An Overview of Selected Curable Sexually Transmitted Infections in Adolescents

The transition from childhood to being health sexual adults is one of the major tasks and challenges facing young people. A successful transition implies forming intimate relationships while avoiding the acquisition of sexually transmitted infections.

The recent emergence of HIV/AIDS has added new relevance to the history of sexually transmitted diseases (STDs). In a remarkably short period of time, AIDS has become a dominant issue in both medical and social dimensions of health. The history of HIV itself reinforce ideas about the complexity of STDs both medical and cultural entities painfully reminding us of the ties between sex and disease. HIV confirms that STDs will remain as much a problem for the twenty first century as they have been for past century.

Sexually transmitted infections (STIs) are among the most common causes of illness in the world and have far reaching health, social and economic consequences. In addition to their sheer magnitude, STIs are a major public health problem for two additional reasons: their serious sequelae, and the fact that they facilitate transmission of HIV. In addition, complications from STIs are found more often in resource poor settings and, as a result, the greatest burden falls on the least well off countries, and, within countries on the poor.

Sexually transmitted infections (STIs) are infections that can be transferred from one person to another through sexual contact. According to the Centers for Disease Control there are over a million cases of sexually transmitted infection reported annually. Adolescents and youth (15-24) are the age groups at the greater risk for acquiring an STI. 3 million teenagers becoming infected each year – that is 13% of all young people between the ages of 13 and 19 — contact an STI. This represents about 25% of sexually experienced adolescents.

It is apparent from the current data that around the world, for a combination of reasons involving biology, psychology, ambient culture and changing moods of
adolescents who have had sexual intercourse have the highest rates of STIs – including HIV/AIDS in some locale – of any age group. As stated by one researcher, “the challenge lies in getting teenagers to view their relationships in a more realistic light without destroying the positive ways in which these (relationships) may also add to their lives.”

The recent emergence of HIV/AIDS has added new relevance to the history of STIs. In a remarkably short period of time, AIDS has become a dominant issue in both medical and social dimension of health. HIV confirms that STIs will remain as much as the twenty first century as they have been for past centuries.

**Extend of STIs**

Sexually transmitted infections (STIs) are the most common causes of illness in the world. Gonorrhoea, syphilis and now AIDS are the most widely known STIs. Most population based rates of sexually transmitted underestimate of the risk of STI for sexually active adolescents because the rate is inappropriately expressed as cases of disease divided by number of individuals in this age group. For rates to reflect risk among those who are sexually experienced, appropriate denominators should include only the number of individuals in the demographic group who have had sexual intercourse, this is true of only 50% of women 15-19 years old.

This underestimation of rates is greater among the youngest adolescents, since only a small proportion of them have had sex. In general when rates are corrected for the percentages in group who are sexually active, the youngest adolescents have the highest STI rates of any age group.

It is seen that globally nearly half of the new HIV cases occur in the young people aged 15-29. Also a large percentage of new STIs occur in this age group reflecting 7000 young people worldwide acquire the infection every day. STIs take a great toll on health through their sequelae i.e. the conditions resulting from its spread to reproductive tract, such as fallopian tubes in women. Sequelae of some sexually transmitted infections, in particular gonorrhoea and chlamydial infection which cause pelvic inflammatory disease in women, impair the fertility in both men and women. Another sequela of STIs is the increased risk of ectopic pregnancy, a condition that can kill from sudden and severe internal bleeding following rupture of fallopian tube.

Some STIs attack foetus and the infant as well. In two-thirds or more of pregnant women with early syphilis, for example, the infection spreads through the placenta and infects the foetus and because of this up to one-half of syphilis-infected pregnancies and in spontaneous abortion, stillbirth, or perenatal death. Gonorrhoea or chlamydial infection may likewise infect the eyes of babies as they pass through the cervix and vagina during birth, while chlamydial infection may spread to the lungs of newborns, resulting in chlamydial pneumonia.

Young adults between 15 and 19 years of age often have high rates of STIs on account of their frequent and multiple casual sex partners and present important problems of their lack of easy access to medical services and supply of condoms.
Because treatments of STIs and their sequelae, have such a widespread effect on men, women, youth and newborns, the problem of curable STIs is expensive to the individual’s and health care system as well as to individuals. The World Bank has estimated that STIs collectively rank second only in importance among diseases for which intervention is possible among women between 15-44 years of age worldwide.8

WHO estimated that in the year 1990, there were over 250 million new cases of sexually transmitted infections. The Delphi technique was chosen at that time to arrive at the estimates because of the lack of information on STIs in many regions. Recently there has been an increase in publications on STI prevalence in developing countries in Africa, Asia, Latin America and the Caribbean. Using this information, and information from other sources such as official STI prevalence estimates from industrialized countries and WHO archival information from country specific reports, prevalence rates of gonorrhoea, chlamydial infection, syphilis and trichomoniasis were estimated by sex and by (UN standard) region.4

In 1990 the WHO generated global estimates for the number of new cases of STDs in adults between 15 and 49 years of age using a modified Delphi approach. The expert panel estimated that in 1990 there were over 78 million new cases of the three “classes” STDs (gonorrhoea, chlambdia and syphilis) and an additional 120 million new cases of trichomoniasis in this age group. More recently, the WHO in partnership with the Rockefeller Foundation, has generated a new set of estimates of or 1995 drawing on data from the Global Data Bank of STDs established by the WHO.9

Because of a lack of published and archival information on chancroid, no estimates of this disease could be made. Likewise estimates were not made for the viral STIs such as herpes, human papilloma virus and hepatitis B.

