conducted in the STD clinic in Ulaanbaatar, the capital and largest city in Mongolia. Among 260 patients, the prevalence of gonorrhoea, chlamydia and syphilis was 31.1%, 8.1% and 8.6% respectively for males and 10.3%, 9.9% and 6.0% for females. Sixty-seven per cent of females had trichomoniasis and 19.7% of males had non-gonococcal urethritis (NGU). Forty-two per cent of gonococcal isolates had plasmid mediated resistance to penicillin, and chromosomal resistance to penicillin, tetracycline, and ciprofloxacin was documented. No patients were infected with HIV. STDs are a significant problem in Mongolia. Improved control efforts are urgently needed to prevent the emergence of HIV.

Keywords

STD; Mongolia; gonorrhoea; trichomonas; syphilis; chlamydia

INTRODUCTION

Mongolia is a country roughly the size of Alaska with a population of 2.3 million and a population density of 1.4/km². It lies between Russia and China, 2 nations with rising rates of HIV¹⁻³. From a global perspective, HIV rates are increasing most rapidly in the Asian continent^{4,5}. Nonetheless, there is only one known case of HIV in Mongolia⁶. As of 1990, when the democratization process began in this country, there have been concerns that rates of STDs other than HIV are increasing in Mongolia. If true, rising rates of STDs without appropriate control programmes could presage an epidemic of HIV. As a first step in determining the extent of the STD problem in Mongolia, we conducted a study of the prevalence of STDs at the public health STD clinic in the capital city of Ulaanbaatar.

METHODS

The study was conducted at the outpatient public health STD clinic in Ulaanbaatar. This clinic also serves as a referral clinic for the remainder of the provinces; however, the majority of patients with an STD referred in from the provinces are admitted to an inpatient unit for treatment. This is due to the availability of free drugs for in-patients and to the long distances

travelled by many patients. The study was approved by the Institutional Review Board of the University of Alabama at Birmingham and by the Ministry of Health of Mongolia.

Patients attending the clinic with a new complaint or for screening were included in the study during a 14-day enrolment period. Verbal informed consent was obtained from the patients and none refused to participate.

Patients were examined by one of 2 physicians (TA and JRS). Pertinent complaints and findings on physical examination were noted. Syndromic treatment was provided following published guidelines⁷. For males, urethral specimens were collected for gonorrhoea, chlamydia and Gram stain. For females, endocervical specimens were collected for gonorrhoea and chlamydia and vaginal specimens were obtained for trichomonas culture, pH (ColorpHast Indicator Strip, EM Science, Gibbstown, New Jersey), and Gram stain. Blood was drawn from all participants for syphilis and HIV serology. In addition, all patients were administered a questionnaire designed to obtain demographic and behavioural data.

Laboratory methods

Urethral and endocervical specimens were immediately inoculated onto modified Thayer-Martin agar plates, placed into a CO₂ environment and incubated for 48 h at 36°C. Plates were examined for colonies typical for *Neisseria gonorrhoeae* and a presumptive identification was made using Gram stain and oxidase test⁸. Isolates were tested for the production of beta-lactamase using the chromogenic cephalosporin method (Cefinase, BBL Microbiology Systems, Cockeysville, Maryland). Disk diffusion susceptibility testing was performed according to standard methodology using published criteria for zone sizes for the interpretation of sensitivity and resistance^{9,10}. Urethral smears were Gram stained and interpreted as either positive, equivocal, or negative for gonorrhoea according to standard criteria¹¹. A case of gonorrhoea was defined as either a positive culture or a positive urethral Gram stain. Smears which were negative for gonorrhoea but which had greater than or equal to 5 neutrophils per oil immersion field were considered to represent NGU¹². Detection of chlamydia was performed using an EIA technique (Clearview, Unipath Ltd, Bedford, UK). Culture for trichomonads was performed using the *Trichomonas vaginalis* (TV) pouch system (In Pouch TV test, BioMed Diagnostics Inc., Santa Clara, California). Inoculated pouches were incubated at 36°C and examined daily by light microscopy for the presence of motile trichomonads for up to 5 days. Vaginal fluid smears were Gram stained and interpreted by the Nugent criteria for the presence or absence of bacterial vaginosis¹³. Syphilis serology was performed using the rapid plasma reagin (RPR) method (Becton Dickinson Microbiology Systems, Cockeysville, Maryland) and reactive tests were confirmed by the fluorescent treponemal antibody test (Wampole Laboratories, Cranbury, New Jersey). Sera were screened for antibody to HIV with an ELISA assay (Genetic Systems Corporation, Redmond, Washington) and reactive specimens were further studied using Genetic Systems Western blot, as well as a p24 antigen detection method (Coulter Corporation, Miami, Florida).

