

Original Articles

Sexually Transmitted Infections in Adolescents

SY CHENG, KK Lo

Abstract

Adolescents are at high risk for acquiring sexually transmitted infections. In particular, genital chlamydia infection and gonorrhoea predominantly affect adolescents. There is also an increasing reservoir of asymptomatic patients who are infected with genital human papillomavirus, herpes simplex and human immunodeficiency virus. Multiple factors contribute to the increased risk of acquiring sexually transmitted infections in adolescents, including psychosocial development, socio-cultural changes, biological susceptibility and sub-optimal health care access. From 1991 to 2000, the Social Hygiene Service has recorded an increase in the incidence of all types of sexually transmitted diseases from 12446 to 28541 for all patients and from 394 to 976 for adolescent patients. The increment in both groups was largely due to an increase in incidences of non-gonococcal urethritis in men and nonspecific genital infection in women. Target group oriented preventive programs which base on behavioural interventional therapies should be enhanced. In addition, the ABC rules of prevention of sexually transmitted infections should be publicized to all teenagers.

Key words

Adolescent; Hong Kong; Sexually transmitted infections

Introduction

Sexually transmitted infections (STIs) are common and they can be prevented by behavioural intervention. However, most of the STIs are either subclinical or asymptomatic and hence will easily be undiagnosed or under-recognized by health care workers and adolescents themselves. In United States, STIs have become a hidden epidemic and the estimated annual health costs reached US\$17 billion.¹ An estimate of fifteen million people would be infected with one or more STIs each year and out of these, approximately three million occurred in the adolescent age group from 15 to 19 years old.^{1,2}

In this article, the age definition of adolescents was arbitrarily defined as from 13 to 19 years old. Those below the age of 13 were less likely to be sexually active whereas those above 19 were considered as adults. Several factors draw our concern towards STI prevention in adolescents. Firstly, most population-based incidence or prevalence rates of STIs in adolescents were likely to be underestimated. The crude rate of STIs in the whole adolescent population does not accurately reflect the actual incidence of STIs in the sexually active portion. It is expected that the incidence of STIs is much higher in the sexually experienced adolescents. Secondly, some STIs, in particular gonococcal and genital chlamydial infection, predominantly affect adolescents and may result in serious sequelae.³ Thirdly, any preventive measures against health habit such as the concept and message of safer sex and persistent condom use should be promoted early. Finally, it was shown that the risk for acquiring human immunodeficiency virus (HIV) infection was enhanced in patients who have co-existing STIs.⁴ Therefore, successful prevention of the spread of HIV infection can be enhanced by early detection and treatment of STIs.

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Risk Factors for Acquiring STIs in Adolescents

Multiple factors contribute to the high prevalence rates of STI in adolescents. These factors include psychosocial development associated with transition from childhood to adulthood, socio-cultural changes, biological susceptibility to STIs and health care access issues.

Adolescents have undergone significant psychological, physiological and social development before they reach adulthood. Each development may not run in parallel with each other. Behaviourally, adolescents are more likely to have sequential or concurrent multiple sexual partners, to engage in unprotected sex and to select high-risk sexual partners.⁵ They are less likely to recognize or understand the potential consequences of current risky behaviours. Therefore, they may not have any initiation to change their current behaviour.⁵

As a result of socio-cultural and behavioural changes, the age of first sexual intercourse has steadily decreased in the past two decades. In United States, the National Center for Health Statistics found that respectively 55% and 49% of adolescent males and females were sexually active.⁶ More female adolescents were found to have first sexual intercourse before the age of 15 in 1995 (19%) when compared with 1988 (11%) whereas the corresponding figures for male adolescents were stable in both time periods (21%).⁶ A substantial proportion of adolescents (29% of females and 19% of males) had unprotected recent sexual intercourse.⁶ Risk factors for earlier sexual experience and engaging in risky sexual behaviours included: less educated mothers, mothers who delivered their first baby in the adolescent period, single-parent families and poor academic result.⁶ In Hong Kong, it has been concluded that adolescents today tend to be more sexually permissive on an analysis of several local sexuality studies.⁷ Among those who are working (18 to 19 years old), their rates of sex experience before 19 are 53% for male and 42% for female.⁷

Adolescent women are biologically more susceptible to STIs. During the pubertal development, the cervix and vagina undergo dramatic histological changes due to estrogen exposure. The epithelial lining of the vagina and cervix thickens and undergoes squamous metaplasia. The cervical columnar epithelium eventually recedes completely, to be replaced with squamous epithelium. This replacement process is gradual and continues into adulthood. Hence, the cervix in adolescent still displays areas of exposed columnar epithelium. This is often referred to as "cervical ectopy".⁸ The vasculature found with the

columnar epithelium is more superficial and more easily traumatized than that of squamous epithelium. Hence the presence of cervical ectopy increases the chance of developing infection, such as genital chlamydia trachomatis and gonococcal infection, which primarily infects the columnar epithelium.

