SEXUALLY TRANSMITTED INFECTIONS AMONG MALE HIGHWAY COACH DRIVERS IN MYANMAR

Wah Wah Aung[1], Myo Thant[2], Khin Thet Wai[3], Mya Mya Aye[1], Phyu Win Ei[1], Thuzar Myint[1] and Moe Thidar[3]

[1]Bacteriology Research Division, Department of Medical Research (Lower Myanmar); [2]National AIDS Programme, Department of Health; [3]Epidemiology Research Division, Department of Medical Research (Lower Myanmar), Ministry of Health, Myanmar

Abstract. A cross sectional descriptive study was conducted from February 2008 to December 2009 at the largest Highway Terminal, Yangon, Myanmar to determine the prevalence of curable STIs (syphilis, gonorrhea, chlamydial infections, and trichomoniasis), to find out the associated factors for STIs, and to determine the antibiotic susceptibility pattern of gonococcal infection among highway drivers. Urine and blood specimens were collected from 601 male highway coach drivers after an interview about their behavior. Standard laboratory tests were carried out to detect STIs. Multivariate analysis was used to ascertain potential risk factors for STIs. The prevalence rates of syphilis, gonorrhea, chlamydial infections, and trichomoniasis were 4.8, 4.3, 5.7, and 9.8%, respectively. One hundred and two (17.0%) were infected with at least one of the tested four STIs, and 34 (5.7%) had STI co-infections (2STIs). Those who had multiple sexual contacts were likely to be infected with at least one STI, and those who had a history of inconsistent condom use within past two weeks and multiple sexual contacts were more likely to have STI co-infections ($p<0.05$). Antimicrobial susceptibility of 21 *Neisseria gonorrhoeae* isolates showed that 85.7% were susceptible to azithromycin, 80.9% to spectinomycin, 66.7% to cefixime, 61.9% to ceftriaxone, and 38.1% to ciprofloxacin. The high prevalence of STIs in this study and the decreased susceptibility of *Neisseria gonorrhoeae* to cephalosporin and fluoroquinolone highlighted the role of periodic screening in early diagnosis and effective treatment of STIs among high-risk populations.

Keywords: sexually transmitted infections, highway drivers, prevalence, gonococcal antimicrobial susceptibility, Myanmar

INTRODUCTION

Sexually transmitted infections (STIs) continue to cause significant morbidity and mortality throughout the world. Syphilis, gonorrhea, chlamydial infections and trichomoniasis are the commonest curable STIs. The World Health Organization (WHO) estimates that 340 million new STIs occurred throughout the world in men and women aged between 15-49 years and the largest number of infections occurred in the South and Southeast Asia (WHO SEARO, 2008). In Myanmar STIs are ranked as the fourteenth priority

Correspondence: Dr Wah Wah Aung, Bacteriology Research Division, Department of Medical Research (Lower Myanmar), Nº 5 Ziwaka Road, Yangon 11191, Myanmar.
Fax: 95-1-251514
E-mail: drwahwahaung@gmail.com, wahwahaung@mail4u.com.mm

health problem among 42 priority diseases in the National Health plan (2006-2011) (Ministry of Health, Myanmar, 2008).

STIs are an important health priority in themselves, and also because of their association with human immunodeficiency virus (HIV) and AIDS. The presence of STIs facilitates the acquisition and transmission of HIV infection. Therefore, prevention and control of STIs have gained greater importance with the emergence of HIV/AIDS.

Highway drivers have been identified as a highly mobile population and they have a high risk life style for STIs (Leung *et al*, 2009). As elsewhere in Myanmar, work conditions for highway drivers are conducive to high-risk sexual activity (frequent absence from home, easy access to sex workers, and frequent travel to border areas). Moreover, they are also an important group for transmission of STIs to their female partners. Failure to diagnose and treat the curable STIs can have serious complications such as infertility, pelvic inflammatory diseases, miscarriage, prematurity, and neonatal infections in men, women and newborns (Brooks *et al*, 2004).

A cross sectional study at a truck stand in Dhaka, Bangladesh accessed the prevalence and risk factors of STDs among 388 truck drivers and helpers. The levels of prevalence of disease were herpes simplex virus-2 (25.8%), serological syphilis (5.7%), gonorrhea (2.1%), chlamydiasis (0.8%) and the risk factor was having sex with a commercial sex worker in the past year (Gibney *et al*, 2002). Trichomoniasis, which is one of the most prevalent STIs in women, was more prevalent in male Kenyan transport workers than both gonococcal and chlamydial urethritis and 85% of the cases were asymptomatic (Watson-Jones *et al*, 2000).

