Review Article

Changing patterns of sexually transmitted infections in India

VINOD K. SHARMA, SUJAY KHANDPUR

ABSTRACT

Sexually transmitted infections (STIs) are more dynamic than other diseases prevailing in the community. Their epidemiological profile varies from country to country and from one region to another within a country, depending upon ethnographic, demographic, socioeconomic and health factors. The clinical pattern is also a result of the interaction among pathogens, the behaviours that transmit them and the effectiveness of preventive and control interventions. We reviewed the changing patterns of different STIs (excluding HIV infection) in India and their various risk factors.

A MEDLINE search was undertaken using the key words ‘sexually transmitted infections, epidemiology, India’. Related articles were also searched. In addition, a manual search for many Indian articles, published in journals that are not indexed was also carried out. Wherever possible, the full article was reviewed. If the full article could not be traced, the abstract was used.

Most of the published data are institution based. There is a paucity of community-based data, except for information obtained from high risk groups such as commercial sex workers, truck drivers, hotel workers and drug abusers. From the literature search undertaken, it was observed that during the 1960s and 1970s, bacterial infections including syphilis, chancroid and gonorrhoea were the major STIs, while viral infections caused by herpes simplex virus and human papillomavirus were so rare that they merited publication as case reports. Since the 1980s, the spread of human immunodeficiency virus (HIV) with subsequent behavioural (sexual and healthcare) change, the indiscriminate and prophylactic use of over-the-counter broad-spectrum antibiotics, upgrading of health services at the primary level and the success of ‘syndromic’ approach of treatment, has resulted in major changes in epidemiological patterns. As in developed countries, there has been a rise in viral and chlamydial infections and a relative fall in the incidence of traditional infections. This has forced a reappraisal of the importance of sexual and healthcare behaviours, since the control of incurable viral STIs depends to a great extent on societal efforts at primary prevention and counselling rather than their early diagnosis and treatment, which is an effective strategy against curable bacterial STIs.

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INTRODUCTION

Sexually transmitted infections (STIs) are perhaps as old as human civilization itself. Medical descriptions of STIs date back to the fifteenth century when syphilis and gonorrhoea were primarily responsible for the abandonment of public baths in Europe. After World War II, new diagnostic techniques and clinical and epidemiological studies established that many ‘non-traditional’ microbes could also produce infections when transmitted sexually. In the USA, of the top 11 reportable diseases in 1996, 5 were transmitted sexually (gonorrhoea, chlamydial infection, syphilis, hepatitis B and acquired immunodeficiency syndrome [AIDS]). STIs are also among the 5 leading causes of health problems in developing countries. The World Health Organization (WHO) estimated that in 1999, 340 million new cases of curable STIs occurred globally, of which 150 million cases were reported from South and Southeast Asia including 50 million from India.

The epidemiological profile of STIs is more dynamic than that of other diseases. STIs differ from other diseases in the following aspects: (i) their incubation periods are highly variable; (ii) the genetic structure of most sexually transmitted pathogens are so diverse that researchers have been unable to design a vaccine against them; and (iii) these diseases are primarily spread by a behaviour that is inherently resistant to change (it is highly motivated and varies considerably within and between social and ethnic groups).

A variety of demographic and medical factors contribute to the high prevalence of STIs. The incidence and distribution of these diseases are also influenced by factors such as lifestyle and susceptibility of the individual, pathogenicity of the microbes, prevailing therapy and disease control measures. A complex set of behavioural factors also determine the risk of acquiring STIs. The risk of acquiring STIs is high, especially in developing countries such as India, where a large percentage of the population belongs to the sexually active age group. Rural-to-urban migration has led to family separation and unbalanced sex ratios in both rural and urban areas, loss of traditional values of sexual behaviour and increased sexual promiscuity. The stigma associated with STIs is still strong and embarrassment may prevent infected persons from seeking medical treatment, thereby increasing the reservoir of infection. Moreover, cure after appropriate antibiotic therapy is no longer certain for some infections such as gonorrhoea and chancroid because of the increasing resistance of the microbes to antibiotics.

In developed countries, there has been a steady increase in the rates of STIs, especially viral STIs and genital chlamydial infection. The development of more accurate diagnostic tests helped in the detection of widespread reservoirs of subclinical infection. A rapid decline in the incidence of syphilis has been observed in the Caucasian population with stable or even decreasing rates among blacks, especially among urban, poor and minority populations. Prostitution has emerged as a multiplier of STIs
and the phenomenon of sex in exchange for drugs has contributed to the epidemic of syphilis, gonorrhoea and chancroid in North America. There has been a constant decline in the incidence of gonorrhoea, especially among heterosexual men and all women. However, it has been on the increase in homosexual men. In developing countries, STIs account for 10%–20% of adult patients attending government health facilities. However, these figures are an underestimate, since such infections are rarely treated in the public health sector, as patients prefer to visit traditional healers, quacks, pharmacists or private practitioners who are more accessible and less judgemental in their attitudes. In India in the 1970s and early 1980s, syphilis and chancroid were the main causes of genital ulcer disease (GUD), while viral GUDs such as genital herpes were extremely rare. With the recognition of human immunodeficiency virus (HIV) infection in the 1980s and subsequent behavioural, social and psychological changes, the pattern has shifted from predominantly bacterial to viral STIs.

