

# Resurgence of sexually transmitted infections in India

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## Abstract

Sexually transmitted infections (STIs) are increasing throughout the world including India at present. In 1960s and 70s, the bacterial STIs were predominant than the viral STIs. The discovery of human immunodeficiency virus (HIV) and its rampant spread changed the situation with the increase of viral STIs in 1980s and 90s. There was a declining trend of viral and bacterial STIs in late 1990s to 2010. During the past two decades, HIV infection is on the declining trend, but other viral STIs are widely prevalent with insufficient decline. Currently, there is resurgence of syphilis and emergence of drug-resistant *Neisseria gonorrhea*. The interplay of various factors may have a role in this resurgence and this may act as an alarming sign of an impending epidemic. Hence, stringent monitoring of the trend of STIs including antibiotic resistance, appropriate management of STIs, and proper implementation of STI control program is needed. This will tackle the current situation and prevent the further spread of STIs.

**Key words:** Bacterial sexually transmitted infection, gonorrhea, resurgence, syphilis, viral sexually transmitted infection

## Introduction

Sexually transmitted infections (STIs) affect the physical as well as the mental health of the individual. They may cause morbidity including adverse pregnancy outcomes and various malignancies. Its management and prevention have an impact on world economy and pose an economic burden on developing countries. In recent years, a remarkable increase in its incidence has been noted all over the world. In India, during 1960s and 70s, there was predominance of bacterial STIs. The discovery of human immunodeficiency virus (HIV) and its reporting in the 1980s changed this picture with the rampant increase in viral STIs until 1990. There was a declining trend of STIs from 1990 to 2010, due to the stringent implementation of STI control program<sup>[1,2]</sup> which stressed safe sexual practices. Although the HIV infection is declining currently, the viral STIs are still predominant<sup>[3]</sup> with fluctuating trends. The curable syphilis has ups and downs in its trend in various parts of India from 2010, followed by upsurge from 2015, especially in men having sex with men (MSM).<sup>[4-15]</sup> There are reports of drug-resistant *Neisseria gonorrhoeae* from few parts of India at present.<sup>[16]</sup> As STIs have public health implications, stringent monitoring on its trend is needed for the implementation of programmatic interventions.

## Global Prevalence

The World Health Organization (WHO) states that more than 30 different bacteria, viruses and parasites are transmitted sexually. Among them, eight are selected as the prominent causal agent of sexually transmitted diseases (STDs). Of these, four are curable (syphilis, gonorrhea, chlamydia infection, and trichomoniasis) and four are incurable (hepatitis B, herpes simplex virus, HIV and human papilloma virus (HPV) infections).<sup>[17]</sup>

The curable STIs are highly infectious, transmitted mainly by sexual route and none had a lifetime immunity and hence, occurrence of these infections indicate the active transmission of STIs. The WHO has estimated 374 million new curable STIs occurred in the year 2020. They were chlamydia (129 million), gonorrhea (82 million), syphilis (7.1 million), and trichomoniasis (156 million). More than 1 million curable STIs are acquired every day in people aged 15–49 years and majority of them are asymptomatic. An increase in the incidence of syphilis, congenital syphilis, gonorrhea and drug-resistant gonorrhea have been reported. In 2022, the WHO has set out an ambitious target of reducing the annual number of adult syphilis infections by ten-fold by 2030 (7.1 million to 0.71 million).<sup>[18]</sup>

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However, worldwide around 8 million adults acquired syphilis in 2022 which is more than the previous year.<sup>[17]</sup>

In addition, there is an insufficient decline in the prevalence of HIV and other viral infections. In 2022, 1.2 million hepatitis B infection, 1.1 million hepatitis C infection and 1.3 million HIV infection were reported. This indicates the spread of viral as well as bacterial STIs.<sup>[18]</sup> Although HIV infection has been declining over years, individuals with high-risk behaviors are continued to be disproportionately affected, with an increased risk of HIV transmission from mother to child, as well as syphilis.