The prevalence of candidiasis, trichomoniasis, bacterial vaginosis and gonococcal infection was found to be higher in married women of mobile military population than those of less mobile population in suburban Yangon Region, Myanmar (Thein-Myint-Thu *et al*, 2008).

Since no community-based study on the magnitude of STIs has been conducted among the asymptomatic male population in Myanmar, this study focuses upon a specified male population, the highway drivers. As one of the special activities of National AIDS/STD control program, the highway drivers are required to have blood tests for syphilis and HIV when they update their driving licenses once every two years. Thus, our findings will add to the findings from routine surveillance of HIV and syphilis in our study population.

The World Health Organization reported that gonorrhea might soon become untreatable as improper use of antibiotics has resulted in widespread antimicrobial resistance of first-line antibiotics (WHO, 2010). Thus the present study was carried out to determine the prevalence of certain curable STIs (syphilis, gonorrhea, chlamydiasis and trichomoniasis), to find out the associated factors for STIs and to determine the antibiotic susceptibility pattern of gonococcal infection among highway coach drivers.

MATERIALS AND METHODS

Study design, site and population

A cross-sectional station-based descriptive study was carried out at Aungmingalar Highway Bus Terminal, the largest highway station in Mingaladon Township, Yangon. The recruitment sites

were the travel agencies where all the drivers need to go for their trip arrangements.

A total of 601 male highway drivers were enrolled in the study, which was conducted after written informed consent was obtained. The eligible participants were long-distance male highway drivers of any age, married or unmarried, who were registered at the highway bus terminal. Long-distance driving means the duration for a round trip is at least two days. The drivers working in a long driving service for less than six months were not included in the study.

Data collection

The research team visited the recruitment sites and eligible participants were invited to participate. Face-to-face interviews were carried out by trained male research assistants in a room with complete privacy. Structured interview questionnaires constructed to explore socio-demographic characteristics; knowledge and experiences on STIs, behavioral determinants, life style, and perception to STIs were used.

After the interview, the respondents were examined by the male medical officer. Clinical history related to symptoms of STIs was taken and external genitalia examination was carried out. Then venous blood and first voided urine specimens were collected to perform laboratory procedures.

Laboratory diagnosis

At the study site, about 20 ml of first-voided urine and 3 ml of venous blood were collected. The specimens were transported in an ice-box to the Department of Medical Research (Lower Myanmar) for laboratory procedures.

Within 6 hours of specimen collection, the urine specimens were mixed thoroughly and 5 ml aliquots of urine were stored at -20ºC to perform Polymerase Chain Reaction (PCR). A 10 ml aliquot from each specimen were centrifuged at 3,000 rpm for 10 minutes and the urinary deposit were tested for culture and microscopy according to the method described by van Dyck *et al* (1999). Sera were separated from the blood samples by centrifugation and kept at -20ºC until tests for syphilis were done.

Detection of *Trichomonas vaginalis*

A drop of re-suspended urine pellet was used for wet-mount microscopy and culture onto Diamond modified Trichomonas medium. The Trichomonas medium was incubated at 35ºC for up to 7 days and positive growth was checked by microscopy on wet films and Giemsa stained smears.

Isolation and antibiotic susceptibility testing of *Neisseria gonorrhoeae*

Urine pellet was inoculated onto Modified Thayer Martin agar and chocolate agar at 35ºC for up to two days in the CO_2 incubator for isolation of *Neisseria gonorrhoeae*. The confirmed *Neisseria gonorrhoeae* isolates was preceded for drug susceptibility testing by the Kirby-Bauer disc diffusion method using azithromycin, cefixime (5 g), ceftriaxone (30 g), ciprofloxacin (5 g), kanamycin (30 g), spectinomycin (100 g), sulfamethoxazole-trimethoprim (25 g) disks (Oxoid, Hampshire, England). The results were interpreted as susceptible, intermediate, and resistant according to the guidelines of the Clinical and Laboratory Standards Institute (2005).

Detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* by PCR

Detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* was carried out

Table 1
Demographic, socio-economic and mobility characteristics of highway coach drivers (*N*=601).