Based on the probability of a symptomatic or an asymptomatic person getting treatment for his/her STI, the duration of each infection by sex and region were estimated. Regional adult STI incidence for 1995 was calculated by dividing the estimated prevalence by the estimated duration of each disease and the results are shown in Table-1, which summarises population, prevalence and incidence data by region.

<table>
<thead>
<tr>
<th>Region</th>
<th>Population 15-49 (Millions)</th>
<th>Prevalence (Millions)</th>
<th>Prevalence Per/1000</th>
<th>Annual Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>153</td>
<td>8</td>
<td>52</td>
<td>14</td>
</tr>
<tr>
<td>Western Europe</td>
<td>211</td>
<td>10</td>
<td>45</td>
<td>16</td>
</tr>
<tr>
<td>Australasia</td>
<td>11</td>
<td>0.6</td>
<td>52</td>
<td>1</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>251</td>
<td>24</td>
<td>95</td>
<td>36</td>
</tr>
</tbody>
</table>

(Contd...)
Adolescent women are much more likely to have chlamydia infection than older women and are also more likely to have repeated infection.\(^2\)

Men aged 15 to 19 have the second highest gonorrhoea rates among men; women 15 to 19 years old have the highest gonorrhoea rates among women.\(^11\)

Gonorrhoea and syphilis rates among adolescents while decline are disproportionately high for Afro-American youth compared to white and Hispanic youth.\(^12\)

The consequences of STIs can be devastating: infants, infected at birth, with blinding eye infection of pneumonia, women suffering chronic abdominal pain, ectopic pregnancy or infertility; and men with infertility. Young people are specially exposed to the infection. Around 50% of the new infections worldwide are occurring in young people. Women, in addition, may suffer social consequences as well; telling a husband about an infection may lead to beatings and divorce, and husbands may abandon infertile wives.

The high incidence of STIs among women attending antenatal, family planning or gynaecological clinics indicates the extent of STI problem. For example, in studies in developing countries, up to 18% of these patients have gonorrhoea, upto 17% have syphilis and upto 30% have trichomoniasis. Sexually transmitted infections are a major public health problem in both developed and developing countries, but prevalence rates apparently are far higher in developing countries, where treatment of STIs is less accessible. Among women, syphilis prevalence rates may be 10 to 15 times higher; and chlamydia rates may be 2 to 3 times higher\(^13\). Incidence rates also are higher. For example, the annual rate of new gonorrhoea infections in large African cities is 3000 to 10,000 population, or as many as one in every 10 people. By comparison, in the US the annual incidence of gonorrhoea was 233 per 100,000 population in 1991 and in Sweden, about 30 per 100,000 in 1987.\(^{14,15,16}\)

Among developing region STIs appear to be more common in Africa than in the Asia or Latin America. In a review by Judith Wasserheit, a median of 20% of women attending family planning, antenatal, or other clinics in Africa had trichomonosis, for example, while the median prevalence in Asia studies was 11% and in Latin American studies 12%.\(^17\)

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Cases</th>
<th>New Infections</th>
<th>Repeated Infections</th>
<th>Total Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>254</td>
<td>53</td>
<td>208</td>
<td>85</td>
</tr>
<tr>
<td>Northern Africa and Middle East</td>
<td>163</td>
<td>6.5</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>158</td>
<td>12</td>
<td>75</td>
<td>18</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>803</td>
<td>16</td>
<td>19</td>
<td>23</td>
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<tr>
<td>South and South East Asia</td>
<td>943</td>
<td>120</td>
<td>128</td>
<td>150</td>
</tr>
<tr>
<td>Total</td>
<td>2946</td>
<td>250</td>
<td>85</td>
<td>333</td>
</tr>
</tbody>
</table>

Source: WHO; Global Programme on AIDS
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Youth have high rates of STIs. In a study at Kenyatta hospital in Nairobi, for example, 23% of women ages 15 to 19 seeking antenatal care had gonorrhoea, and men ages 15 to 19 had the second highest incidence of any age group.

In many countries clinic surveys are the available indicators of STI levels. The true extent of STIs in the general population remains unknown for several reasons:

- Both men and women may suffer from asymptomatic STIs, but women suffer more so than men. For example, 70% of women and 30% of men infected with chlamydia may be asymptomatic as well as 30% of women and 5% of men infected with gonorrhoea.

- Many people with STIs do not seek care. In developing countries people are not routinely screened for STIs when they seek other health care.

- Because of stigma attached to STIs many people seek care from providers, who do not report cases.

- Some governments are reluctant to admit to a high prevalence of STIs. However, the AIDS epidemic is beginning to change this attitude.

The few studies in developing countries report mixed trends. For example, between 1987 and 1991 in 15 to 21 Latin American countries, the incidence of primary, secondary, or congenital syphilis increased. Evidence from developed countries also shows mixed trends. The incidence of chlamydia is increasing in North America and some European countries. Chancroid and primary syphilis are becoming common in USA. In contrast, the incidence of gonorrhoea has been decreasing in Canada, Sweden, the UK and the US and the incidence of primary syphilis has decreased in Sweden.

Sexual behaviour involves risk. The same is true of experimentation with drug usage, legal or illegal. Some young people may be infected with STIs. The behaviour that causes teenage pregnancies and STIs also causes AIDS. HIV/AIDS is no longer restricted to certain groups. It is the behaviour that puts people at risk.