Because of the results of susceptibility testing (disk diffusion) on gonococcal isolates performed on-site in Mongolia, we attempted to transport additional strains to Birmingham, Alabama (USA) for further evaluation. During a visit to the same clinic in Ulaanbaatar during August 1997, 21 isolates collected from patients with discharge syndromes and presumptively identified as *N. gonorrhoeae* were stabbed three-quarters of the way into chocolate agar deeps, and transported at room temperature for a period of 3 days. Upon arrival at Birmingham, the deeps were incubated for 24 h at 36°C in a CO₂ incubator and then subcultured onto chocolate agar. These were subsequently confirmed to be *N. gonorrhoeae* using a fluorescent antibody test (Syva Microtrak *N. gonorrhoeae* Culture Confirmation Kit, Behring Diagnostics, Cupertino, California) and a carbohydrate utilization test (QuadFerm, bioMerieux Vitek Inc., Hazelwood, Missouri). Thirteen (62%) of the 21 isolates survived this transportation in room

temperature. Beta-lactamase testing was performed on these isolates as previously described. The minimum inhibitory concentrations (MICs) to penicillin, tetracycline, spectinomycin, ceftriaxone and ciprofloxacin were performed using previously described methods¹⁴. Chromosomal resistance to penicillin was defined by a penicillin G MIC of ≥ 2 mcg/ml for strains that did not produce beta-lactamase⁹. Chromosomally mediated resistance to tetracycline was defined by a tetracycline MIC of 2.0 to 8.0 mcg/ml⁹. Resistance to spectinomycin and ciprofloxacin were defined by MICs of ≥ 256 and ≥ 1.0 mcg/ml respectively^{9,10}. Decreased susceptibility to ceftriaxone was defined by a MIC of ≥ 0.06 mcg/ml.

Statistical methods

Standard statistical techniques were used to compare means (Student's *t*-test) and to compare proportions (Chi square). Odds ratios were calculated with 95% confidence intervals (2-tailed tests).

RESULTS

Two hundred and sixty patients were enrolled in the study. Of these, 137 were male and 123 were female. The median age was 26 years for males (mean 27.3 ± 7.5 , range 15-62) and 28 years for females (mean 29.6 ± 8.6 , range 17-55). Data regarding urban versus rural residence were available for 233 of the subjects and of these, only 13 (5.6%) were from rural areas. The study population was predominantly heterosexual, with only one male and one female admitting to bisexual activity. Behavioural characteristics of the population are shown in Table 1. Of note, only 7% of males and 10% of females consistently used condoms. Also, 45% of men and 33% of women surveyed reported prior history of STDs with an additional 18% of males and 17% of females giving internally inconsistent answers to 'prior history' questions, probably due to a lack of awareness concerning STDs. The majority of males (89.8%) were un-circumcised. The majority of both men and women believed alcohol use to be associated with the acquisition of their current STD symptoms. Douching was a common behaviour with 88/112 (78.6%) of women admitting to the practice. Among these women, 65/88 (73.9%) admitted to regular douching, and 58/65 (89.3%) douched more than once per week.