It is often not successful to persuade sexually active adolescents to attend health clinics regularly for STI screening. Factors discouraging the adolescents to seek health advice and medical treatment include: asymptomatic nature of most STIs, inability to recognize the symptoms, concern about confidentiality, and cultural setting to impose feeling of discomfort with facilities and services designed for adults.

Local Trend of STIs in Adolescents

Social hygiene service, under the Department of Health, is a public institution to treat patients with dermatological diseases, STIs and leprosy. One of the major aims of the service is to provide effective control of STIs through accurate diagnosis, effective treatment, contact tracing and health education and counselling. The service is totally free of charge and no referral letter is required. Confidentiality is strictly kept for each patient.

In Hong Kong, STIs are not notifiable communicable diseases and thus there would be no officially reported incidence. Since over 80% of the STIs were diagnosed and treated in the private sector, the statistical data provided by Social Hygiene Service only reflect part of the actual incidence of STIs in Hong Kong.⁹

From 1991 to 2000, the incidences of all types of STIs increased from 12446 to 28541 for all patients and from 394 to 976 for adolescent patients (age 13 to 19) (Figure 1). The increment in both adult and adolescent groups was largely due to the increase in incidence of non-gonococcal urethritis in male and non-specific genital infection in female (Figure 2), which are defined as equal or more than 10 pus cells per high power field in the urethral and/or more than 30 pus cells in the cervical gram-stained smears without evidence of gonorrhoea. This category of disease is predominantly caused by genital chlamydial trachomatis infection. A gradual rising trend of the incidences of genital wart (Figure 3) and early syphilis (Figure 4) in adolescents was also noted. On the other hand, the incidence of gonorrhoea (Figure 5) remained steady in the early nineties, which then declined in the mid-nineties and subsequently showed an upward trend after 1998. The incidence of genital

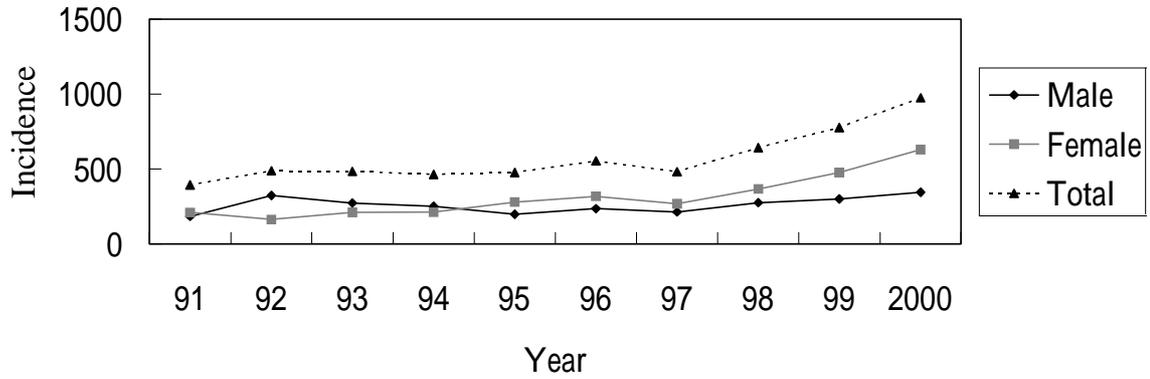


Figure 1 Trend of incidences of all types of sexually transmitted infections in adolescent patients, 1991-2000.