According to Marx et al. (1989), nearly all 20 to 24 years old have had sexual intercourse, this was true for only 50 percent of women 15 to 19 years old. This underestimation of rates is greatest among the youngest adolescents, since only a small proportion of them have had sex.

Chlamydial Infection

Chlamydia trachomatis has become the most prevalent sexually transmitted bacterial infection in North America and Europe. During 1995, it is estimated there will be approximately 89 million new adult chlamydial infections worldwide, again with the greatest number in South and South East Asia followed, as for syphilis and gonorrhoea, by Sub-Saharan Africa.

Chlamydial infection, like gonorrhoea, is a common adult disease, which has asymptomatic rates in women similar to those for gonorrhoea, but higher rates of asymptomatic infection than gonorrhoea in men. Like gonorrhoea, chlamydia has serious
sequelae such as pelvic inflammatory disease and infertility. Diagnosis of chlamydial infection is costly and those diagnostic tests, which are most sensitive are not generally available in developing countries. Even in industrialized countries laboratory testing is not available in all health facilities. Screening programs in women at risk of infection are therefore not consistently conducted. As many infections are neither detected nor treated, prevalence rates are high. Rates of infection among women attending family planning clinics from 1989 to 1993 in the United States of America were shown to vary from 4.5% to 8.5%.30

Chlamydia trachomatis is the most common of all bacterial sexually transmitted infections, which is strongly associated with adolescents, with an estimated 4 to 8 million new cases occurring each year. In both men and women, chlamydial infection may cause an abnormal genital discharge and burning with urination.

Numerous clinic-based studies have demonstrated that prevalence of cervical chlamydia is greatest among sexually active individuals under 20 years of age, being approximately twice that found among older individuals.25-28

We, in India, are only beginning to realize the importance of this disease. It causes an estimated 4 million infections annually, primarily among adolescents and young adults. In women, untreated Chlamydia is a very dangerous STI as it usually has no symptoms; 75% of infected women and 25% of infected men, have no symptoms at all and without testing and treatment the infection may persist for as long as 15 months. Although majority of studies have been performed among females, tests performed on urine specimens, among other tests have been used recently to evaluate prevalence among males. The findings are similar to those for females. With prevalence of chlamydia being greater among those under 25 years of age, and somewhat greater among minority youth, prevalence among males is usually found between 5 to 10 percent, somewhat less than among females.25,26

Recurrent infections may be particularly worrisome since such infections are associated with development of significant tissue damage than in primary infection. Many recurrent infections are associated with continuing presence of a sex partner, who has remained untreated. The risk of recurrent infection is twice as high among adolescents as among older women.27,28 However, in much of the developing world rates are still very high, as shown by the prevalence of disease (up to 22%) in antenatal or family planning clinics in a rural survey.31,32

When age-specific data are available from other countries, chlamydia prevalence is found to be greatest among adolescents.27,28

Treatment: Infection can be cured with antibiotics. However, it cannot undo the damage done before the treatment.

Possible consequences for infected person: In women, untreated infections can progress to involve the upper reproductive tract and may result in serious complications with an estimated 4 to 8 million new cases occurring each year. If untreated in women, up to 20-40 percent will experience pelvic inflammatory disease (PID), which in turn often leads to entopic pregnancy, infertility, a chronic pelvic pain. In men, if untreated can cause epididymitis, an inflammation of testicles which may result in sterility. Infected individuals are at greater risk of contracting HIV, if exposed to the virus.30
Gonorrhoea

Gonorrhoea is one of the most frequently reported STIs. 40% of its victims contract PID if not treated and it leads to infertility. During 1995, it is estimated that there will be approximately 62 million new cases of gonorrhoea among adults worldwide, with the greatest number in South and South East Asia followed, as for syphilis, by Sub-Saharan Africa. From 1981-91 although the overall rate among males declined 46%, the rate among males 15-19 years old did not decline at all and in females decreased.31

Gonorrhoea is a common adult disease, though a significant proportion of those with infection (up to 80% among women, 10% among men) are asymptomatic, i.e. they do not have symptoms and therefore they are neither aware of the need for treatment nor of the risk of transmitting the disease to others. Men aged 15-19 have the second highest gonorrhoea rates, women 15-19 years old have the highest annual gonorrhoea rates.12,15

Infected men, who have symptoms, usually seek treatment spontaneously. Women frequently have only minor symptoms or are asymptomatic, so detection of infection depends mainly on screening by culture. This is costly and requires relatively sophisticated facilities. Few countries operate regular screening programs and gonorrhoea reporting, therefore, seldom reflects true levels of infection. Co-infection with chlamydia is very common and treatment with antibiotics is simple and highly effective.