The clinical and laboratory diagnoses of the population are shown in Table 2. Due to initial difficulties with temperature regulation of the onsite incubator, gonorrhoea and trichomonas cultures were unavailable for 28 and 39 patients, respectively. An additional 7 women were not cultured for trichomonas. For those 232 patients with valid cultures for *N. gonorrhoeae*, the prevalence of gonorrhoea was 42/135 (31.1%) for males and 10/97 (10.3%) for females. Urethral Gram stains were positive for gonorrhoea in 2 patients with negative cultures and were considered indicative of a positive case. Two males had equivocal Gram stains for gonorrhoea with negative cultures and were considered not to be infected for the purpose of this analysis. Also, 26/132 (19.7%) of males were diagnosed with NGU by Gram stain. The sensitivity and specificity of urethral Gram stain for the diagnosis of gonorrhoea among males was 97% and 98% respectively compared to culture. Of note was a significant rise in the prevalence of gonorrhoea immediately after the national holiday (Naadam) for which the clinic had remained closed for 5 days and during which there was a considerable influx of people into Ulaanbaatar from the provinces (10/81 [12.3%] prior to the holiday versus 42/151 [27.8%] after the holiday $P=0.007$).

A positive diagnosis of chlamydia was made for 11/135 (8.1%) of males and 12/121 (9.9%) of females. Syphilis serologies were reactive and confirmed for 11/128 (8.6%) of males tested. Of these, 8/11 (72.7%) had clinical evidence of primary or secondary syphilis. An additional 3 males had a clinical diagnosis of primary syphilis with non-reactive serologies. Among females, the seroprevalence for syphilis was 7/116 (6%). Of these, 4/7 had RPR titres greater

than or equal to 1:8 dilutions and one patient (who was pregnant) had clinical evidence of secondary syphilis. Among females, 52/77 (67.5%) had positive cultures for *T. vaginalis*, 37/119 (31.1%) had bacterial vaginosis by Gram stain and 44/103 (43%) had a vaginal pH>4.5. Although 5 patients had sera which were reactive by ELISA for HIV, 2 of these repeatedly reactive, none was confirmed as positive by Western blot. Other clinical diagnosis included external genital warts (10 females, 6 males); genital herpes (4 females, 7 males); cervical cancer (5); pelvic inflammatory disease (1); epididymitis (3); testicular cancer (1) and chancroid (1 male). Of all patients enrolled in the study, 89/137 (65.0%) of males and 86/128 (69.9%) had convincing clinical or laboratory evidence of an STD. Gonorrhoea ($P<0.001$, OR=3.93 [1.77-8.94]) and genital ulcers ($P=0.029$, OR=3.41 [1.03-14.59]) were far more likely among men while chlamydia and serological evidence of syphilis differed little between both groups.

On-site susceptibility testing of the gonococcal isolates revealed that 21/50 (42%) had positive tests for beta-lactamase production. Disk diffusion studies suggested that 5/45 (11%) of the isolates had chromosomally mediated resistance to penicillin. Additionally, 8/45 (17.8%), 4/44 (9.1%), 7/45 (15.6%) and 5/44 (11.4%) of isolates had zone sizes in the resistant range for tetracycline, spectinomycin, ciprofloxacin and ceftriaxone respectively. Results of MIC testing for the 13 isolates successfully transported to Birmingham the following year (i.e. 1997) confirmed resistance to penicillin, tetracycline and ciprofloxacin only. Seven (54%) of these were beta-lactamase positive whereas 3 (23%) were chromosomally resistant to penicillin. Chromosomally mediated resistance to tetracycline was noted in 2/13 (15.4%) and 3/13 (23.1%) of the strains were resistant to ciprofloxacin with MICs=1.0 mcg/ml.

DISCUSSION

Despite rising rates of HIV infection in Asia, there is no evidence to suggest that HIV is currently a problem in Mongolia⁶. However, our study suggests that there is a significant problem with STDs, including antimicrobial resistant *N. gonorrhoeae* in this region. STDs are known to be an important factor in HIV transmission and outbreaks of STDs have been associated with significant increases in HIV in specific geographic regions¹⁵.