Characteristics	Frequency	%	Median/Mean±SD	Range
Age in completed years			32[a]	
≤24 years	114	19.0		
25-39 years	309	51.4		
≥40 years	178	29.6		
Marital status				
Single	203	33.8		
Married	381	63.3		
Separated/divorced/widowed	17	2.9		
Education status				
Illiterate/just read and write	9	1.5		
Monastic	14	2.3		
Primary	109	18.1		
Middle	252	41.9		
High school and above	217	36.2		
Average monthly family income (MMK)[b]			70,000[b]	8,000-500,000
Duration of high way driving career (years)			6.23±5.06	1-30
Reaching border areas in high way trip				
Yes	250	41.6		
No	351	58.4		
Duration per highway trip				
≤2 days	272	45.3		
3-7 days	317	52.7		
>7 days	12	2.0		
Experience of STI symptoms				
Burning micturition (*N* = 601)	227	37.8		
Treated during last episode[c]	87	38.3		
Painful micturition (*N* = 601)	188	31.3		
Treated during last episode[c]	80	42.5		
Urethral discharge (*N* = 601)	66	11.0		
Treated during last episode[c]	46	69.7		
Other STI symptoms (*N* =601)				
Pain in genitals[c]	33	5.5		
Ulcers in genitals[c]	25	4.2		
Inflamed inguinal glands[c]	30	5.0		

[a]Median; [b]USD1 ≈ MMK900; [c]Out of 601

by multiplex polymerase chain reaction as described by Mahony *et al* (1995). Lambda phage-Neisseria hybrid DNA was used as an internal control for PCR assay (Nasution, 2003).

Detection for syphilis (*Treponema pallidum*)

The Immutrep® Rapid Plasma Reagin (RPR) test (Omega Diagnostics, Alva, UK) was used, and a positive test was con-

Table 2
Prevalence of curable sexually transmitted infections (N = 601).

Type of STI	Total	No. positive	% Positive	95% CI
Single infection				
Syphilis	601	29	4.8	2.2 - 11.2
Gonorrhea	601	26	4.3	1.6 - 9.8
Trichomoniasis	601	59	9.8	5.5 - 17.4
Chlamydia	601	34	5.7	2.8 - 12.5
Combinations				
STI co-infections (≥ 2 STIs)	601	34	5.7	2.8 - 12.5
Non-ulcerative STIs[a]	601	88	14.6	9.3 - 23.3
At least one STIs (1-4 STIs)	601	102	17.0	10.9 - 23.5
All 4 STIs combined	601	3	0.5	0.2 - 5.4

[a]Combined gonorrhea, chlamydial infection, and trichomoniasis.

firmed by Immutrep® *Treponema pallidum* Hemagglutination (TPHA) test, (Omega Diagnostics, Alva, UK).

Men were defined as having a specific STI if any of the laboratory tests for syphilis, *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, or *Chlamydia trachomatis* were positive.

Treatment protocol for the participants

The participants who had positive laboratory results for STIs were referred to the Sexually Transmitted Diseases STD team for counseling and treatment. Counseling was following the national guidelines (Ministry of Health, Myanmar, 2006). The team leader of Township STD Control Team took responsibility for treating the patient. Choice of drugs was based on potential sensitivity to particular drugs and contraindications.

Partner notification of syphilis

If a driver was found to have positive RPR and TPHA tests, the wife or regular partner was informed by either patient referral or provider referral, and treatment was provided according to national guidelines (Ministry of Health, Myanmar, 2006). For the other STIs and RTIs, partner notification was voluntary, non-coercive, and mainly by the patient's referral. In Myanmar, syphilis is a priority notifiable disease. For other STIs and RTIs, partner notification was voluntary without any coercion.

Data analysis

Study subjects found positive for at least one of the four STIs (syphilis, gonorrhea, chlamydial infection and trichomoniasis) that were diagnosed were considered as having "infection with STIs". All statistical tests were based on a 2-sided p-value, in which $p \leq 0.05$ was considered significant. All data were entered in the EpiData database management program version 3.0 (The EpiData Association, Odense M. Denmark, http://www.epidata.dk) and analyses were done using the SPSS version 17.0 (Norusis, 2009). For multivariate analysis binary logistic regression procedure was used to identify the likely predictors for being infected with at least one curable STI (dependent variable) when controlling for other independent variables. The model selected independent variables from initial bivariate

Table 3
Associated factors for likelihood of at least one curable STIs (1-4 STIs) in highway coach drivers.