WHO estimated that by successfully treating 100 women for gonorrhoea, among whom one-quarter are pregnant, 25 would be prevented from developing pelvic inflammatory disease and 7 of their newborns would be spared from ophthalmia neonatorum, an eye infection acquired during passage through the birth canal which, if untreated, can result in blindness. Serious sequelae such as ectopic pregnancy, chronic pelvic pain and infertility could also be averted by treatment of these women.30

The complications and sequelae of gonorrhoea infection clearly demonstrated in reports from Cameroon in the mid-1980s, when up to 30% of newborns to women infected with gonorrhoea at the time of delivery developed ophthalmia neonatorum, leading to an overall rate of ophthalmia neonatorum of 4% among all births. In West and Central Africa, upto 40% of women over the age of 45 years were unable to conceive, mainly due to STI induced infertility among young women, resulting from the potential of 17% rate of gonorrheal infection in the area.31,32

Gonorrhoea is one of the most frequently reported STIs. 40% of its victims contract pelvic inflammatory diseases (PID), if not treated and can cause sterility. It can be treated with antibiotics. While gonorrhoea rates among adults have declined, rates among adolescents have risen or remained unchanged. Adolescent females aged 15-19 have the highest rates of gonorrhoea and an estimated 50% of women with gonorrhoea have no symptoms without early screening and treatment, 10 to 40 percent of women with gonorrhoea will develop PID.31
Consistent and correct use of condom is very effective for reducing a variety of STIs: There is a growing difference between the rates among older females and among females 15 to 19 years of age. The rate of gonorrhoea declined least among adolescents as observed in the United States. However, much of the developing world, it is still heavy high.

Possible consequences for the infected person: Untreated in women, the disease is a major cause of pelvic inflammatory disease. PID can lead to ectopic pregnancy, infertility and chronic pelvic pain. Untreated gonorrhoea can cause sterility in men. It can infect joints, heart valves and/or the brain.

Prevention: Abstaining from vaginal, anal and oral sex with an infected person is the only 100% effective means of prevention. Latex condoms can reduce but not eliminate the risk of contracting the disease during sex.

Syphilis

Syphilis fluctuates in incidence more dramatically than gonorrhoea as sexual behaviour changes. Syphilis is a chronic systemic infection caused by treponema pallidum subspecies pallidum. Following an incubation period averaging 3 weeks a primary lesion appears and is often associated with regional lymphodenopathy, a secondary bacteremic stage is associated with generalized muco cutaneous lesions and generalized lympho adenopathy, followed by a latent period of sub clinical infection lasting many years. In about one third of untreated cases, the tertiary stage is characterized by progressive destructive mucocutaneous musculoskeletal or parenchymal lesions, aortitis, or symptomatic central nervous system disease.

Approximately 12 million new cases of syphilis were estimated among adults worldwide, with the greatest number of cases occurring in South and South East Asia followed by Sub-Saharan Africa.

Syphilis was first described in the sixteenth century. In industrialized countries syphilis apparently declined during the latter half of the nineteenth century. In these same countries, however, there was a sharp rise in incidence after the First World War, but following the Second World War the incidence fell rapidly, coinciding with the availability of improved diagnostic tests and antibiotics. In some industrialized countries, syphilis began to rise again in the 1960s and has been increasing steadily in some industrialized and developing countries since then. Syphilis cases increased dramatically from 1985 to 1990 among women of all ages. An analysis of 1993 data has shown that rates of syphilis were higher among females than among male adolescents; rates among females were more than twice as higher rates among males in the 15-19 age group.

Syphilis is the classic example of an STI, which can be successfully controlled by public health measures; a simple and highly sensitive diagnostic test is available. If untreated, however, syphilis may lead to nerve damage, arterial wall damage, and mental disorientation and eventually to death.
Treponema pallidum, the causative agent of syphilis, can cross the placental barrier and infect the fetus. There is evidence that in approximately two-thirds of pregnancies, infection spreads across the placental barrier, and that many of these pregnancies end in spontaneous abortion, stillbirth, or perinatal death. Congenital defects may occur in those fetuses, which go to term and are delivered. In a study in Ethiopia, for example, pregnant women with a positive serological test for syphilis were shown to have a five times greater chance of having a spontaneous abortion or stillbirth than those who were serologically negative while in Zambia, 24% of stillbirths could be attributed to syphilis and congenital syphilis was implicated in 30% of all perinatal infatal mortality.

Syphilis is quite prevalent in the developing world (2 to 16%) among antenatal patients, up to 30 percent in other clinic based evaluation. The pattern of primary and secondary syphilis are the highest among 20 to 24 years old all over the world. Rates among 15 to 19 years old are around half of those in the older group.

No similar data is available for Indian adolescents. However, a population based survey in rural Nigeria found 2.6% of sexually active teenagers (under 20 years old) to have syphilis.

A recent study in Houston found that not only adolescents had the highest rate of syphilis but also that the increase in the rate was associated with a sharp increase in HIV sero prevalence from 1.6 to 3.8 percent among adolescents attending STI clinic.

Syphilis if untreated can lead to serious damage of the brain or heart.

**Link between STIs and HIV**

Genital sores (chancres) caused by syphilis make it easier to transmit HIV infection sexually. There is an estimated 2 to 5 fold increased risk of acquiring HIV infection when syphilis is present.

Ulcerative STIs that cause sores, ulcers, or breaks in skin or mucous membranes, such as syphilis, disrupts barriers that provide protection against infections. The genital ulcers caused by syphilis can bleed easily and when they come into contact with oral and rectal mucus during sex, increase the infectiousness of and susceptibility to HIV. Having other STIs is also an important predictor for becoming HIV infected because STIs are on a marker for behaviour associated with HIV transmission.

By 1992 between 9 and 11 million adults and about 1 million children had been infected with the AIDS causing human immunodeficiency virus (HIV), according to WHO, two-thirds of these people live in developing countries. It was expected that by 2000, 30 to 40 million will be infected and 10 million people with HIV infection will have developed AIDS, and 90% of them will be living in developing countries.