The epidemiological data on the STIs prevalent in India and their risk factors were obtained by a thorough MEDLINE search using keywords such as ‘sexually transmitted infections, epidemiology, specific disease (syphilis, genital herpes, etc.)’. Also, an exhaustive manual search of various journals in dermatology, venereology, gynaecology, general medicine, community medicine, paediatrics and microbiology (both full articles and abstracts) was also done.

EPIDEMIOLOGY OF BACTERIAL STIs
Syphilis
It is a major cause of GUD and an important risk factor in the transmission of HIV infection. In developed countries, the prevalence of syphilis has fallen steeply except for a few focal outbreaks. This is due to improved access to healthcare, effective control programmes and efficacious treatment. However, in some developing countries, it remains a major public health problem with an estimated 12 million cases occurring worldwide annually, of which 4 million occur in Africa. In India, syphilis continues to be a major health problem. In England and Wales, after almost 2 decades of a persistent decline, infectious syphilis is again on the rise. Since 1997, when the Bristol outbreak heralded a resurgence of the disease, outbreaks have been reported in the Northwest, Southeast and London regions of England. By 2000, nearly two-thirds of the nationally reported cases were diagnosed in these areas. In 1999–2000, the infection rose by 160% in men (from 153 to 248 cases), 130% in women (from 55 to 73 cases), and 217% in MSM (from 52 to 113 cases). These outbreaks were associated with high rates of partner exchange, travel to or migration from endemic areas, predominance of homosexuality and a high proportion of HIV co-infection. Resurgence of syphilis has also been reported from other European countries. In the STI clinics in Amsterdam, the Netherlands in 1999, 76 new cases of infectious syphilis were reported, an increase of 111% from 1998, with the largest increase being among MSM (from 9 in 1998 to 40 in 1999).

In India, syphilis continues to be a major health problem. However, a constant decline in its prevalence has been observed in recent years. In a retrospective analysis of the data obtained from STI clinic attendees at a tertiary hospital in Delhi between 1954 and 1994, although the STI cases increased 8-fold, with the prevalence increasing from 5.5% in 1964 to 14.7% in 1994, the syphilis load declined from 61.2% to 9.1%. Men outnumbered women in the ratio of 2.8:1, probably because women report for investigations and treatment much later than men, due in part to the asymptomatic nature of the disease in women. In this analysis it was also observed that the prevalence in adult men increased until 1984 in contrast to children under 14 years of age, in whom it decreased from 12.6% in 1954 to 0.5% in 1994. No case of neurosyphilis was diagnosed during the 40-year study period while 10 cases of cardiovascular syphilis were last reported in 1954. In other Delhi hospitals also, the syphilis load had decreased from 54.9% in 1965–78 to 15.6% in 1995–99. During 1965–78, 2 cases each of neurosyphilis and cardiovascular syphilis in women were reported. In Madurai, Tamil Nadu in 1992, 17.5% of men presenting with neurological manifestations and an associated past history of multiple sex partners were diagnosed as having neurosyphilis, predominantly meningovascular syphilis. A major decline in syphilis has been observed in Chandigarh, with the prevalence decreasing from 10.4% in 1977–85 to 2% in 1995–96, in Rohtak from 30.2% in 1992–93 to 24% in 1995–2000 and in Patiala from 29.6% in 1983–88 to 17.2% in 1990–98. This reduction may be attributed to the regular supply and consistent use of effective drugs. A cross-sectional survey of women in the reproductive age group in an urban slum community in Mumbai in 1995 reported a venereal disease research laboratory (VDRL) seropositivity of 0.5%, while a study from a similar population in Delhi in 1996–2000 showed a seropositivity of 4%. Blood donors may also acquire and transmit syphilis (Table I).

In our hospital, between 1989 and 1995, VDRL reactivity among voluntary and replacement blood donors increased from 0.23% to 0.52%. A survey undertaken in Vellore, Tamil Nadu showed that