The reported upsurge in STIs serves as a warning sign of the transmission of STIs in the community. In addition, this increase in STI incidence and prevalence has important implications for public health like serious sexual and reproductive morbidity, adverse pregnancy outcomes, and various cancers. Thus, the prevention, management, and control of STIs are critical programmatic issues which need to be addressed adequately. The prevalence data tends to vary among different regions, but increasing trend has been reported by many countries including India. In England, STIs increased by 22% from 2014 to 2019, particularly among those aged 45 and above. In the United States, syphilis increased by 17% and the Centers for Disease Control and Prevention (CDC) surveillance report 2022 mentioned an alarming increase of congenital syphilis by 937% over the past decade.<sup>[19]</sup>

### Indian Scenario

The precise data on STI prevalence and trends are not clear in India. However, the community-based studies suggest that about 6% of the adult population suffers from STIs at any given time<sup>[20]</sup> and the prevalence of four curable STIs is Less than 4%.<sup>[21]</sup> The prevalence is considerably higher among high-risk groups, ranging from 20% to 30%.

To ascertain the situation and trends of various STIs in India, we reviewed available studies published in medical journals from 1970 till date. These studies included a diverse set of methodologies, such as cross-sectional, retrospective, and prospective studies, as well as clinic-based, hospital-based, and a few community-based studies. We also examined surveillance data from syndromic surveillance of STIs and nationwide HIV and syphilis sero-surveillance conducted by the National AIDS Control Organization (NACO) – the national program responsible for the surveillance, prevention, and management of both HIV and STIs. The syndromic surveillance and syphilis sero-positivity data are collected monthly from a network of 1133 district STI/reproductive tract infection (RTI) Clinics (DSRCs) spread across India, while HIV sentinel surveillance is conducted anonymously biennially.

### Sexually Transmitted Infection Trends in India

India showed a changing trends and patterns in the incidence and prevalence of STIs.

In 1960s and 70s, bacterial infections such as syphilis, chancroid, and gonorrhea were the major STIs. Viral diseases such as herpes simplex and human papilloma virus infection were extremely rare. The spread of HIV infection with subsequent behavioral change since the 80s and 90s has resulted in significant alteration in epidemiological patterns. As like developed countries, there has been a significant rise in viral diseases and a relative fall in the incidence of bacterial infections.<sup>[1,2]</sup> A high prevalence of bacterial and ulcerative STIs including chancroid was noted

mainly in urban areas linked to migration and mobility and has strong associations with HIV acquisition and transmission.

Later studies showed a different picture, with evidence of large declines in STIs between the late 1990s and 2010 among key populations (sex workers, men who have sex with men, people who use drugs and prisoners); male bridge groups (higher risk men, e.g. migrants or transport workers, who have contact with both key populations and lower-risk populations); and pregnant women with an epidemiological shift from predominately bacterial to viral STIs. The strongest intervention-linked data showed decline in the incidence or prevalence of STIs between 21.3% (from 8.9% to 7.0%) and 77.3% (from 9.7% to 2.2%) across several large Indian states between 2004 and 2010.

The prevalence of syphilis, assessed by sentinel surveillance, declined by more than 99%, from more than 25% in 1992 to 0.2% in 2005. A community-led intervention among sex workers in Karnataka, India, reported significant reductions in the prevalence of syphilis (45.4%, from 24.9% to 13.6%), gonorrhea (83.3%, from 5.4% to 0.9%) and chlamydia (63.0%, from 10.8% to 4.0%) from 2004 to 2009. Large reductions in syphilis and HIV prevalence were also reported in pregnant women over the same period. This large decrease in STIs in India, from 1980 to 2010 can be due to comprehensive prevention efforts like promotion of condom use in targeted high-risk groups and programs to control STIs mainly the HIV epidemics.<sup>[22]</sup>

The outbreaks of STIs have been reported from various regions in India over the past decade.<sup>[22]</sup> The National AIDS Control Organization, which monitors the situation of STIs in India also states that, there is an increase in STIs in India.<sup>[23]</sup> There is a baffling increase of syphilis and gonorrhea in various teaching hospitals and clinics.<sup>[3]</sup>

### National Surveillance

The ongoing National surveillance for STIs, including HIV, includes (1) syndromic diagnosis and reporting from a network of 1133 DSRCs operational at district and subdistrict levels, where diagnosis is made on a syndromic, clinical, and etiological basis – reported as vaginal/cervical discharge, genital ulcer disease, urethral discharge, lower abdominal pain, etc., as well as asymptomatic seropositivity for syphilis, and (2) nationwide HIV and syphilis sentinel surveillance providing information on HIV and syphilis status and trends.