Biological factors of the curable STIs which increase the risk of HIV transmission and infection include disruption of the normal epithelial barrier by genital ulceration and/or microulceration; and by accumulation of pools of HIV-susceptible or HIV-infected cells
(lymphocytes and macrophages) in semen and vaginal secretions. Epidemiological studies from Sub-Saharan Africa, Europe and North America have suggested that there is approximately, a four times greater risk of becoming HIV-infected in the presence of a genital ulcer such as caused by syphilis and/or chancroid; and a significant though lesser increased risk in the presence of STIs such as gonorrhoea, chlamydial infection and trichomoniasis which cause local accumulations of lymphocytes and macrophages.44

Other sexually transmitted infections make it easier for HIV to pass from one person to another. Chancroid, chlamydia, gonorrhoea, syphilis, and trichomoniasis may increase the risk of HIV transmission by two to nine times.45-54 The link between HIV infection and other STIs may partly explain why HIV in heterosexual populations is more prevalent in Africa than in Europe and the US, where STIs are more than treated and cured.55

Carried in body fluids, HIV may leave one person’s body and enter another’s body more easily through genital ulcers. HIV itself has been isolated from the genital ulcers of women with HIV infection. Thus the link is clearest between HIV infection and STIs that cause genital ulcers, although not all studies find an association. Six of 10 studies in Kenya and Zaire, for example, found that people with genital ulcers, caused mainly chancroid, were more likely to be infected with HIV than people without ulcers. Their risk was two to five times greater. Nine of 11 studies of syphilis and HIV infections found an association. Syphilis increased the risk of HIV infection threefold to ninefold for heterosexual men. Three of six studies of genital herpes and HIV infection found an association. Herpes doubled the risk of HIV infection for women and heterosexual men.54

Six studies found that chlamydia, gonorrhoea and trichomoniasis, which do not cause ulcers, increase the risk of HIV transmission to women by three to five times.54 Several studies, however, have found no link between these STIs and HIV infection, but methodological problems may have obscured the connection. These STIs may enhance HIV transmission because they increase the number of white blood cells – which are both targets and sources of HIV in the genital tract and because genital inflammation may cause microscopic cuts than can allow HIV to enter the body. Diseases causing vaginal and urethral inflammation are far more common than genital ulcer and so may be responsible for a larger share of HIV transmission.

Infection with HIV also affects the other STIs. In people with HIV infection, other STIs may be more resistant to treatment. For example, several studies have reported that one-dose treatment for chancroid failed at least six times more often in HIV-infected patients than in patients without HIV infection.45 Also syphilis lesions may last longer in people infected with HIV, and these people may get gonorrhoea more often.54 Thus, HIV enhances its own transmission. With longer lasting STI symptoms, people with HIV infection are more likely to transmit HIV and increase the pace of AIDS epidemic.

Perceived susceptibility to adverse health outcome is major factor in theorical clinical models of behaviour change. Accurately accessing personal risk and making the connection between behaviour and susceptibility to infection are important first steps in preventing disease.
Inaccurate perceptions of susceptibility may be a significant barrier to preventing STIs and, ultimately, human immunodeficiency virus (HIV) infection. In order to perceive themselves as susceptible, adolescents should be able to recognize a number of factors as indicators of risk for STIs. For instance, unprotected intercourse and multiple sexual partners, the focus of most prevention programs are significant sources of STI risk. Although STIs are often asymptomatic, symptom recognition is an important aspect of diagnosis, treatment and prevention. Finally, an STI history is a strong predictor of future STI diagnosis and in terms of adolescents cognitive associations, previous experience with an STI could increase awareness of behaviour and symptoms that indicate STI risk. If adolescents appropriately understand the factors that put them at risk for STI, they should recognize that these indicators make them more susceptible to STI. Further accurate perceptions of susceptibility of STI should be related to actual infection.

Complications and Sequelae

STIs take their greatest toll through their sequelae-conditions resulting from the spread of STI pathogens (bacteria or viruses, for example) from the point of infection to another part of the reproductive tract or another part of the body. Chlamydia, gonorrhoea and syphilis can have severe sequelae. Human papilloma virus may cause cervical cancer 5 to 30 years after the initial infection.56

Some sexually transmitted infections threaten the fertility of both men and women. In women STI pathogens migrate up from the lower reproductive tract, causing pelvic inflammatory disease (Inflammation of the uterus, fallopian tubes, ovaries, or other pelvic structures), chronic pelvic pain and infertility. Sexually transmitted infections, mainly Chlamydia and gonorrhoea, cause most cases of pelvic inflammatory disease.57,58 An estimated 8% to 20% of women with untreated cervical gonorrhoea develop pelvic inflammatory disease.59-61 In a Swedish study begun in 1960, one of the largest studies of pelvic inflammatory disease, 18% of women with pelvic inflammatory disease had chronic pelvic pain compared with about 5% of women who had not had pelvic inflammatory disease.62 Often the first symptom that women with chlamydial infection notice is the pain of pelvic inflammatory disease. At that point, any damage to the fallopian tubes is irreversible.