<table>
<thead>
<tr>
<th>City</th>
<th>Year</th>
<th>Blood donors (%)</th>
<th>Antenatal women (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>1987</td>
<td>2.8</td>
<td>–</td>
</tr>
<tr>
<td>Delhi</td>
<td>1989</td>
<td>0.23</td>
<td>–</td>
</tr>
<tr>
<td>Delhi</td>
<td>1995</td>
<td>0.52</td>
<td>–</td>
</tr>
<tr>
<td>Delhi</td>
<td>1996</td>
<td>–</td>
<td>3.4</td>
</tr>
<tr>
<td>Delhi</td>
<td>1998</td>
<td>–</td>
<td>2.53</td>
</tr>
<tr>
<td>Lucknow</td>
<td>1996</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>Tirunelvelli</td>
<td>1985</td>
<td>3.62</td>
<td>–</td>
</tr>
<tr>
<td>Bihar</td>
<td>1993</td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>Jodhpur</td>
<td>1994–99</td>
<td>0.22</td>
<td>–</td>
</tr>
<tr>
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<td>2002</td>
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<td>–</td>
</tr>
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<td>1994–99</td>
<td>0.2</td>
<td>–</td>
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<tr>
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<td>1996</td>
<td>0.11</td>
<td>–</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>2002</td>
<td>0.66</td>
<td>–</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>1986</td>
<td>–</td>
<td>1.8</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>2003</td>
<td>–</td>
<td>0.67</td>
</tr>
<tr>
<td>Shimla</td>
<td>1987–90</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>Bijapur</td>
<td>1996–2001</td>
<td>0.57</td>
<td>–</td>
</tr>
<tr>
<td>Aligarh</td>
<td>1987</td>
<td>–</td>
<td>2.9</td>
</tr>
<tr>
<td>Rohtak</td>
<td>1996–2000</td>
<td>–</td>
<td>1.47</td>
</tr>
<tr>
<td>Vellore</td>
<td>2001</td>
<td>–</td>
<td>0.98</td>
</tr>
</tbody>
</table>
seroprevalence among blood donors decreased between 1990 and 1995 and then increased in the next 3 years. In other parts of India, VDRL positivity has been observed to vary from 0% in Lucknow and Shimla, and 0.095% in Ludhiana to as high as 7% in Bihar.

Congenital syphilis (CS) is the most dreaded consequence of untreated syphilis in pregnant women, and is estimated to occur in 25%–75% of exposed infants. It has been suggested that approximately 10%–12% of infants born to mothers with a positive serology for syphilis would die if untreated, yielding a mortality rate of 1%–3% among children under the age of 4 years. In Delhi, during 1965–78, 82 cases of CS were reported, with a higher female-to-male ratio (1.73:1). In Kurnool, Andhra Pradesh, only 7 cases of CS were observed from 1980 to 1990.

Surveys conducted among antenatal women have shown VDRL seropositivity to vary from 0.67% in Chandigarh to 3.4% in Delhi.

Gonorrhoea

This is a well recognized public health problem and remains one of the commonest bacterial STIs in the world, with approximately 62 million new Neisseria gonorrhoeae infections occurring annually worldwide. The importance of this disease is not only limited to its high incidence and acute manifestations, but also extends to the complications and disturbing sequelae. It is also an important risk factor for the transmission of HIV infection.

In developed countries, there has been a constant decline in the incidence of gonorrhoea. However, in developing countries, the prevalence is high. In India, the prevalence of gonorrhoea among STI clinic attendees in different regions varies from 3% to 19% (Tables II and III). However, it has been on the decline over the past decade, probably due to the availability of medical facilities at the primary healthcare level, indiscriminate use of potent over-the-counter drugs for unrelated illnesses, prophylactic use of antibiotics after sexual exposure and growing awareness about AIDS. A steady decline in prevalence was observed in Chandigarh, Delhi and Patiala, while a marginal increase was reported from Rohtak and Ahmedabad (Tables II and III). In a survey of women attending an STI clinic in Mumbai in 1996, 9.7% were positive for gonorrhoea. This was higher than that reported from gynaecological clinics in Amritsar (1995) and Chandigarh (1986), where it was 0.8% and 1.8%, respectively. The apparent ratio of male-to-female cases is 10:1 with 80%–90% of men acquiring the infection from commercial sex workers (CSWs).

Chlamydial infection

Genital Chlamydia trachomatis infection is an STI of epidemic proportions. It causes up to half of all acute non-gonococcal urethritis (NGU) and at least one-third of acute epididymitis in men. In women, it is responsible for half of all cases of mucopu-
rulent cervicitis and 20%–40% of cases of pelvic inflammatory disease (PID) with a risk of subsequent infertility or ectopic pregnancy. In 1997, 89 million new chlamydial infections were detected and WHO estimates that the global frequency of the infection is 50 million cases per year. In the USA, it is the commonest nationally notifiable infectious disease, with 3 million cases occurring annually. The majority of epidemiological studies conducted in India have used the criterion of demonstration of >5 neutrophils in urethral smears or endocervical specimens to establish the diagnosis of NGU, without isolating the causative organism. The prevalence using this criterion varies from 1.5% to 19% among STI clinic attendees in different parts of the country (Tables II and III). There are only a few studies in which the disease prevalence has been established by specific diagnostic modalities. Among STI clinic attendees in Delhi in 1998–99, 50% positivity for C. trachomatis was found using the plasmid-based polymerase chain reaction (PCR) assay, 26% positivity using enzyme immunoassay for antigen detection and 52% positivity using enzyme-linked immunosorbent assay (ELISA) for antibody detection.