Although our data are limited to those patients attending the clinic in the capital city of Ulaanbaatar, indirect evidence suggests that STDs are problematic in the more rural provinces. The increase in gonorrhoea prevalence immediately following the national holiday suggests influx of infection from the rural areas, although it could simply reflect increased sexual activity among the residents and visitors in Ulaanbaatar. Anecdotally, the authors observed that many of the patients who were admitted to the 'in-patient' unit (and not enrolled in the study) had clinical evidence of syphilis.

Several of our findings are noteworthy and deserve further investigation and confirmation. Firstly, the extremely high rate of trichomoniasis among women needs to be confirmed with further sampling. Secondly, the rate of plasmid mediated resistance to penicillin which was found is quite high. Although the preliminary susceptibility studies using disk diffusion testing on-site in Mongolia suggested that resistance to multiple antimicrobials was present, such resistance could only be confirmed for penicillin, tetracycline and ciprofloxacin. Resistance to quinolones has been previously reported in North America, Asia and Russia^{16,17}. Currently, the antibiotics of choice for the treatment of gonorrhoea in the Ulaanbaatar STD clinic are kanamycin and ciprofloxacin, but these antibiotics, particularly the latter, are frequently prescribed for an extended length of time instead of as a single dose. Further, there is a thriving black market for antibiotics in the region, and the number of patients admitting to previous recent use of antibiotics is likely an underestimate. Our data regarding susceptibility patterns must be considered as preliminary. Further investigation into the susceptibility patterns of *N. gonorrhoeae* in this region needs to be performed.

Effective control of the current STD situation in Ulaanbaatar will not be easy. Inadequate diagnostic techniques currently in use combined with the lack of condom use and other high-risk sexual behaviour in the population will continue to contribute to high rates of STDs. Significant improvements in the infrastructure of the STD control programme as well as in health education and condom availability need to be made in an attempt to combat this serious problem and prevent the spread of HIV in this region.

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Table 1
Behavioural and demographic characteristics of the study population

	Men (n=137)	Women (n=123)
Mean age (years)±SD	27.3±7.5	29.6±8.6
Mean age at first intercourse±SD	17.6±2.6	19.2±2.3
Mean number of lifetime partners±SD	11.0±11.2	2.2±1.6
Median number of lifetime partners	8	2
Prior history of STD	55/123 (44.7%)	37/114 (32.5%)
Condom use (last 3 months):		
None	39/100 (39%)	57/100 (57%)
</=50%	41/100 (41%)	26/100 (26%)
>50% but <100%	13/100 (13%)	7/100 (7%)
100%	7/100 (7%)	10/100 (10%)
Believed alcohol associated with current STD symptoms	75/107 (70.1%)	84/103 (81.5%)
Antibiotic use (in past 2 weeks)	28/121 (23.1%)	20/114 (17.5%)

Table 2
Clinical and laboratory diagnoses of STDs

	Men (n=137)	Women (n=123)
Clinical		
Urethritis/cervicitis	58/136 (42.6%)	34/123 (27.6%)
Genital ulcer disease	14/136 (10.3%)	4/123 (3.3%)
Genital warts	6/136 (4.8%)	10/123 (8.1%)
Laboratory		
Non-gonococcal urethritis [*]	26/132 (19.7%)	NA
Bacterial vaginosis	NA	37/119 (31.1%)
Trichomoniasis	NA	52/77 (67%)
Gonorrhoea [†]	42/135 (31.1%)	10/97 (10.3%)
Chlamydia	11/135 (8.1%)	12/121 (9.9%)
Syphilis (seroprevalence)	11/128 (8.6%)	7/116 (6%)
Clinical/Laboratory evidence of an STD	89/137 (65%)	86/123 (69.9%)

Missing data for selected studies account for discrepant denominators

^{*} As defined by >5 white blood cells/oil, absence of Gram-negative diplococci

[†] As defined by positive Gram stain or culture