Characteristics	At least one curable bacterial STI (1-4 STIs)							
	1-4 Positive (n = 102)		Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
	No.	%						
Age								
<24 years	14	14.6	1.0					
≥24 years	88	17.4	1.2	0.7-2.3	0.560		2.2-11.2	
Marital status								
Currently married	38	17.3	1.0					
Not married[a]	64	16.8	0.9	0.6-1.5	0.910			
Age at marriage								
<20 years	14	23.3	1.0					
≥20 years	57	16.9	0.7	0.3-1.3	0.270			
Border trip								
No	56	16.0	1.0					
Yes	46	18.4	1.2	0.7-1.8	0.440			
Duration per trip								
<2 days	41	15.1	1.0					
≥2 days	61	18.5	1.3	0.8-1.9	0.280			
Multiple sexual contacts								
None/not reported	14	14.1	1.0			1.0		
Single partner	55	13.8	0.9	0.5-1.8	0.870	0.9	0.5-1.8	0.88
Multiple partners	33	32.4	2.9	1.4-5.9	0.003	2.5	1.1-5.5	0.03
Condom use								
No/non-response	59	14.8	1.0			1.0		
Yes	43	21.4	1.6	1.0-2.4	0.050	0.9	0.5-1.6	0.73
Condom use within past two weeks								
No/non-response	85	15.5	1.0			1.0		
Yes	17	32.7	2.7	1.4-4.9	0.003	1.7	0.8-3.7	0.14
Previous experience of STI symptoms								
No	45	13.9	1.0			1.0		
Yes	57	20.6	1.6	1.0-2.5	0.040	1.2	0.8-1.9	0.42
Exposure to IEC								
Multiple source	91	18.4	1.0			1.0		
Single source	11	10.4	0.5	0.3-0.9	0.050	0.5	0.3-1.0	0.06

[a]Including single, widow, divorced; IEC, information education and communication

analysis using the cut-off point of probability of ≤ 0.10 for entry and ≥ 0.20 for removal and the Hosmer-Lemeshow test was used to assess the goodness of fit of the model (Hosmer and Lemeshow, 2000).

RESULTS

Demographic characteristics and experiences of STI related symptoms

The demographic, socio-economic

Table 4
Associated factors for likelihood of STI co-infections in highway coach drivers.

Characteristics	STI co-infections (≥2 STIs)			Total
	None No. (%)	Single infection No. (%)	Co-infections No. (%)	No. (%)
Age in years				
< 24	82 (85.4)	8 (8.3)	6 (6.2)	96 (100.0)
≥ 25	417 (82.6)	60 (11.9)	28 (5.5)	505 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 1.05, df = 2, $p = 0.59$			
Marital status				
Currently not married	182 (82.7)	25 (11.4)	13 (5.9)	220 (100.0)
Currently married	317 (83.2)	43 (11.3)	21 (5.5)	381 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 0.04, df = 2, $p = 0.98$			
Age at marriage				
<20 years	46 (76.7)	10 (16.7)	4 (6.7)	60 (100.0)
≥20 years	281 (83.1)	39 (11.5)	18 (5.3)	338 (100.0)
Total	327 (82.2)	49 (12.3)	22 (5.5)	398 (100.0)
	Chi-square = 1.51, df = 2, $p = 0.47$			
Duration per round trip				
≤2 days	231 (84.9)	28 (10.3)	13 (4.8)	272 (100.0)
>2days	268 (81.5)	40 (12.2)	21 (6.4)	329 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 1.35, df = 2, $p = 0.51$			
Border travel				
No	295 (84.0)	37 (10.5)	19 (5.4)	351 (100.0)
Yes	204 (81.6)	31 (12.4)	15 (6.0)	250 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 0.64, df = 2, $p = 0.73$			
Experience of non ulcerative STI				
No	279 (86.1)	31 (9.6)	14 (4.3)	324 (100.0)
Yes	220 (79.4)	37 (13.4)	20 (7.2)	277 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 4.92, df = 2, $p = 0.09$[a]			
Condom use				
Not used/Non-response	341 (85.2)	40 (10.0)	19 (4.8)	400 (100.0)
Used	158 (78.6)	28 (13.9)	15 (7.5)	201 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 4.3, df = 2, $p = 0.12$			
Inconsistent condom use within past two weeks				
Not used/Non-response	464 (84.5)	60 (10.9)	25 (4.6)	549 (100.0)
Used	35 (67.3)	8 (15.4)	9 (17.3)	52 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 16.2, df =2, $p = 0.0005$[b]			
Multiple sexual contact				
None/Non-reported	85 (85.9)	8 (8.1)	6 (6.1)	99 (100.0)
Single partner	345 (86.2)	42 (10.5)	13 (3.2)	400 (100.0)
Multiple partners	69 (67.6)	18 (17.6)	15 (14.7)	102 (100.0)
Total	499 (83.0)	68 (11.3)	34 (5.7)	601 (100.0)
	Chi-square = 27.4, df =4, $p = 0.0005$[b]			
Source of IEC				
Multiple sources	404 (81.6)	60 (12.1)	31 (6.3)	495 (100.0)
Single source	95 (89.6)	8 (7.5)	3 (2.8)	106 (100.0)
	Chi-square = 4.1, df =2, $p = 0.13$			