Pelvic inflammatory disease can cause infertility. Without treatment 55% to 85% of women with pelvic inflammatory disease may become infertile62. In some areas pelvic inflammatory disease is a common cause of women’s infertility. In a study in Zimbabwe, 84% of 135 infertile women with abnormal fallopian tubes had a history of pelvic inflammatory disease.63 Many women may lose their fertility without ever realizing that they had pelvic inflammatory disease. For example, in 14 studies of women with blocked fallopian tubes, 40% to 80% did not report that they had pelvic inflammatory disease.64

STIs also can increase a women’s risk of ectopic pregnancy, a condition that can kill from sudden and severe internal bleeding when the out-of-place pregnancy ruptures the
fallopian tube. Studies in the 1980s in developing countries found that ectopic pregnancy caused 1% to 15% of all maternal deaths. Pelvic inflammatory disease, by permanently scarring narrowing the fallopian tubes, increases the risk that a pregnancy will be ectopic by 7 to 10 fold. A US study found that genital chlamydial infection more than doubled a woman’s risk of having an ectopic pregnancy.

In men, infertility may follow an infection that spreads from the urethra (where it is described urethritis) to the epididymis (epididymitis). In men under age 35, the most common cause of epididymitis is gonorrhoeal or chlamydial infection. Before antibiotics became available, 10% to 30% of men who had gonorrhoea developed epididymitis and 20% to 40% of men with epididymitis became infertile.

Some STIs attack the fetus and infant. In two-thirds or more of pregnant women with syphilis, the infection spreads to the amniotic sac and infects the fetus. About 40% of infected pregnancies end in spontaneous abortion, stillbirth or perenatal death. Gonorrhoea or Chlamydia may spread to the eyes of babies as they pass through the cervix and vagina. Without preventive therapy 2% to 50% of infants exposed to the gonorrhoea-causing bacteria Neisseria gonorrhoea during birth develop eye infections (ophthalmia neonatorum). In a number of developing countries ophthalmia neonatorum afflicts 5% of newborns. Without treatment ophthalmia, neonatorum permanently damages the vision of 1% to 6% of affected infants. Chlamydia also may spread to the lungs of newborns and lead to Chlamydia pneumonia.

Economic Costs

Sexually transmitted infections and their sequelae are costly to individuals and the health care system. Many people with STIs seek care from private providers, where they may pay one-quarter to one-third of their monthly earnings for drugs. Also, STIs reduce the productivity of men and women in the prime of their lives. For example, in urban areas of sub-Saharan Africa with a high prevalence of STIs, syphilis causes the loss of an estimated 9 productive days per capita per year or the entire urban population; HIV infection leads to the loss of 48 days.

Clinic and hospitals must devote their time and resources to patients with STIs. In a province of Mozambique, for example, 10% to 15% of visits to primary health clinics are for STIs treatment. In reports from sub-Saharan Africa pelvic inflammatory disease accounts for 17% to 40% of gynaecological admissions to hospitals; in Asia, 3% to 37%.

Determinants of STI/HIV Risk Among Adolescents

Adolescence is a unique time of life, when societal, biologic, behavioural and developmental factors all act in concert to increase the likelihood of STI acquisition.

Biological factors

Several aspects of physical development may be relevant to the high risk of STIs among adolescents. The histology of the cervix and vagina undergo dramatic changes from childhood through puberty and into adulthood. Newborns show effects of exposure to maternal
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estrogen, which produces the squamous epithelium lining of the vagina as seen in adults. Soon after birth these squamous cells are replaced with columnar epithelium. At puberty, estrogen exposure causes the vaginal lining to thicken again which layers of squamous epithelium. Such epithelial changes may be particularly important at the cervix, since the persistence of cervical columnar epithelium in young women appears to significantly increase their vulnerability to STIs. Although cervical columnar epithelium eventually recedes completely, to be replaced with squamous epithelium, this replacement is a gradual process, continuing well into adulthood. Typically, the cervix in the adolescent still displays areas of exposed columnar epithelium, a condition often referred to as ectopy. This is significant because chlamydia trachomatis infects columnar, no squamous, epithelium.

The presence of ectopy has repeatedly been associated with chlamydial infection, even after adjusting for sexual behaviour and other confounders. Although it may be that chlamydial infection causes the appearance of columnar epithelium on the cervix, 62 longitudinal studies have demonstrated that ectopy is associated with increased risk of subsequent infection.

The presence of ectopy also appears to increase the risk for other STIs and their adverse outcomes, Neisseria gonorrhoea attaches preferentially to columnar epithelium rather than squamous tissue. In addition, there is growing evidence that ectopy may contribute to HIV acquisition and HIV shedding. Ectopy may therefore partially account for the high incidence of HIV among adolescent women by increasing both infectivity and susceptibility. The vasculature found with the columnar epithelium associated with ectopy is more superficial and more easily traumatized than that of squamous epithelium, theoretically permitting HIV-infected cellular elements from the circulation to gain access to the mucosal surface, and infected monocytes and lymphocytes to reach the circulation.

The vaginal flora also changes during puberty. The appearance of Lactobacillus spp. results in reduction of the high vaginal pH levels of childhood to the more acidic pH associated with adulthood. The higher vaginal pH of early adolescence of hydrogen-peroxide producing organisms. However, casual links between these anatomic or physiologic changes and STI acquisition have not yet been demonstrated.

Changes in mucosal anatomy produce changes in mucus production, which is minimal in childhood. Mucus production is greatly increase in early puberty, but the mucus of thinner than that found in older adolescents or adult women. Thinner mucus may permit organisms to penetrate more easily and to attach to mucosal sites or gain access to the upper tract.