Among antenatal clinic attendees (Table IV) in Delhi in 1999, 21.3% were found to be infected with C. trachomatis, with high incidences of stillbirths, prematurity and low birth-weight. Another study from Delhi in 1999 showed a prevalence of chlamydial infection in 17% and 18.6% of the cases during mid-pregnancy and labour. However, there was no difference in neonatal complications due to the infection except for purulent conjunctivitis as compared with the control group.

In women attending gynaecological clinics (Table IV) in a Delhi hospital between 1990 and 1992 with symptoms of lower genital tract infection and infertility, the prevalence was 41% and 36%, respectively. In young women undergoing a routine gynaecological check-up in Mumbai in 1994, genital chlamydial infection was diagnosed in 15% of cases; 53% of cases showed clinical signs suggestive of cervicitis and only 2% had PID. In this study, the contribution of C. trachomatis to PID was much lower compared with a study from Nagpur, in which it was responsible for 33% of cases with PID. This infection was detected in 23.3% of attendees of the gynaecological clinic of an outpatient department (OPD) in Delhi in 1994. Among women seeking healthcare for reproductive health complications, chlamydial infection rates from the same region during different periods, a considerable decrease in the prevalence was observed (Tables II and III). This may be due to the availability of newer antibiotics, their indiscriminate use at the primary care level due to free availability, their prophylactic use before or after sexual exposure, greater awareness regarding early diagnosis and treatment, and the immense success of the syndromic approach in the treatment of STIs and condom promotion campaigns.

### Table IV. Prevalence of Chlamydia trachomatis infection in India and some other countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Antenatal clinics (%)</th>
<th>Attendees of gynaecology clinics (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delhi</td>
<td>1997</td>
<td>21.3</td>
<td>–</td>
</tr>
<tr>
<td>Delhi</td>
<td>1999</td>
<td>17–18.6</td>
<td>–</td>
</tr>
<tr>
<td>Delhi</td>
<td>1990–92</td>
<td>–</td>
<td>36–41</td>
</tr>
<tr>
<td>Delhi</td>
<td>1994</td>
<td>–</td>
<td>23.3</td>
</tr>
<tr>
<td>Mumbai</td>
<td>1994</td>
<td>–</td>
<td>15</td>
</tr>
<tr>
<td>Mumbai</td>
<td>2000</td>
<td>–</td>
<td>14.3–20</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>1989</td>
<td>–</td>
<td>33</td>
</tr>
<tr>
<td>USA</td>
<td>1990s</td>
<td>5</td>
<td>–</td>
</tr>
<tr>
<td>UK</td>
<td>1990s</td>
<td>3–4</td>
<td>–</td>
</tr>
<tr>
<td>China</td>
<td>1993</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>The Philippines</td>
<td>1994</td>
<td>5.6</td>
<td>–</td>
</tr>
<tr>
<td>Thailand</td>
<td>1999</td>
<td>6.8</td>
<td>–</td>
</tr>
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</table>

### Chancroid

The epidemiological data for chancroid may be inaccurate in view of the difficulty in diagnosing the condition on clinical grounds alone, since most medical service providers do not have the facility to perform laboratory tests. Recently, chancroid has received more attention because of its strong association with HIV transmission. In developed countries, it is an uncommon cause of GUD. Chancroid is the leading cause of GUD in developing countries, particularly in sub-Saharan Africa and Southeast Asia. In African countries, its prevalence varies from 9.8% to 68%. The risk factors include early age at first coitus, long duration of marriage (>20 years), large number of lifetime sexual partners, serological evidence of exposure to another STI and lower socioeconomic status. The incidence is highest among divorcees and CSWs. In India, the prevalence was observed to vary from 1.6% in Patiala to as high as 51.9% in Mumbai. On comparing the rates from the same region during different periods, a considerable decrease in the prevalence was observed (Tables II and III). This may be due to the availability of newer antibiotics, their indiscriminate use at the primary care level due to free availability, their prophylactic use before or after sexual exposure, greater awareness regarding early diagnosis and treatment, and the immense success of the syndromic approach in the treatment of STIs and condom promotion campaigns.