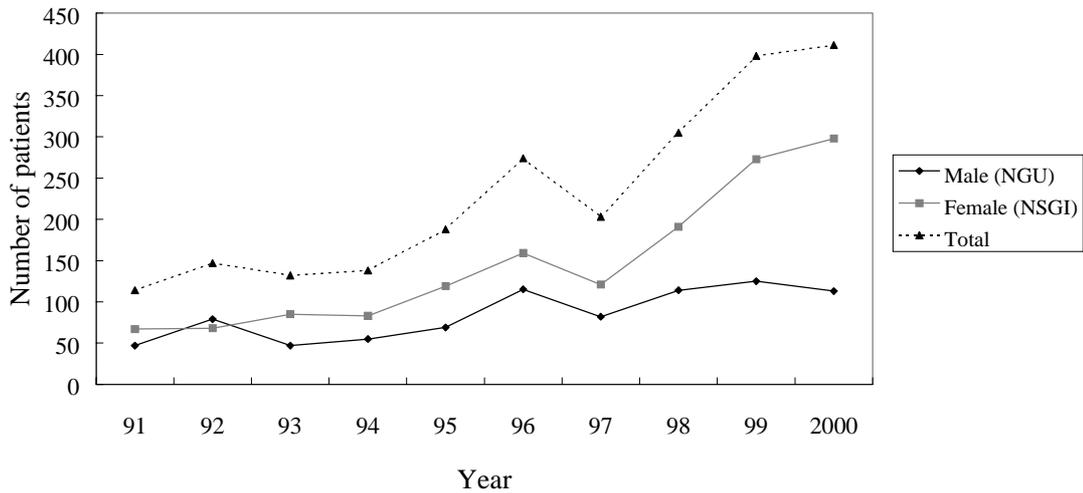


Figure 2 Incidences of non-gonococcal urethritis (NGU) and non-specific genital infection (NSGI) in adolescent patients, 1991-2000.

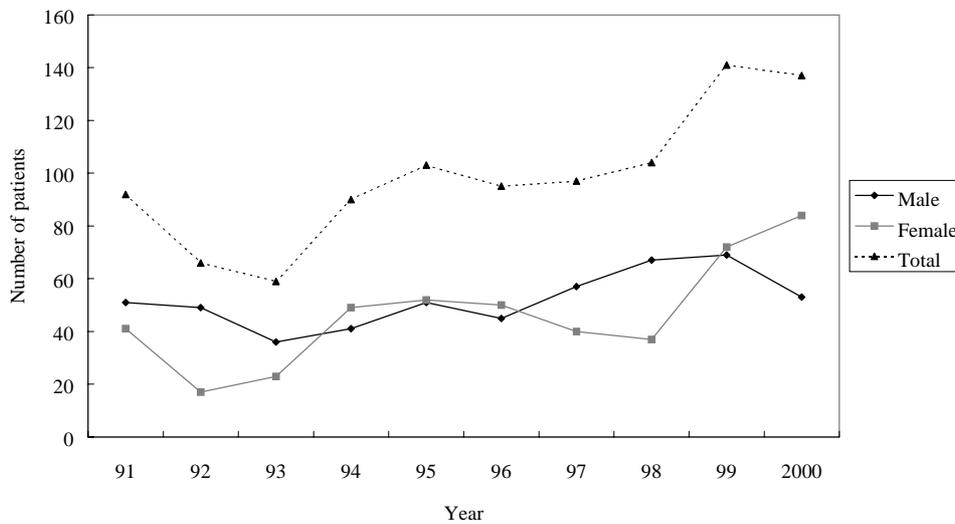


Figure 3 Incidence of genital wart in adolescent patients, 1991-2000.