[a]Marginally significant; [b]Highly significant; IEC, information education and communication

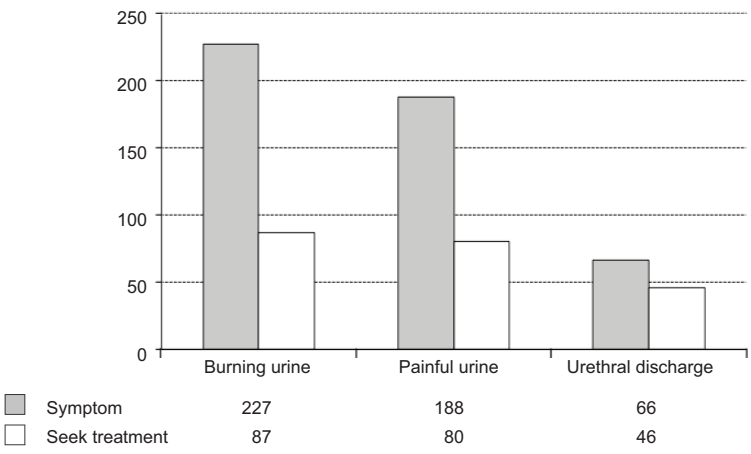

Fig 1–Experiences of STI related symptoms and treatment seeking behavior (*N*=601).

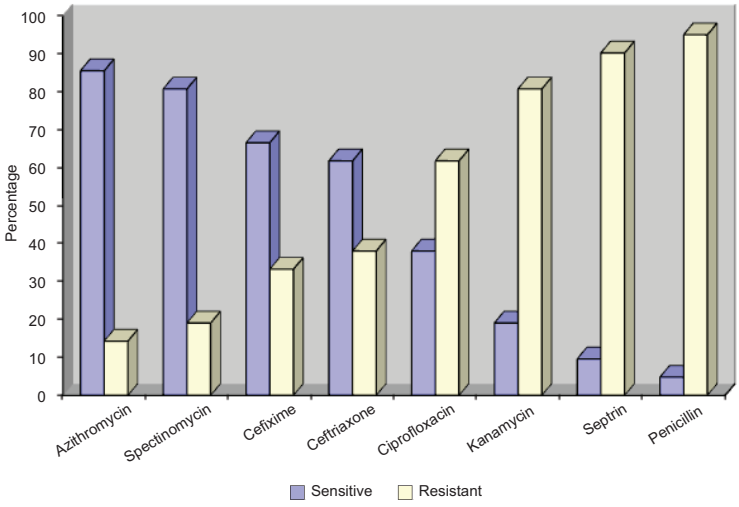

Fig 2–Antibiotic susceptibility pattern of *Neisseria gonorrhoeae* isolates (*n*=42).

and mobility characteristics of highway coach drivers are shown in Table 1. Majority were married men of 25-39 years age group with median family monthly income of about US$ 77 (1US$ ≈ 900 Kyats). More than 40% of them reached borders areas in highway trips and more than 50% spent about 3 days to one week during one highway trip.

Regarding the STI related symptoms and treatment seeking behavior, over 30% of the participants had experiences of having symptoms of burning and painful micturition in their life time and only about 40% of them sought for treatment. History of urethral discharge was found only in 11 % of the participants but 69.7% of them sought treatment for these symptoms. Other STI symptoms such as pain and ulcers in genital and inflamed inguinal lymph nodes were found in ≈5% (Fig 1).