Data reported by NACO in Sankalak 2023 outlining the Status of National AIDS and STD response shows that the number of syndromic diagnoses has been increasing over the years, from 2.6 million in 2018 to 2.9 million in 2020. Of the 5.8 million visits to DSRCs during 2023, urethral discharge (47%) was the most common syndrome among males, followed by genital ulcer disease (40%). Among females, 62% had vaginal/cervical discharge, followed by lower abdominal pain (34%). The current syphilis seropositivity rate of 0.7% which continued to rise compared to 2021 (0.49%) and 2022 (0.60%). The increase was reported in both males and females (1% and 0.28%, respectively).

The HIV epidemic level continues to be low nationally, but the level and trend of HIV prevalence and incidence in the North-Eastern States are alarming. With an overall adult (15–49 years) HIV prevalence of 0.20%, it remains more than 1% in Mizoram and Nagaland. While annual

new infections between 2010 and 2022 have declined by 42% nationally, many states in North-East India have seen increases in annual HIV infections in 2022 compared to 2010. In Tripura, annual new HIV infections in 2022 increased by 300% compared to 2010. Similarly, in Arunachal Pradesh, annual new HIV infections increased by around 200%, in Meghalaya by 150%, and in Assam by 75%.

Preliminary analysis of data from HIV sentinel surveillance 2021 shows syphilis seropositivity of 0.10% among pregnant women and 0.34% among inmates in central prisons. State-wise, syphilis seropositivity among pregnant women was the highest in Meghalaya (0.77%), followed by Nagaland (0.71%). Mizoram had a syphilis seropositivity rate 3.5 times that of the national average. Interestingly, the states where HIV positivity is increasing are also those reporting the highest prevalence of STIs captured through syndromic diagnosis, such as urethral discharge or vaginal/cervical discharge.<sup>[23]</sup>

### Current Sexually Transmitted Infection Status in India

The precise data on STIs other than HIV infection based on the etiology are scarce in India since of widely used syndromic approach for the management of STIs. Various studies [Table 1]<sup>[4,5,7,9,10,24-28]</sup> done at tertiary care setting based on the etiological and clinical approach reported the predominance of viral STIs (Genital herpes and Genital wart) than the bacterial STIs in recent times.<sup>[7,9,10,29,30]</sup> The persistent and recurrent nature of viral STIs, management of genital wart only at the tertiary care may be the cause for this increased proportion of viral STIs. The relatively less proportion of bacterial STIs in the institutional setup is probably due to widespread use of antibiotics by general physicians, treatment at the primary care setup by syndromic approach followed by disappearance of the symptoms of bacterial STIs and usage of over-the-counter medications. An increase in the number of STI clinic attendees was noted. Males outnumbered the females, but the number of females attending the STI clinic was also increasing. This may be due to increasing health education coverage by various governmental and nongovernmental organizations in India and referrals from peripheral STI centers.<sup>[27]</sup>

### Curable Sexually Transmitted Infections

#### Syphilis

Many hospital-based studies from various parts of India, indicated that syphilis has been rising over the past two decades. In a study conducted at Regional STD Teaching, Training and Research Centre, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, North India, the prevalence of syphilis increased from 15.8% in 1990 to 93-24.2% in 2002-2004.<sup>[4]</sup> However, the Lady Hardinge medical college, New Delhi, noted a stable prevalence from 2005 to 2009<sup>[31]</sup> and PGIMS, Rohtak, Haryana reported declining trend from 2008 to 2012.<sup>[32]</sup> An analysis of 28,920 serum samples at Postgraduate Institute of Medical Education and Research, Chandigarh, over 6-year period (2006-2011) observed a rising trend in syphilis from 2008 with a significant increase of syphilis in HIV infection, even though the incidence of HIV infection was decreasing.<sup>[33]</sup> A sharp rise in syphilis was reported from 2012 to 2018 in Government Medical College, Thrissur, Kerala.<sup>[8]</sup> The GMC, Nagpur, reported rising trend in syphilis from 2013 to 2017<sup>[9]</sup> and the Regional Institute of Medical Sciences, Imphal, Manipur reported a sharp rise in syphilis cases from 2018 onward when