Psychological and Cognitive Development

The stages of adolescence have been arbitrarily categorised as “early”, “middle”, and “late” and have been considered in terms of psychologic, physiologic and social development.
Development in each of these areas is not necessarily parallel. Individuals are often advanced in some categories but slower than their age-matched peers in others. Furthermore, growth in some of the cognitive areas is strongly influenced by the quality of teaching or role modeling they experience.90 This is particularly relevant for STI prevention, where adults may use indirect methods of educating or reply on “scar tactics” rather than utilize skills training. Several characteristics of adolescents, particularly in early or middle stages of development may have important implications for STI risk and prevention. Younger adolescents frequently use a concrete style of reasoning, focusing on the present times, and are unable to conceptualise the long-term impact that current actions may have until they teach middle or late adolescence. Since some STIs (for example, HIV or Chlamydia) may have adverse effects that are not experienced for a decade or more, it should not be surprising that younger adolescents may not take actions needed to avoid such consequences. Furthermore, adolescents may have difficulty correctly implementing complex tasks (such as condom use) involving a series of steps that must be accomplished in a certain sequence to be effective. Finally, many parents, educators and health care workers do not teach about STI risk or even details of pubertal development until long after many adolescents are at risk for STIs. Therefore, these youths do not have even the basic information to make informed choices.

Sexual Behaviour

Over the last century, socio-cultural and behavioural changes have combined with changes in aspect if the developmental physiology of adolescents to increase the risk of STIs among these young people. Biologically, the average age at menarche has decreased (although it has been stable over the last generation). At the same time societal changes have resulted in increase in the average age in which young men and women marry. As a result, whereas 100 years ago young men in the United States spent approximately 7 years between maturation and marriage, today the interval is 13 years; for young women, the interval between menarche and marriage has increased from 8 years to 14. For this reason alone, it should be expected that premarital sex in the United States has increased.91

Changes in sexual behaviour have placed adolescents at increased risk of STIs, with the trend to earlier age at first intercourse occurring worldwide.92-95 In the United States, several ongoing, population-based surveys provide information about the sexual behaviour of adolescents. They show that during the past several decades the proportion of teenagers who have experienced premarital sexual intercourse has steadily increased, and that age of first intercourse has steadily decreased, although recent data indicate that this trend has leveled off in the United States over the half-decade through 1995.96-98 These trends have occurred despite concern about HIV infection. As a result, in the late 1980s, 56 percent of 18 years-old females and 73 percent of 18-year old males had sex. Of particular note, in 1970 only 5 per cent of women in the United States had premarital intercourse by age 15, whereas in 1988, 26 per cent had engaged in intercourse by this age.99 At each age a greater percentage
of males than females have been sexually active; in general, the percentage of males who have had sexual intercourse if approximately equal to that of females 1 year older.

In addition, younger ages of sexual “debut” is associated with a greater number of sexual partners, an important determinant of STI risk. In 1988, among American women 15 to 24 years of age who were sexually active for the same length of time (less than 24 months), over 40 percent of 15 to 19 olds had two or more partners, compared with only 26 percent of women 20 years of age or older 80 younger age of sexual debut (below age 18) is also associated with ongoing sexual risk among unmarried partners. Nevertheless, partner acquisition tends to follow a pattern of serial monogamy, with fewer than 10 percent of sexually active adolescents having more than one partner within a 3-month period.

Population-based data demonstrate that condom use has increased substantially, but also that use is not consistent. Surveys indicate that more adolescents are using condoms. In the United States between 1983 and 1988, 65 percent of females used contraception at first intercourse, compared with 47 percent of females in the period 1975 to 1979; this increase was entirely a result of increased use of condoms. Comparison data over time are also available for adolescent males. In 1979, 21 percent of never-married urban males 17 to 19 years old reported using condoms at last intercourse, compared with 58 percent in 1988. Reported use was greatest among African American males. However, follow-up data indicate that as males get older and as the duration of the existing relationship increases, condoms are less likely to be used, while forms of contraception that offer less protection against STIs are used more, particularly oral contraceptives. This pattern has also been reported from other countries, such as Australia, Canada, and New Zealand. It is noteworthy that the combined effect of serial monogamy and diminishing use of condoms over the duration of a relationship may be particularly important in exposure to and ongoing transmission of organisms such as HSV-2, Chlamydia, HPV, and HIV, which are associated with chronic and often asymptomatic infection.

Although more people are using condoms, few people, including adolescents, use them consistently. Among unmarried women in the United States 59 percent of 15 to 19 years old reported using condoms for at least 1 month during the 4 years before interview, but only 31 percent of these women’s partners used condoms consistently. Furthermore, the young people most at risk for STIs appear to use condoms least. A survey among adolescent males indicated that those who were substance abusers or had paid for sex were among the least likely to have used condoms at last intercourse. Young males were less likely than older males to use condoms at first intercourse with partners they perceived to be at higher STI risk. Among young people with two or more partners, individuals with greater numbers of partners were less likely to use condoms consistently with either primary or secondary partners. A similar pattern has been observed in other countries.