Prevalence of STIs

Of 601 participants, prevalences of STIs were trichomoniasis 59 (9.8%), gonorrhea 26 (4.3%), syphilis 32 (4.8%) and chlamydial infection 34 (5.7%). Single infection was found in 68 (11.3%). Co-infections of ≥ 2 STIs were found in 34 (5.7%), non-ulcerative STIs (gonorrhea, chlamydial infections and trichomoniasis) were found in 88 (14.6%) and all 4 STI co-infections were found in 3 (0.5%) of cases. One hundred and two (17%) was found to be infected with at least one of tested 4 STIs (Table 2).

Associated factors for likelihood of STIs in highway coach drivers

According to the bivariate analyses, 17.4% of highway coach drivers in ≥24

years age group, 16.8% of those who currently not married, 17% of those who married late ≥ 20 years, 18.4% of respondents with reported border trip in the previous year, and 18.5% of those with duration of border trip of ≥2 days suffered from at least one curable bacterial STI. However, there were no significant differences from the corresponding reference categories. The history of condom use at any time in the past, their reported condom use within past two weeks, and their previous experience of STI symptoms revealed significant odds to suffer from at least one curable bacterial STI (Table 3).

Binary logistic regression analysis was conducted to explore the associations between curable STIs and demographic characteristics, mobility characteristics, sexual risk behaviors, experience of STI symptoms. There was no significant association between age, marital status, age at marriage, border trip, and duration per trip with STIs in the multivariable model.

Highway coach drivers who had experience of multiple sexual partners (adjusted OR 2.5; 95% CI 1.1-5.5, p=0.03)were significantly more likely to be infected with at least one STI when controlling other variables (Table 3).

Associated factors for likelihood of STI co-infections in highway coach drivers

Bivariable analysis indicated highway coach drivers who had history of inconsistent condom use within past two weeks ($p < 0.0001$) and those who had multiple sex contacts ($p < 0.0001$), were significantly found to have STI co-infection (Table 4). We did not proceed with multivariable analysis.

Antimicrobial susceptibility pattern of *Neisseria gonorrhoeae*

The gonococcal antimicrobial susceptibility pattern was analyzed on 21 isolated *N. gonorrhoeae* strains. We found that 85.7% of the isolates were susceptible to azithromycin, 80.9% to spectinomycin, 66.7% to cefixime, 61.9% to ceftriaxone, and 38.1% to ciprofloxacin. The isolates were highly resistant to penicillin (95.2%), sulfamethoxazole-trimethoprim (90.4%), and kanamycin (80.9%) (Fig 2).

Ethical considerations

This study was approved by The Ethical Review Committee on Medical Research Involving Human Subjects (Lower Myanmar) (Ref Nº 24 Ethics 2006, 2006 Jun 21) and the WHO Research Ethics Review Committee (Ref Nº A65225, 2007 Jul 18).

DISCUSSION

This station-based study demonstrated that men working as highway coach drivers in Yangon had a fairly high prevalence of syphilis, gonorrhea, chlamydial and Trichomonas infections like other studies on same population in India, China, and Bangladesh (Manjunath *et al*, 2002; Chen *et al*, 2006; Alam *et al*, 2007). When compared to Myanmar studies, these rates were considerably higher than those reported in the general population of Yangon, although lower than that of symptomatic patients attending sexually transmitted clinics (Nyein *et al*, 2003; Wah-Wah-Aung *et al*, 2007).

The prevalence of trichomoniasis (9.8%) was found to be highest among tested four STIs. Although trichomoniasis is a common STI among women, there has been very little information on *Trichomonas vaginalis* infection that causes asymptomatic urethritis among the male population. A previous community-based study among sub-urban married women in Yangon Division showed high infection rate of 25.2% (Thein-Myint-Thu *et al*, 2008). A study in Mwanza, Tanzania

reported high prevalence (11%) among rural men (Watson-Jones *et al*, 2000). A study in Zaire also reported that trichomoniasis can increase risk of acquiring HIV infection (Laga *et al*, 1993). The high prevalence of trichomoniasis in asymptomatic men found in the present study indicated that it can be a potential reservoir in the community, and screening of this infection among the high risk population (both men and women) is needed.