compared to previous 5 years.<sup>[13]</sup> The Christian Medical College, Vellore, South India also witnessed significant rise from 2015 to 2020 (0.52%–2.1%).<sup>[14]</sup> Studies done over a period of time in Civil Hospital, B J Medical College, Ahmedabad, Gujarat, also showed an increase in syphilis in 2019–2021 when compared to the data from 2013 to 2014.<sup>[11,12]</sup> Similarly, a sudden increase in cases of syphilis was noted during 2021–2022 in a 10-year retrospective observational study in Shimla Medical College Hospital with an increase in the proportion of primary and secondary syphilis [Table 2].<sup>[15]</sup>

Although the clinicians report rare presentations of syphilis, and discuss the increasing trend of syphilis, the exact analysis of the syphilis trend along with the stage of disease is not uniformly done over a period of time. This is probably due to the STI treatment centers reporting this as genital ulcer disease and seropositive syphilis in Indian setup. Moreover, cases treated at private hospital setup other than the dedicated STI clinic are mostly not reported and they have inadequate facility of partner tracing. When these cases are included, the true incidence of syphilis may tend to rise.

Multiple factors would have caused this resurgence, but the major risk factors for the rise is the alteration in the sexual behavior. More proportion of MSM with syphilis has been reported in STI clinics.<sup>[14]</sup> The others include economic and social factors leading to large scale migration, from less developed rural communities to more affluent urban centers. Many of them are younger, without a formal education with less health seeking behavior. This demography poses a major public health challenge concerning STIs since these migrants are more likely to engage in STI-associated risk factors (avoidance of condom use, multiple sexual partners, and illicit drug/substance use simultaneously with sexual activities).

MSM, female sex workers (FSW), migrants, and intravenous drug users are the groups at highest risk for syphilis. The probable factors for this include:

1. The usage of pre-exposure prophylaxis (PrEP) by MSM (Truvada-Tenofovir and emtricitabine) regularly, has reduced the transmission of HIV, but conversely there has been a surge in syphilis
2. Methamphetamine and recreational drugs like amyl nitrate usage to facilitate painless anal intercourse among MSM resulted in increased transmission of syphilis
3. Individuals meeting each other through social networking sites has increased resulting in unprotected high-risk sexual practices<sup>[34]</sup>
4. Increasing indulgence in unprotected oral sex by MSM and some considering it as a safe practice<sup>[8]</sup>

The incidence of syphilis showed a rise with HIV infection. In India, the incidence of syphilis corresponded to high prevalence regions of HIV, which included the North-Eastern states, Goa, urban areas of Tamil Nadu and Karnataka and metro cities compared to rural regions of the country.<sup>[16]</sup>

The spread of syphilis in general population is noted in India. Prevalence of syphilis among blood donors show a rising trend and clinicians witness a greater number of congenital syphilis and syphilis exposed infants. This raises the concern on the growing incidence in the community since blood donors and antenatal mothers are not the high-risk individuals for acquisition of STIs.<sup>[34]</sup>

Changes in the clinical manifestation of syphilis is also noted in present era. The secondary and latent syphilis