Use of condoms is a complex behaviour, but we can make some generalization about determinants of condom use upon which to base prevention strategies. Many studies but not all, indicate that use is associated with perceived risk of HIV infection. Youths
who think their peers use condoms are more likely to use them,\textsuperscript{114-118} as are adolescents who feel that their partner would support their use.\textsuperscript{109,119,120} Adolescents are often mistaken about what their partners believe, however, with females overestimating the resistance and negative attitudes that males have about condom use.\textsuperscript{121}

Studies have noted that self-efficacy, perceived risk, and partner support are important factors in increased condom use.\textsuperscript{117-122} For example, many young females who feel confident that they could get their partner to use condoms or could discuss condom use with them are not using condoms.\textsuperscript{123} An important factor appears to be the extent to which young people underestimate their partners’ risk of infection. Young homosexual males\textsuperscript{124} believe that they are safe if they have sex with younger partners. Heterosexual females often feel that they have little or no risk of acquiring HIV from their male partners and believe in their boy friends’ statements of fidelity, often despite having a history of STI themselves.\textsuperscript{3} A major concern, however, is the belief that their partners, particularly their steady partners, would view the request to use a condom as indicating a lack of trust. Conversely, if the request for use is made by the male, the female may assume he is dating outside the relationship, approaches to reconciling these issues are complex and require skillful and practiced communication, as well as interventions suitable for sexually active adolescents who are in the formative phases of social skill development. Other barriers to condom use that are unique to adolescents include lack of ready availability.\textsuperscript{113}

Embarrassment about purchasing condoms may be a particular obstacle for girls.\textsuperscript{123}

**Legal and Ethical Issues**

Adolescents have unique legal status with regard to the provision of health care. Legally they are accorded more rights than children, but in some matters they may have rights that differ from those of adults. However, in all states of the United States, adolescents can be diagnosed and treated for STIs without parental consent or knowledge, and some states have specific provisions regarding testing for and treating HIV infection. Beyond STI diagnosis and treatment, they are three basic issues providers confront in dealing with adolescents.\textsuperscript{124}

1. Does the adolescent have the authority to consent to care without parental involvement?
2. Does the adolescent have the authority to release or prevent release of confidential information (particularly to parents)?
3. Is the adolescents or another source responsible for payment for services rendered?
   Can adolescents insist that parents not be contacted?

Parents usually have the responsibility for medical care for their minor children and are liable for the costs of their care. However, as stated, all states, either have specific status or otherwise permit the diagnosis and treatment of “venereal disease” (the usual terminology) without parental consent.
Consent

Although all states permit a minor to consent to STI care without parental consent, some states identify an age criterion. As of 1994, in five states (Alabama, California, Delaware, Illinois, and Vermont) minors must be at least 12 years old to consent to STI related care, and in five states (Hawaii, Idaho, New Hampshire, North Dakota and Washington), they must be 14 years old.

Health Care Utilization

Till to-date very few studies have been conducted on the felt needs of adolescents regarding health care utilization and compliance. However, data from ICMR study in 1998 suggest that adolescents in Delhi do not obtain health group they do not need health services. In the focus group discussion they came out that they need health care, they should be regarded for seeking health services as a separate group (ICMR, 1998).

Reducing the Toll of STIs

Timely and effective care for STIs can reduce their toll by preventing transmission and sequelae. To provide care for the most people, STI services need to be widely available. Several steps are necessary:

- Adopting a quick, simple, and effective way to diagnose and treat STIs. Microscopes and laboratory tests permit specific diagnosis. Many health care providers lack equipment or time to await test results, however. They manage STI patients by relying on symptoms (what the patient notices) and easily observable signs (what the provider notices). Often STIs can be identified by syndromes (groups of symptoms). The syndromic approach to case management, now begin prompted by the World Health Organization (WHO), gives providers a systematic way to use this information and NACO has already recommended for Indian situation.

- Making effective services accessible. Most important is offering STI services in primary health centres, which serve the most people. The syndromic approach can help primary health care providers to diagnose STI patients. At the same time, primary health care providers need help and support from STI experts in district and medical college level hospitals and in apex hospitals. Such support includes ensuring a steady supply of drugs, training, managing difficult cases referred by the primary health system, that means a good support of referral system and surveillance must be established.

- Getting people with STIs to treatment. There are a variety of approaches: mass – media communication to alert people and inform them about STIs, screening people for STIs when they seek health care for other reasons, notifying the sexual
partners of STI patients that they should seek treatment, and setting up special programs for high risk populations.

• Encouraging people to avoid STIs by following, what Philippine health secretary Juan Flavier calls the ABCs of safe sex: “A for abstinence. If you can’t abstain, B for be faithful, and if you can’t be faithful, then use C for condom’s”.

**Managing STIs**

Effective managements of STIs as of most infections, requires that patients and health care providers cooperate in a series of steps leading to cure:

1. Obtaining information: Providers question about patient’s health and sexual activity; patients answer questions completely and truthfully.

2. Performing a physical examination: Patients are willing to be examined; providers check patients for signs of STIs.

3. Diagnosing and treating patients: Providers know the signs and symptoms of STIs and have the right drugs to treat them; patients can obtain the drugs, and they take the full course as directed.

4. Counseling: Providers counsel patients to cure the current infection and prevent re-infection; patients follow the counseling advice and help get their sexual partners treated.

Effective STIs prevention for adolescents require involvement by numerous individuals and institutions that have contact with young people, and it should include activities implemented in several different settings. Despite the many challenges facing prevention of STIs among adolescents, there are encouraging findings from interventions based in schools, colleges, and hospitals.

There are effective strategies, if coordinated and implemented broadly, should result in healthier behaviour and lower rates of STIs among adolescents. Health education messages found to be effective can be provided with consistency across the different levels of social context of adolescents’ lives, and educational and health service activities can be systematically linked across schools, media, community organizations, and health care delivery systems.
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