### Donovanosis

This is a chronic, mildly contagious STI characterized by granulomatous ulceration of the genitalia and neighbouring sites caused by Calymmatobacterium granulomatis. It has been ignored as a cause of GUD for many years due to the non-availability of specific laboratory diagnostic facilities. However, during the past decade, there has been a renewed interest owing to the emergence of HIV infection and the consequent increase in the number of cases of donovanosis. Although donovanosis has a worldwide distribution, it is endemic in tropical and subtropical countries, especially in India, Papua New Guinea, Brazil, South Africa and among aborigines of Australia. Racial and ethnic predispositions are associated with it since it is more common among Dravidians in southern India and hill dwellers of Himachal Pradesh. The disease has been frequently reported from some parts of India, especially Tamil Nadu, Pondicherry, Andhra Pradesh and Orissa. It is speculated that in these states, climatic factors such as moderate relative humidity and persistent high temperatures are responsible for the higher prevalence. A strong association with HLA-B57 has also been observed. In various STI clinics, the prevalence ranged from 0.013% in Tezpur to 8.2% in Pondicherry and 10% in Mumbai. In Chandigarh, the prevalence showed a major decline from 6.3% in 1977–85 to 0.5% in 1995–96, probably due to the availability of broad-spectrum antibiotics. In Delhi, it increased from 0.25% in 1955–61 to 1.4% in 1989–95 and then declined to 0.48% in 1995–99. Two epidemics of donovanosis occurred in Delhi, in 1983 and 1985, when the reported incidences were 6.38% and 8.33%, respectively. The disease mainly affected young, unmarried men who contracted the disease during heterosexual intercourse with CSWs, and those who were illiterate and from low socioeconomic groups. The increase in incidence was also attributed to the large-scale migration of high risk individuals from endemic areas.
**Lymphogranuloma venereum (LGV)**

It is a less commonly encountered STI in developed countries, with only sporadic cases reported from North America, Europe and Australia, where it occurs mainly among immigrants and travellers returning from endemic areas. In India, a prevalence of 0.15%–9.74% has been reported from different parts of the country (Tables II and III). Perhaps the lack of specific diagnostic criteria in these studies and the relatively poor degree of clinical suspicion of the condition may have introduced some bias in these estimates.

**Bacterial vaginosis**

This is a common cause of abnormal vaginal discharge in women of reproductive age, and an established risk factor for premature rupture of the membranes and preterm delivery. In recent studies, a very high prevalence of bacterial vaginosis has been reported among those attending antenatal and gynaecological clinics, varying from 26% to 50% in women with symptomatic vaginitis and from 11.5% to 22.2% among asymptomatic women. In two community-based surveys conducted in the districts of Haryana and Karnataka among ever-married women in the 15–44 years age group, and in married women with 6–12-month-old children, respectively, bacterial vaginosis was detected in 48% of women complaining of vaginal discharge in the first survey and in 18% in the second survey. The attributable risk of preterm delivery associated with bacterial vaginosis has been observed to be as high as 82.5%. This infection strongly correlates with sterilized women in urban areas, long duration of marriage, lower socioeconomic status and women with more than two children.

**EPIDEMIOLOGY OF VIRAL STIs**

**Genital herpes infection**

Genital herpes simplex virus (HSV) infection is the second most prevalent STI worldwide and the commonest cause of GUD in the developed world. This infection has important public health implications because: (i) undiagnosed cases contribute to the population reservoir and transmission of the virus; (ii) perinatal transmission to the neonate may result in disseminated disease, neurological damage and high mortality; and (iii) herpetic ulcers facilitate HIV transmission.

Genital herpes is one of the three most prevalent STIs in the USA (along with chlamydia and human papillomavirus infections), and probably of greatest concern to sexually active people, apart from HIV infection. In the USA, about 1 in 5 persons >12 years of age (approximately 45 million people) are infected with HSV-2 infection with up to 1 million new HSV-2 infections occurring annually. There has been a constant increase both in the incidence and prevalence of genital herpes. In India also, there has been a major increase in the proportion of viral STIs, especially HSV infection, with rates varying from 4.1% to 27.9% among STI clinic attendees in different regions of the country (Tables II and III). In Chandigarh, the prevalence rose from 11.4% in 1977–85 to 22.2% among asymptomatic women. In Ahmedabad, during the 1990s, it marginally increased from 18.1% to 21.5% and then declined to 19.4%. Similarly, in Ahmedabad, a slight increase was observed from 7.2% in 1993–94 to 9.1% in 1998–99. However, in Chandigarh and Patiala, the prevalence of genital warts had declined. These studies were based on clinical diagnosis only, rather than the detection of HPV DNA or serological tests. The subclinical and asymptomatic nature of HPV infection, especially in women, may have been responsible for the wide disparity in the incidence rates.

Infection with oncogenic HPV is the leading cause of cervical cancer in India. In a study from Delhi during the late 1990s among women STI clinic attendees, HPV-16 DNA was detected in 30% of cases, which increased to 52% and 72% among women with precancerous and cancerous cervical lesions, respectively. In Mumbai, using southern hybridization of the HPV PCR product by HPV-16/18 probes, HPV-16/18 was detected in 77% of cervical cancer patients, 38% of patients with low grade squamous intraepithelial neoplasia lesions (SIL), 80% of patients with high grade SIL and 15.2% of healthy women. In another study from Mumbai, using the non-isotopic in situ hybridization technique, HPV DNA was detected in 76.4% of patients with cervical cancer lesions; HPV-16/18 in 29.4% of cases with squamous cell carcinoma, and only HPV-18 in all cases of adenocarcinoma and neuroendocrine carcinoma of the cervix. HPV-16 was isolated in 29.1% and HPV-18 in 8.3% of patients with SIL lesions. In Kolkata, HPV DNA was detected in 50% of biopsy specimens and in none of the exfoliative cervical cell specimens of patients with carcinoma of the cervix; HPV-16/18 was isolated from 56% of the positive biopsy material.