**Table 1: Various studies at tertiary care setup based on etiological and clinical approach**

Place	Kerala <sup>[7]</sup>	Andhra Pradesh <sup>[24]</sup>	Rohtak <sup>[23]</sup> (%)	New Delhi <sup>[4]</sup>	Puducherry <sup>[26]</sup>	Punjab <sup>[27]</sup>	Mysore <sup>[28]</sup>	Nagpur <sup>[9]</sup>	Karnataka <sup>[10]</sup>	New Delhi <sup>[5]</sup>	
Duration	1998-2017	2000-2002	2003-2005	2001-2006	2002-2004	2004-2006	2007-2014	2010-2016	2013-2017	2015-2019	2018-2022
Sample size	2470	5004	7067	1542	2035	435	3908	2111	4552	614	
Syphilis	17.2%	1.74%	0.29%	16.67%	24.2%	11.6%	2.06%	3.22%	Females - 0.54% Males - 0.70%	9.12%	3.16%
Chancroid	-	0.48%	-	4.74%	5.4%	1.8%	1.10%	2.74%	Females - 0.11% Males - 2.32%	3.42%	7.8%
Genital herpes	39%	6.78%	3.47%	31.26%	22.4%	32.8%	21.75%	14.73%	Females - 15.26% Males - 20.95%	24.58%	11.64%
LGV	Less cases	1.04%	0.18%	0.45%	0.2%	1.8%	0.17%	0.14%	-	2.44%	Nil
Donovanosis	Less cases	0.22%	0.01%	0.06%	0.2%	-	0.07%	0.52%	Females - 0.054% Males - 0.148%	1.47%	Nil
Gonorrhea	2.26%	-	-	12.06%	15.4%	1.8%	0.33%	4.68%	UD-males - 0.81%	3.36%	3.36%
NGU	2.3%	-	-	5.06%	2.8%	14.1%	2.37%	-	UD-males - 0.81%	-	-
Candidiasis	Excluded	Males - 4.18% Females - 2.46%	Males - 6.41% Females - 2.61%	-	8.6%	6.7%	Males - 2.4% Females - 12.05%	Males - 32.92% Females - 28.42%	CVD - 18.65%	VVC - 11.89%	26.24%
Trichomoniasis	0.4%	-	-	-	1.2%	-	0.25%	-	CVD - 18.65%	0.49%	1.05%
Bacterial vaginosis	Excluded	-	-	-	1.4%	3.68%	-	-	CVD - 18.65%	0.81%	9.97%
Genital wart	37.9%	2.89%	1.81%	-	18.1%	17.1%	10.61%	8.43%	Females - 1.14% Males - 1.47%	13.52%	8%
Chlamydia	-	-	-	-	-	-	-	-	-	2.12%	11.78%
HIV infection	16.08%	16.08%	28.06%	1.65%	5.5%	34.5%	10.59%	7.24%	2.37%	2.12%	1.74%
Non-STIs	-	-	-	-	-	-	-	-	-	-	4.01%
Scabies	-	-	-	-	-	-	-	-	Females - 0.65% Males - 1.29%	-	-
Molluscum contagiosum	0.22%	0.31%					6.11%	3.07%	Females - 7.87% Males - 8.52%	-	-
UD=Urethral discharge; CVD=Cervicovaginal discharge; LGV=Lymphogranuloma venereum; VVC=Vulvovaginal candidiasis; HIV=Human immunodeficiency virus; STIs=Sexually transmitted infections; NGU= Non gonococcal urethritis											



**Table 2: Trends of syphilis from various tertiary care centers**

Study center	Duration	Sample size	Trends of syphilis
Vardhaman Mahavir Medical College, New Delhi	1990-2004	78,617	Rising
Lady Hardinge Medical College, New Delhi	2005-2009	570	Stable
PGMIS Rohtak, Haryana	2006-2011	28,920	Rising from 2008
Government Medical College, Thrissur	2012-2018	215	Sharp rise
Government Medical College, Nagpur	2013-2017	4552	Rising
Regional Institute of Medical, Imphal	2013-2019	43	Rising
CMC Vellore, Tamil Nadu	2015-2020	265	Rising
B J Medical college, Gujarat	2019-2021	1330	Rising
Shimla Medical College, Himachal Pradesh	2021-2022	3110	Rising

were highly prevalent than primary syphilis probably due to the rampant usage of over-the-counter antibiotics. The resurgence of syphilis may also be contributed by these two stages. Latent syphilis being asymptomatic does not warn the patient of the presence of disease thereby tending to increase the risk of sexual transmission. In secondary syphilis, the manifestations are extremely variable and are often difficult to be diagnosed by physicians. Secondary syphilis lesions harbor the maximum load of infective treponemes, and hence the chance of transmission is highest both through the sexual route and other modes. Currently, the involvement of palms and soles in the form of scaly macules and plaques with Bielt's collarette has been observed most commonly than maculopapular rash of secondary syphilis in STI clinics. Condyloma lata, split papules over the angle of mouth, lichenoid lesions, annular and corymbose plaques, and moth-eaten alopecia have also shown an increasing occurrence.<sup>[34-36]</sup>