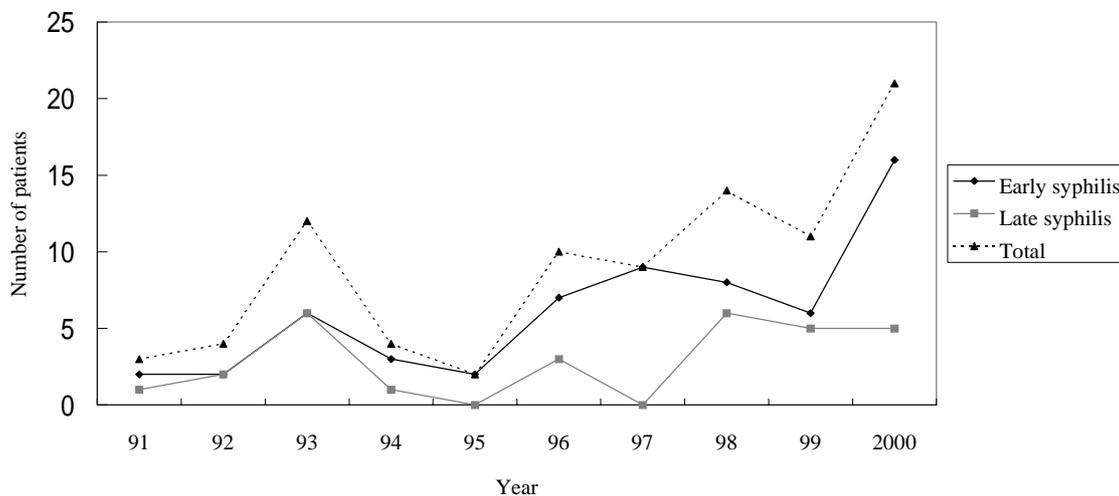


Figure 4 Incidence of syphilis (excluding congenital syphilis) in adolescent patients, 1991-2000.

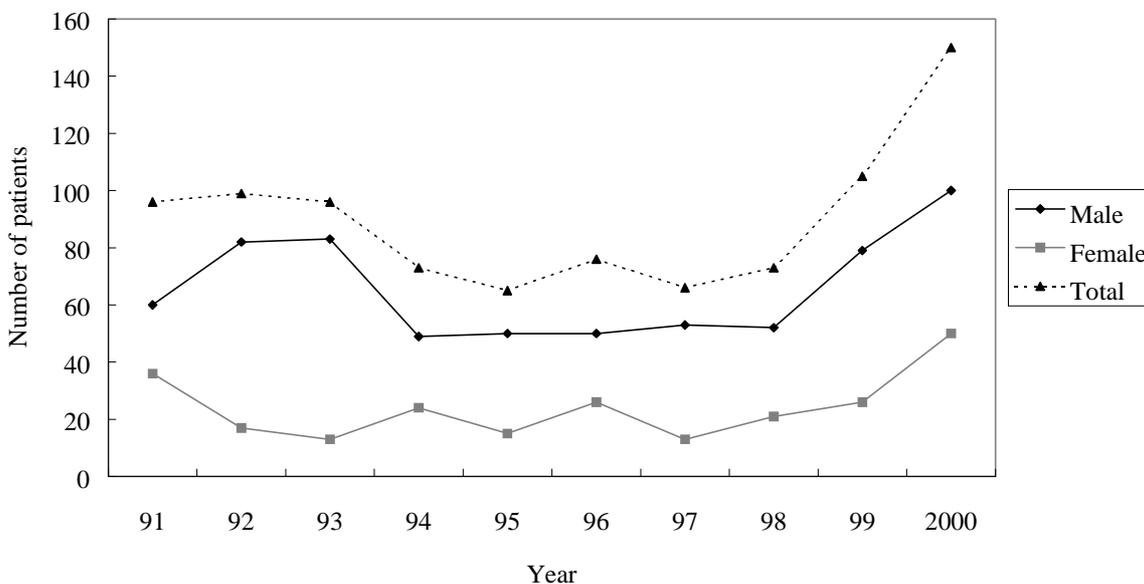


Figure 5 Incidence of gonorrhoea in adolescent patients, 1991-2000.

herpes in adolescents was quite steady over the past decade and ranged from 3 to 15 patients per year. The top five major STIs in male and female adolescent patients were shown in Table 1. The ranking order of the adolescent group was similar to the adult group.

Specific Infections

Genital chlamydia trachomatis and gonorrhoea infection disproportionately affect adolescents. Viral STIs, caused

by HIV, human papillomavirus (HPV) and herpes simplex virus (HSV), represent an emerging epidemic worldwide. Untreated syphilis is notorious for its multi-system complications and teenage unexpected pregnancy is particularly at high risk for delivering syphilitic babies. These infections, except HIV infection, will be discussed in this article.

1. Chlamydia Trachomatis Infection

Genital chlamydia trachomatis infection is found at disproportionately high rates in the adolescent population.

Table 1 The top five major sexually transmitted infections among adolescent patients in 2000.