In a majority of the studies cited above, the risk of acquiring HPV infection, especially among cytologically normal women, was inversely related to age and directly to the number of sexual partners, poor socioeconomic status, low education, use of oral contraceptives, reproductive characteristics, concomitant presence of other STIs, smoking and dietary factors. In the early 1990s, a high rate of prevalence was reported among the adolescent population, ranging from 15.6% to 46.1%. The inverse association with age may be explained by the fact that the immunological or hormonal changes occurring in old age may clear or suppress existing infection. Moreover, fewer sexual partners in older women may reduce the rate of infection. In a study from Japan, the risk of acquiring premalignant and malignant cervical lesions with HPV-16 was 8 times higher in women ≤44 years of age than in women ≥45 years of age. The use of oral contraceptives may influence the transcription and translation of the HPV genome and hence...
play an important role in the causation of cervical neoplasia. Ethnographic variations have also been observed in the epidemiology of HPV infection. Higher rates of prevalence have been reported among African/American women than among whites or Hispanics. This may be due to differences in the probability of encountering an HPV-positive partner, genetic predisposition towards a greater susceptibility to the acquisition and persistence of infection, endogenous hormonal factors or differences in sexual behaviour among the ethnic groups.

Hepatitis B virus (HBV) infection

This is an important viral infection in India, transmitted predominantly via the parenteral, percutaneous or perinatal route. Many studies also suggest sexual contact as a possible mode of transmission both in homosexual and heterosexual individuals. In fact, very high hepatitis B surface antigen (HBsAg) positivity has been observed in homosexual patients with STIs. India falls in the intermediate zone of HBV prevalence (between 2% and 7%) based on surveys among blood donors, intravenous drug abusers, other high risk groups, pregnant women and the general community. Among voluntary and replacement blood donors, a prevalence of 1%–4% in most regions, with a rate of 7% in Chennai has been reported.

In pregnant women attending antenatal clinics, HBsAg positivity of 2.3%–5% has been recorded, while in healthcare workers (HCW), it has been found to vary from 1.7% to 5.3%. Among HCW, laboratory technicians showed the highest positivity of 40% in a study from Shimla.

Tandon et al. have reported an HBV carrier rate of 2%–8% in the north Indian population. In various community surveys, HBsAg positivity of 3.4%–11.3% has been observed. Certain tribal communities are endemic for this infection. In the tribal regions of Madhya Pradesh, a prevalence of 4.4% and 15.7% has been found, while in the two tribes (Nicobar and Jarawas) of the Andaman and Nicobar islands, an HBsAg positivity of 22.3% and 60%, respectively, was recorded. Horizontal transmission through close contact with carriers, the perinatal route and use of unsafe injections were the common modes of transmission in this population.

Prevalence rates in high risk populations including drug abusers, STI clinic attendees and prisoners have also been reported from different regions. In Manipur, 100% HBsAg positivity was found in HIV-positive intravenous drug abusers. In two surveys of prison inmates in Delhi, HBV infection was found in 12% and 34% of the cases, while in the two tribes (Nicobar and Jarawas) of the Andaman and Nicobar islands, an HBsAg positivity of 22.3% and 60%, respectively, was recorded. Horizontal transmission through close contact with carriers, the perinatal route and use of unsafe injections were the common modes of transmission in this population.

Hepatitis C virus (HCV) infection

This is a global public health problem affecting 3% of the world’s population. Its transmission is primarily attributed to contact with infected blood or unsterile needles. There is also evidence of sexual transmission of HCV infection which is facilitated by ulcerative STIs and homosexual practices. Among blood donors, the worldwide prevalence of HCV infection ranges from 0.01% to 2% and in India, 0.08%–4% of non-professional blood donors have been found to be infected. Among HCW, in Chandigarh, HCV seropositivity was reported in 0.9% but in Shimla and Madurai there was no evidence of infection in this group. In high risk cases such as prisoners, HCV infection was reported in 4.8%–16% of cases. In Manipur, 92% of HIV-positive intravenous drug abusers were positive for HCV. A very high prevalence of anti-HCV antibody was observed among those undergoing haemodialysis (27.8% in Mumbai, 42% in Indore) and receiving multiple blood transfusions (36.4% in Mumbai, 25.5% in Indore). In a community-based survey in a district of West Bengal in 1999, 0.9% of cases were positive for anti-HCV antibody. The age-specific prevalence was low in children (0.3%), but increased progressively in adolescents (0.8%), adults (1%) and the elderly (1.9%), suggesting a steady cumulative rise in the incidence of infection. A very high prevalence of anti-HCV antibody (7.9%) was reported among the Lisu community of Arunachal Pradesh in 1999–2000, of whom 75% were illiterate and 92% cultivators.

The above studies suggest that the prevalence of bacterial STIs is decreasing while that of chlamydial and viral infections is increasing. Community-based data from Tamil Nadu on the prevalence of STI also indicate a similar trend (Table V).