In addition, protein mutations responsible for drug resistance to azithromycin has been proven. *Treponema pallidum* strains with mutation in 23S rRNA are associated with failed treatment with macrolides and these strains are prevalent worldwide.<sup>[37]</sup> Hence, single dose azithromycin which was once efficacious has now developed the resistant strain. Inadequate seroresponse following treatment with single dose of benzathine penicillin occurs in approximately 10%–20% of early syphilis cases.<sup>[38]</sup> Recent studies have reported various single-nucleotide polymorphisms in *T. pallidum* related to penicillin resistance. However, their clinical relevance is not known and trial on penicillin resistance related gene mutation in treatment failure cases is ongoing.<sup>[39]</sup> This may further complicate the current situation.

The epidemic curve of syphilis has ups and downs, but currently, the syphilis is on the rise. The interplay of agent, host, and environmental factors have an impact on the epidemic curve of syphilis. Difficulty in diagnosis/mismanagement of cases by general physicians, difficulty in partner tracing, changing sexual behavior, especially due to mobile phone based social networking (technological improvement), usage of PrEP for HIV infection and emerging drug resistance may have a role in this resurgence.

**Gonorrhea:** There is a dearth in literature on the trend of gonorrhea in Indian setup. The Apex regional center, New Delhi did not report a major change in the number of cases over two decades (cases from 2005 to 10: 295 over 6 years<sup>[40]</sup> and cases from 2013 to 22: 417 cases over 10 years<sup>[16]</sup>). However, a recent study at Apex Regional STD Centre, affiliated with Safdarjung Hospital, New Delhi, during 2018–2022 documented a rising trend of gonorrhea from 2.08% to 5.04%.<sup>[6]</sup> Although the

clinicians witness a greater number of classical cases of gonorrhea in post-COVID era, the trend analysis need a long time. The analysis of trend of disease does not carry much significance to the clinicians since of the available national surveillance system. Moreover, in Indian setup cases of gonorrhea are treated commonly as urethral discharge syndrome or cervico vaginal discharge. They are treated as mixed infections and facilities for demonstration or isolation of gonococci is limited. Hence, the methods of etiological diagnosis vary from center to center based on the existing facilities. In addition, these cases are handled by general physicians and gynecologists without giving due importance on the epidemiology of the disease. It is important to note that a recent study done at Gujarat, states that greater number of urethral discharge cases were treated by general physicians and vaginal discharge like trichomoniasis was handled by gynecologist than the dermatovenereologists. The treatment guidelines used by them also was not uniform.<sup>[41]</sup> On the other side, most of the genital discharge cases handled by general practitioners in the primary and secondary care settings are not reported to the health care system. Hence, we are having only the tip of iceberg data; but as per the WHO census, more gonorrhea was reported than syphilis. These factors pose a difficulty in analyzing the trend of gonorrhea. Hence, for the exact analysis of the disease trend, strengthening of case reporting, diagnostic facilities, follow-up after treatment to ensure cure is essential.