Rank order	Male (No.)	Female (No.)
1	Non-gonococcal urethritis (113)	Non-specific genital infection (298)
2	Gonorrhoea (100)	Genital wart (84)
3	Genital wart (53)	Gonorrhoea (50)
4	Syphilis (7)	Syphilis (14)
5	Genital herpes (4)	Genital herpes (11)

The actual number of incidents was quoted in brackets.

It accounts for up to 50% of non-gonococcal urethritis in men and 50% of mucopurulent cervicitis in women.¹⁰ It is also the major cause for one-third of cases of acute epididymitis and 60% of cases of pelvic inflammatory disease.¹¹ Symptoms of lower genital tract infection in both sexes can be mild or non-specific. Up to 70% of infected female and 25% of infected male are asymptomatic.¹¹ However, the complication from untreated chlamydial infection can be serious. In men, it is associated with urethritis, epididymitis, proctitis and Reiter's syndrome. In women, it is associated with urethritis, cervicitis, perinatal transmission and pelvic inflammatory disease leading to chronic pelvic pain, infertility and ectopic pregnancy. Adolescent females may be at even greater risk of developing serious sequelae than older women. The major public health impact of genital chlamydial infections results from these complications in women.

There is not an accurate prevalence rate in general population because of the asymptomatic nature and the low sensitivity of the conventional diagnostic tests, including culture, direct immunofluorescence and enzyme immunoassay. In United States, the prevalence rate in sexually active adolescents ranges from 5% to 15%.¹² In Hong Kong, Lim et al reported a prevalence rate of 8.9% among gynecological patients with increased rate in adolescents (18.7%), in patients with high risk factors such as pelvic inflammatory disease (10.5%), STI (10.2%), termination of pregnancy (11.5%) and teenage pregnancy (29.4%).¹³ Another local study found that the prevalence rate in adolescent commercial sex workers was 13%.¹⁴

With the development of more sensitive diagnostic DNA amplification tests, recent focus has been directed to mass screening of genital chlamydia infection in high risk people. The sensitivity of these new diagnostic methods such as the polymerase chain reaction and ligase chain reaction has reached more than 90%.¹⁵ These tests have permitted adolescents to be screened in community settings outside health care facilities. Home sampling is possible since these tests were shown to be applicable on urine or introital

samples.^{16,17}

The treatment regime was shown in Table 2. The Centers for Disease Control and Prevention (CDC) recommended single dose of azithromycin 1 gm or one week course of doxycycline 100 mg bd.¹⁸ In the adolescent group, single dose of azithromycin has the advantage of better drug compliance.

2. Genital Human Papillomavirus Infection

There is inadequate epidemiological information concerning the natural history and course of genital HPV infection. The HPV has caused a wide clinical spectrum of diseases ranging from benign lesions to malignant neoplasms. It is now clearly associated with the development of cervical or other anogenital cancers.¹⁹

It is difficult to estimate the overall prevalence rate of genital HPV infection because majority of patients have subclinical infection. Genital wart only represents the visible clinical manifestation of HPV infection. It is estimated that approximately 1% of sexually active adults either have or have had genital warts whereas 10% to 20% of adults have molecular evidence of genital HPV subclinical infection.²⁰ Higher prevalence rate of genital HPV infection from 27.8% to 46% was found in young sexually active women.^{21,22} However, respectively 70% and 91% of young women are able to eradicate their infections after 12 months and 24 months.²³ The risk factors for persistent HPV infection included older age, infection with multiple types of HPV, and infection with a high-risk type at the previous visit.²³

The conventional therapies are usually carried out by clinicians (Table 2). These include topical podophyllin resin, topical trichloroacetic acid, cryotherapy, curettage and cauterization, and excision. The less often used method included topical 5-fluorouracil and local interferon injection. Newer home therapies (Table 2) with comparable efficacy include topical 5% imiquimod and topical podophyllotoxin. 5% Imiquimod is an immune modifier and it induces local release of cytokines.²⁴ It is applied onto the lesions three

Table 2 Usual treatment regimes of common sexually transmitted infections in Social Hygiene Service