The findings on the demographic, socio-economic, and mobility characteristics supported the suggestion that Myanmar highway drivers are highly mobile population, and they have high-risk lifestyle for STIs.

Regarding the experience of STI symptoms and treatment seeking behavior, over 30% of highway drivers had previous experiences of having symptoms of burning and painful micturition, but only ≈40% of them sought treatment. A history of urethral discharge was found only in 11% of the participants, but 69.7% of them sought treatment for that symptom. These findings indicated that individuals might also fail to recognize urinary symptoms as the manifestations of STI.

The syndromic management approach of STI relies on symptom recognition by an infected person who, as a consequence, seeks medical care. Reliance on reported symptoms may miss asymptomatic infections. The present finding supports the fact that public health programs should target asymptomatic infections.

Multiple sexual partners was found to be a significant associated factor for STIs among highway coach drivers. Those who had exposure to information, and education and communication materials (IEC) on STI from single source were more likely to be infected with STI than those who had IEC from more than one source (*eg*, health personnel combined with print media). These findings could provide the necessary information to the National AIDS/STD Control Programme for choosing suitable implementation program for effective prevention, control, and health education.

Of the study participants, 8.7% (52/601) had condom use within the past two weeks, and they were inconsistent users as they failed to use condom regularly, or some used condom when having sex with commercial sex workers, but not with their wives, and some may use condom incorrectly. They were significantly likely to have STI co-infections (p=0.0005). Therefore, IEC programs on protective condom culture within high-risk communities should be promoted.

The worldwide prevalence of gonorrhea and the emergence of antibiotic resistant *N. gonorrhoeae* reinforce the need for surveillance of its susceptibility to antibiotics commonly used for treatment. The antibiotics included in the currently recommended WHO regimen are ciprofloxacin, ceftriaxone, cefixime, azithromycin and spectinomycin. Kanamycin and sulfamethoxazole- trimethoprim are the drugs for the alternative regimen.

The antimicrobial susceptibility pattern of 21 isolated *N. gonorrhoeae* strains revealed that 85.7% were susceptible to azithromycin, 80.9% to spectinomycin, 66.7% to cefixime, 61.9% to ceftriaxone and 38.1% to ciprofloxacin. The isolates were highly resistant to penicillin (95.2%), trimethoprim-sulfamethoxazole (90.4%) and kanamycin (80.9%). Thus decreased susceptibility of gonococcal isolates to ceftriaxone and ciprofloxacin and high resistance of drugs used for alternative regimen were noted in the present study.

Fluoroquinolone-resistant gonococci have appeared in several Asian countries since early 1990 (Ieven *et al*, 2003). Although quinolones, such as ciprofloxacin, and third generation cephalosporin, such as ceftriaxone and cefixime, are recommended as the first line of therapy for gonorrhea, the emergence of significant resistance to these drugs in the high-risk population will limit their usefulness.

The present study indicated that azithromycin and spectinomycin were more effective on *N. gonorrhoeae*. Wah-Wah-Aung *et al* (2007) described 87.5% azithromycin susceptibility and 80% cefixime susceptibility of gonococcal isolates among symptomatic women attending STD and gynecology clinics in Yangon. The present finding suggested that the susceptibility pattern of currently recommended antibiotics used for the treatment of gonococcal infection, and these results could provide useful information to National AIDS/STD Control Program in Myanmar.

In conclusion, the high prevalence of curable STIs and the decreased susceptibility of *Neisseria gonorrhoeae* to cephalosporin and fluoroquinolone among highway coach drivers highlighted the role of periodic screening in early diagnosis and effective treatment of STIs among the high-risk population. The present study also suggested that there are significantly associated factors for STIs. The research findings provide benefit, not only in the selection of strategies to manage the STI problem in the high risk male population, but also by initiating possible strategies to protect their female partners from fertility threatening infections.

ACKNOWLEDGEMENTS

Our thanks go to the Special Programme of Research, Development and Research Training in Reproduction (WHO/HRP) for funding support of Project ID A 65225: Sexually transmitted infections among male highway drivers in Myanmar; to Dr Katherine Bathike, WHO/RHR for guidance throughout the study; to Professor Ngeow Yun Fong, Department of Medical Microbiology, University of Malaya, Malaysia, for supervision of laboratory procedures; to authorities for necessary arrangements; and to the participants for their active participation.

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