Interestingly seasonal variation in gonorrhea with increased number of cases during April to June was observed in a study done at North India. The potential explanation for this was: (1) It was representative of the increased sexual activity during the summer vacation months of April to June. (2) April is the harvesting month in India with increased chances of promiscuous sexual behavior. (3) It was also due to the fact that health-seeking behavior increases in the holidays with a greater number of patients reporting to the health care facilities. A decreased number of cases from October to February may be due to the festival season and less health care-seeking behavior during winter months in India.<sup>[40]</sup>

Resistance to antimicrobials is now a major concern. Resistance to penicillin was considerably high, at 80%, in a 10-year (2013–2022) study done at North India and many of the isolates were penicillinase producing *N. gonorrhoeae*. It must be noted here that, although 80% were resistant to penicillin, it does not translate as 20% being sensitive, because these 20% of isolates were in the less sensitive category and hence not useful in treating gonorrhea. The tetracycline resistance was 68%. A study on gonococcus isolates from India, Pakistan, and Bhutan, from 2007 to 2011, reported 68% resistance to penicillin

with 52% isolates producing  $\beta$ -lactamase. The resistance to tetracycline reported in the same was 55%. This states the increasing rate of resistance in present days.

In addition, there is gradually increasing resistance to the drugs used in the recommended National treatment regimen (NACO), namely, azithromycin, cefixime/ceftriaxone, is a cause of great concern. The 4% of isolates were resistant to azithromycin and 4% were less susceptible to third-generation cephalosporins. The probable cause of this is the irrational use of antibiotics for non-STI cases and empirical treatment of other diseases.<sup>[16]</sup>

The emergence of *N. gonorrhoea* isolates resistant to multiple antimicrobial agents, including decreased susceptibility to third-generation cephalosporins, is a serious problem and threat in the management of gonorrhea in India. As the largest manufacturer and consumer of antibiotics, India plays a crucial role in monitoring drug resistance, including for the treatment of STIs. Hence, continuous and ongoing antimicrobial susceptibility testing and monitoring are needed. Appropriate control measures and a strong antimicrobial stewardship are required to limit the spread of antibiotic-resistant strains and control the emergence of multi drug-resistant strains.

### Chlamydial infection

There is lack of studies on the analysis of trend of chlamydial infection in India. However, few prevalence studies were done on symptomatic patients presenting in health care settings, infertile and subfertile women, pregnant women and asymptomatic population groups. The infection is prevalent in all these groups, but the methods that were used for diagnosis is not uniform in all studies.<sup>[42]</sup> This infection is usually reported as urethral discharge or cervicitis as like gonorrhea and treated as mixed infection. Hence, in Indian setup strengthening of laboratory facilities is required to report this as a separate entity. Even then the sensitivity of the employed test and the asymptomatic nature of the infection may further pose a challenge in reporting.

### Trichomoniasis

There is scarcity in literature on the analysis trends of trichomoniasis. In India, the prevalence of trichomoniasis is about 6%–10%.<sup>[43]</sup> This is usually reported as vaginal discharge syndrome along with bacterial vaginosis and vulvovaginal candidiasis. This is a common ailment and, in a study, conducted at Institute of Venereology in Chennai, vaginal discharge disease was prevalent in almost one-fourth (26.4%) of STI clinic attended females aged between 18 and 49 years. The 10.9% of those with vaginal discharge suffered from trichomoniasis and around one-third of them were asymptomatic.<sup>[44]</sup> The prevalence of trichomoniasis in a study done at Stanley Medical College, Chennai was 7.05% in highrisk females and 4.44% in lowrisk females. However, studies among FSW in Mumbai and Hyderabad, the prevalence was 29.73%. As like other STDs, this may also tend to have a up and down trend in correlation with the risky behavior. This need reporting and stringent monitoring in Indian setup.

### Other Sexually Transmitted Infections

**Genital herpes:** The proportionate prevalence of genital herpes is higher than bacterial STIs in various studies conducted at tertiary care institutions over the past two decades.<sup>[4,6,7,10,25,29]</sup> A study among STI clinic attendees from Regional STD Teaching, Training and Research Centre, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, North India has shown a four-fold

increase in genital herpes from 5.7% in early 1990s to 22.4% in 2000–2004.<sup>[4]</sup> An earlier study from Chandigarh has also shown a two-fold increase in its incidence (20.5% in 2000 vs. 11.4% in 1970).<sup>[1]</sup> A rising trend in genital herpes was found in a study conducted from 2001 to 2006 at PGIMS, Rohtak, India, with a proportionate prevalence of 31.26%. This was a rise by two-fold when compared to the previous study done at the same set up which noted a prevalence of 16.92%.<sup>[25]</sup> The Government Medical College, Thrissur, Kerala, documented fluctuations in the trend of genital herpes from 1998 to 2017 with insufficient decline.<sup>[7]</sup> The Apex Regional STD Centre, affiliated with Safdarjung Hospital, New Delhi, during 2018–2022 also noted fluctuating trend of genital herpes.<sup>[6]</sup>