Type of disease	Treatment regime		
Genital chlamydial infection	Tetracycline groups	Doxycycline 100 mg bd Tetracycline 500 mg qid Minocycline 100 mg bd	for 7 to 21 days
		Quinolone	
	Macrolide	Erythromycin 500 mg qid	stat dose
		Azithromycin 1 gm po	
Genital wart	Patient applied home therapies	Topical podophyllotoxin bd for 3 days, then rest for 4 days, for 4 to 6 course	
		Topical 5% imiquimod 3 times per week for up to 16 weeks	
	Clinic based therapies	Weekly topical podophyllin resin or trichloroacetic acid	
		Cryotherapy, curettage and cauterization, excision	
Uncomplicated gonorrhoea	First line	Ceftibuten 400 mg po or Spectinomycin 2-4 gm imi stat	
	Alternative	Single dose of second/third generation cephalosporins: Cefuroxime 1.5 gm imi, Ceftriaxone 250 mg imi, Cefotaxime 500 mg-1 gm imi	
		Azithromycin 2 gm po stat	
Genital herpes	Primary first episode	Acyclovir 200 mg 5x per day Famciclovir 250 mg tds Valaciclovir 500 mg bd	for 5 days
	For frequent and recurrent episodes	Prophylactic continuous antiviral therapies: acyclovir 400 mg bd for 6 to 12 months, then reassess disease activity	
Syphilis	No penicillin allergy	Early syphilis: Procaine penicillin 1.2 megaunit imi for 10 days or Benzathine penicillin 2.4 megaunit imi weekly for 3 weeks	
		Late latent syphilis: Procaine penicillin 1.2 megaunit imi and probenecid 500 mg qid for 15 days	
	Penicillin allergy	Tetracycline 500 mg qid or Erythromycin 500 mg qid or Doxycycline 100 mg bd for 2 weeks (early syphilis) or 4 weeks (late syphilis)	

times a week for at most 16 weeks.²³ Podophyllotoxin is an antimitotic agent and it is the active biological ingredient of podophyllin.²⁵ One course consisted of application of podophyllotoxin twice daily for three days followed by a four-day rest.²⁵ The course can be repeated four to six times.²⁴ Both drugs are safe to be applied by the patient. Most of the reported side effects were local reaction such as erythema, erosion or blister only.^{24,25}

3. Gonorrhoea

In United States, the overall incidence rate of gonorrhoea has declined steadily from 1985 to 1997 followed by a slight increase of nine percent between 1997 and 1999.¹ In 1999, the overall incidence rates in male and female were respectively 136.0 and 129.9 per 100,000 population.¹ The highest incidence rates were reported in adolescent female and young adult men.¹

The classical presentation of gonorrhoea is discharge with dysuria. However, Sherrard et al showed that only 48.1% of men described the classical symptoms.²⁶ The incubation period was reported to be an average of 8.3 days, which was longer than previously described.^{26,27} The less florid clinical presentation of gonorrhoea may cause difficulty to differentiate it with genital chlamydia infection.

Since 1985, the Social Hygiene clinics have used ofloxacin as the first line treatment of uncomplicated gonorrhoea. However, quinolone-resistant strains were increasingly found and were present in 21.7% of patients with gonorrhoea in patients attending Social Hygiene Services.²⁸ Ofloxacin was therefore no longer used as the first line drug for treating gonorrhoea in our service by 1997. The usual first line drugs used in our service include single oral dose of ceftibuten 400 mg, single intramuscular injection of spectinomycin 2-4 gm or ceftriaxone 250 mg

(Table 2).²⁹ The CDC also recommended concomitant treatment for genital chlamydia infection because of the high rate of co-infection.¹⁸

4. Genital Herpes

The seroprevalence correlates with age and socioeconomic status. The National Health and Nutrition Examination Surveys III (1988 to 1994) done in United States showed that the overall seroprevalence of HSV type 2 was 21.9%, which has increased by 30% when compared with late 1970s.³⁰ The prevalence rate in adolescents was 5.6%.³⁰ In Hong Kong, the seroprevalence of HSV-2 antibodies in sexually transmitted disease clinic attendees reached 24.3% in male, 35.5% in female and 77.5% in commercial sex workers.³¹ For the general population, none of those under 15 years was tested positive while 18.2% of those above 24 years had evidence of past infection.³¹

Majority of patients with genital herpes are asymptomatic and sexual transmission usually occurs during subclinical shedding of virus.³² The first three months after acquisition is the most vulnerable period.³³ In the past, it is difficult to estimate the exact prevalence because of the relative low sensitivity of the viral culture test and the nonspecific nature of the serological test which has significant cross reactivity between HSV type 1 and type 2 infection.³⁴ Recently type specific herpes serological tests have been developed with both sensitivity and specificity of more than 95%.³⁵ Commercial kits may be available in the future for widespread screening. However, there is ethical issue to be considered for mass screening in the absence of any effective cure. At present, type specific serological test is indicated in pregnant women who are at risk of acquiring herpes in the third trimester, in monogamous couples in a discordant relationship and diagnosis of recurrent genital eruptions without a positive viral culture.