STIs IN HIGH RISK GROUPS

Commercial sex workers (CSWs)

A CSW is defined as a person who provides sexual service for money or other material gains and includes those who work in brothels or are casual freelance sex workers. They may also work in night clubs, hotels, massage parlours or bars. Contact with CSWs is an important risk factor for the transmission of STIs because they have a high rate of partner change, longer period of exposure to infection, poorer access to healthcare facilities and efficient transmission from sexual exposure.

In India, a majority (74.5%–89%) of men attending an STI clinic give a history of contact with CSWs. In Kolkata, in 1994, a very high prevalence of STIs (80.6%) was observed in this group. Oral infection with HSV-1, HSV-2 and HPV-16/18 was detected in 24.6%, 11.6% and 29% of CSWs, respectively, while cervical infection occurred in 0%, 44% and 63%, respectively.

<table>
<thead>
<tr>
<th>STI syndromes</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genital ulcer disease (men)</td>
<td>0.1</td>
</tr>
<tr>
<td>Genital ulcer disease (women)</td>
<td>2.7</td>
</tr>
<tr>
<td>Vaginal discharge</td>
<td>41.5</td>
</tr>
<tr>
<td>Urethral discharge</td>
<td>0.2</td>
</tr>
<tr>
<td>Bubo (men)</td>
<td>0.02</td>
</tr>
<tr>
<td>Scrotal swelling</td>
<td>2.5</td>
</tr>
<tr>
<td>Pelvic inflammatory disease</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Pattern of STIs

Any STI | 15.8
Classical STI | 9.7
Gonorrhoea | 3.7
Syphilis | 0.3
Chlamydia infection | 3.9
Trichomoniasis | 5.1
Hepatitis B surface antigen positivity | 5.3
HIV infection | 1.8

Table V. Community prevalence (%) of sexually transmitted infections (STIs) in Tamil Nadu.

Genital symptoms | 47.3
Genital discharge | 52.5 women; 1.7 men
Vaginal discharge, abdominal pain, dyspareunia | 60 women
Asymptomatic infection | 32 women; 72 men

STI syndromes

Genital ulcer disease (men) | 0.1
Genital ulcer disease (women) | 2.7
Vaginal discharge | 41.5
Urethral discharge (men) | 0.2
Bubo (men) | 0.02
Scrotal swelling | 2.5
Pelvic inflammatory disease | 0.6

Pattern of STIs

Any STI | 15.8
Classical STI | 9.7
Gonorrhoea | 3.7
Syphilis | 0.3
Chlamydia infection | 3.9
Trichomoniasis | 5.1
Hepatitis B surface antigen positivity | 5.3
HIV infection | 1.8
indicating a high prevalence of oral sex in this group. In a 1996 survey of ‘clients’ visiting the ‘red light’ area of Kolkata, HCV seropositivity was found in 15.1% of cases, HBsAg in 40.9% and syphilis in 20.4%. In Pune, of the 200 CSWs surveyed randomly, 81.5% suffered from an STI. Syphilis was the commonest infection (36.8%) followed by chancroid (31.3%). Forty-seven per cent of CSWs were HIV positive compared with 14% of controls. A survey of CSWs from Tirupati in 1992–93 showed HIV seropositivity in 25%, primary chancre in 15%, gonorrhoea in 15%, LGV in 10%, donovanosis in 5%, seropositivity for syphilis in 70% and HBsAg in 50.

It is estimated that by 2005, HIV infection among CSWs in India would increase to 3.9 million from 2.49 million in 1999 in a favourable scenario, and to 6.87 million under a worst-case scenario unless prevention strategies are enforced in this high risk group. Hence, their continuous surveillance, early diagnosis, appropriate treatment and rigorous follow up is of utmost importance in limiting the transmission of STIs. Moreover, the focus is on STI prevention by using barrier contraceptives.

Transport workers (drivers)
This group is at a high risk of acquiring and transmitting an STI (including HIV) because of their geographical mobility. They often come in contact with CSWs, including homosexuals, while they are away from their families for long periods. Poverty, illiteracy and a low level of awareness about STI and HIV, and the lack of healthy recreational facilities are other contributing factors. In a study conducted in Pondicherry between 1997 and 1999, truck drivers had the highest rates of HBsAg positivity (23.8%) and HIV infection (47.6%) and the second highest rate of HCV positivity (42.8%). In another survey from the same city between 1993 and 1997, 51.4% of truck drivers were seropositive for HIV antibodies. In Nagpur, 43.7% of long-distance truck drivers had one or more STIs—HIV infection in 15.2%, syphilis in 21.9%, gonorrhoea in 6.7% and HBV in 5.1%. In Delhi in 1990, 1% of truck drivers were HIV positive. The risk behaviours included sex with CSWs, homosexuality, illiteracy and non-usage of condoms.