There is no definite cure of HSV infection. Antiviral therapy is indicated in first episode primary infection or as a prophylaxis in patients with severe or frequent recurrent episodes (Table 2).

5. Syphilis

Syphilis is a curable infectious STI in the early phase and systemic disease in the chronic phase. The worldwide incidence of syphilis decreased significantly after the introduction of penicillin, which is still the mainstay of treatment (Table 2). In 1999, the incidence of primary and secondary syphilis in United States was at all time low: 2.5 per 100,000 population.³⁶ In Hong Kong, an overall

rising trend of incidence of all types of syphilis from 310 in 1991 to 990 in 2000 was noted. In particular, the incidence of primary and secondary syphilis increased disproportionately.³⁷ There was also a parallel increment of early syphilis in adolescents. Such trend has raised our concern on enforcing more effective STI prevention programs.

Prevention

Asymptomatic infection is an important contributing factor to the high prevalence of STIs among adolescents. Asymptomatic infection occurs with many STIs, such as HSV, HPV, genital chlamydia, gonorrhea, HIV, hepatitis B and C, thus creating a large reservoir of unrecognized and infected individuals who are capable of transmitting that infection.

Effective STI prevention for adolescents requires involvement of various individuals and institutions that have contact with young people. Screening and treatment programs were shown to decrease the genital chlamydia prevalence rate by 33% in women.³⁸ The relative risk of developing pelvic inflammatory disease in the screening group as compared to the non-screening group was 0.44.³⁹ In 1996, the American Medical Association published the Guidelines for Adolescent Preventative Services (GAPS).⁴⁰ They emphasized primary and secondary prevention rather than episodic care. The guidelines suggested that all adolescents should receive health guidance annually regarding responsible sexual behaviors such as the use of condoms for preventing STIs and appropriate methods of birth control.⁴⁰ Additionally, sexually active adolescents should be screened annually for STIs, in particular chlamydial and gonococcal infection.⁴⁰

The risk for STI acquisition is largely behavioral. Intervention programs that emphasize self-efficacy and motivational enhancement may provide adolescents with skills to change their risk behaviour patterns. The prevention programs should be carried out in school-based, community-based and clinic-based settings so that we do not miss a specific group of target population. The prevention efforts should aim at decreasing the number of new cases of STIs by avoiding sexual exposure and hence infection. This can be achieved by sexual health education and behavioural interventions such as encouraging abstinence from sex, delay in first sexual intercourse, reduction in number of lifetime sexual partners and persistent and correct use of condoms. Other interventions

may include correcting misperceptions regarding peers' behaviour and attitude and setting up of social norms. Though it may take many years for the social norm, subculture and culture of the local community to change positively to be less discriminative against STI sufferers, it is worthwhile to continue the process through various partnership with the media, non-government organization, school authority, community and opinion leaders besides the health and medical professions.

Another aim is to decrease the number of existing cases through early detection and treatment. It can be achieved through mass screening for STIs, improving access to medical care and encouraging partner notification to prevent re-infection and transmission to sexual partners. Clinicians can take this opportunity to provide health education and counseling. By successfully achieving the primary and secondary aim, the medical and psychological consequences of STIs can then be reduced.

In authors' view, the following ABC rules of prevention of STI apply to the whole population irrespective of age: A: Abstinence of sex; B: Be faithful to your sex partners; C: Correct and persistent use of condoms; D: Do the best to achieve ABC; E: Early treatment and help seeking behaviours.

Conclusion

Adolescents are prone to development of STIs and serious complication may develop. The incidence of most STIs has increased worldwide with a significant proportion occurring in adolescents. We should focus on primary and secondary prevention of STIs in adolescents rather than episodic care. Coordinated prevention programs carried out in the community, schools and clinics can achieve successful prevention of STIs in adolescents. We should try our best to publicize the ABC rules to our teenagers.

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