Restaurant workers
They are another high risk group that transmits STIs. In a survey undertaken among this group along a highway in Assam, over one-third had sexual contact with multiple partners or CSWs and 2% were engaged in homosexual activity. A majority of them were illiterate, 30% were alcoholics and smokers, and 3% were addicted to cannabis. GUD was present in 25.7% of the workers, 11.8% had gonorrhoea while 5.1% were VDRL reactive.

Trans-sexuals
In the Indian subcontinent, male sex workers are predominantly transvestites and trans-sexuals. This community engages in commercial sex that comprises mainly insertive anogenital intercourse with men. STI prevalence in this group has been formally studied in Pakistan, although this group is active in India as well and forms an important source of STI transmission. A survey conducted in Karachi in 1999 documented syphilis in 37%, urethritis in 70%, genital warts in 54% and HBsAg positivity in 3.4% of the transvestite sex workers. Fifty-seven per cent of these individuals reported sexual abuse in childhood, the average age of first intercourse with consent was 12 years and the use of condoms by their sexual partners was minimal. Almost 50% of these individuals took drugs and 63% consumed alcohol. Hence, intervention strategies for this community can have a major impact on the prevention of STIs and HIV infection.

Prison inmates
STIs tend to cluster in socially excluded populations and such populations are over-represented in prisons. Numerous studies have found high rates of STIs among prison inmates. Moreover, the spread of HIV, HBV and HCV is linked to a higher imprisonment rate of drug abusers. An epidemiological study in a district jail around Delhi showed that 4.6% of inmates had primary syphilis, 33.3% were positive for HBsAg, 5% were reactive for HCV antibodies and 1.3% were Western blot-confirmed HIV-1 positive cases. 28.8% of the inmates were homosexuals/bisexuals, 54.2% gave a history of multiple sexual partners, 83% had had contact with CSWs and 80.6% indulged unprotected sex. Of the inmates, 68% were alcoholics, 24% consumed heroin while 4.8% were intravenous (i.v.) drug abusers.

Substance abusers
Substance abusers have been associated with epidemics of STIs, especially HIV infection.

Crack cocaine users. The drug most often associated with STIs is smokable freebase (crack) cocaine. Ethnographic research suggests that addiction to crack forces young women to sell sex directly for money to buy crack. Also, sex workers, under the influence of the drug, may be less careful when indulging in sexual practices or choosing partners. Epidemiological data indicate that ‘crack for sex’ exchange differs from other types of prostitution because a high proportion of the adolescent population are drug abusers, oral sex is the predominant type of sexual activity and crack users often indulge in unprotected sex. A high prevalence of STIs in this group has been reported from various parts of the USA. The use of crack cocaine could have a serious impact on the patterns of STIs in India as well, and necessary legislative measures need to be adopted to stop its use and prevent STIs.

Intravenous drug abuse. Epidemiological studies among intravenous drug abusers have shown a high frequency of bloodborne STIs including HIV, HBV and HCV infections and syphilis. In Manipur, in 2000, the prevalence of HIV among intravenous drug abusers was 80% and vaginal discharge was strongly associated with HIV positivity. A study of sexual behaviour among drug abusers in Delhi showed a higher number of sex partners, higher rate of anal intercourse (25.7%) and an increased frequency of visits to CSWs leading to a significantly higher prevalence of STIs.

Alcoholism and smoking. Smoking has been shown to be strongly associated with the persistence of oncogenic HPV cervical infection. Adolescent women with alcohol use disorder in the USA appeared to be at a substantially high risk for HSV-2 infection, with a seroprevalence of 19% compared to 10% in those without this disorder.

CONCLUSION
The studies cited above suggest that, across the country, the prevalence of bacterial STIs is decreasing while that of chlamydial and viral infections is increasing. The decline in bacterial infections may be attributed to the indiscriminate and prophylactic use of over-the-counter broad-spectrum antibiotics, upgradeation of health facilities at the primary level and greater awareness about AIDS. Social factors such as separation from home at an early age in search of job opportunities in big cities, lower level of education, sex at an early age, premature sex, multiple sexual partners and frequent visits to
CSWs have led to a relatively high prevalence of STIs. The epidemiology of STIs depends upon several complex yet distinct and interrelated behavioural, sociodemographic, economic, geographical, and ethnic factors. A comprehensive knowledge of the various epidemiological factors is essential to design preventive and control strategies to curb these infections.

Efforts are being made by many governmental and non-governmental organizations to identify the patterns of development of STIs in the community, which would help policy-makers to design appropriate control measures.

REFERENCES


Obituaries

Many doctors in India practise medicine in difficult areas under trying circumstances and resist the attraction of better prospects in western countries and in the Middle East. They die without their contributions to our country being acknowledged.

The National Medical Journal of India wishes to recognize the efforts of these doctors. We invite short accounts of the life and work of a recently deceased colleague by a friend, student or relative. The account in about 500 to 1000 words should describe his or her education and training and highlight the achievements as well as disappointments. A photograph should accompany the obituary.

—Editor