The data on prevalence of genital herpes among other high-risk groups are sparse, but it is also prevalent in MSM, FSW, trans genders, and IDUs.<sup>[1]</sup> Most of the hospital-based studies showing its high proportionate prevalence and few mentioning its increasing trend indicates the widely prevalent nature of this infection. This indicates the continued transmission by large number of undiagnosed cases and the occurrence of asymptomatic shedding.

**Genital Wart:** Among the prevalent viral STIs, genital wart is commonly seen in STI clinics. A study from Regional STD Teaching, Training and Research Centre, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, showed increasing prevalence of genital warts (5.8% in 1990–1993–18.1% in 2002–2004).<sup>[4]</sup> Another study from North India showed a conspicuous upward trend in prevalence of genital wart, from 9.17% in 1986–1990 to 19.6% in 1995–1999 and 27.3% in 2004–2006.<sup>[1]</sup> The Government Medical College, Thrissur, Kerala, documented declining trend of genital wart from 1998 to 2017.<sup>[7]</sup>

Although genital herpes and genital wart are commonly encountered in STI clinic, its increasing or decreasing trend does not indicate true community spread of the infection as like syphilis and gonorrhea, due to the carrier state and the recurring nature of the disease. However, these need continuous monitoring at present for the prevention of further consequences of infection and control of spread.

### Hepatitis

Viral hepatitis is widespread in India with pockets of hyperendemicity.<sup>[45]</sup> Infections caused by hepatitis B and C virus also showed a fluctuating trend both in the community and among high-risk groups. Hepatitis C infection is very high among IDUs, the highest being reported from the North-eastern states of the country.<sup>[1]</sup> The dedicated STI clinics also encounter hepatitis B- and C-infected individuals. However, due to the systemic manifestation of the infection and varying modes of acquisition, these individuals usually seek treatment from physicians and gastroenterologists. As sexual route is also a mode for acquisition and spread of hepatitis B and C infection this also need stringent monitoring.

In addition, cases of chancroid, granuloma venereum, genital molluscum contagiosum, genital scabies, and other infections are reported in STI clinics. Sporadic spikes and increasing number of chancroid cases were noted in New Delhi and Nagpur.<sup>[6,9]</sup> There is dearth in the literature on the analysis of trend of these STIs, probably due to the minimal number of cases that are reported at each center then and there.

In recent years, few centers reported increased number of fungal RTI like balanoposthitis and vulvo vaginal

candidiasis.<sup>[6,10]</sup> Behavioral risk factors that have been significantly associated with a higher incidence of vaginal candidiasis were frequent sexual intercourse and receptive oral sex as well as the use of high-estrogenal contraceptives and spermicides. Host-related risk factors that have been associated with them include antibiotic use, uncontrolled diabetes, conditions with high reproductive hormone levels, immuno suppression, and genetic predisposition. Being uncircumcised is an additional predisposing factor for candidal balanoposthitis.<sup>[10]</sup> Hence, unless proved due to other medical causes such as diabetes, candidal balanoposthitis, and candidal vaginal discharge have to be considered STI. Hence, targeted intervention is needed for these infections.

In this post pandemic era, there is a need for inclusive approach in STI care. This consists of STI management, follow-up and reporting from all health sectors of our country. A recent study from Tamil Nadu documented the importance of designing a comprehensive sexual health service package using the Internet with correct scientific information by using mobile apps. It is also vital to confirm the availability and accessibility of STI services to the general public. The networking and cross-referral of cases with STI treatment centers is also important for easily accessible clinical, laboratory, and treatment services.<sup>[46]</sup>

### Summary

The available data from the Indian setup states that there is a definite rise in the trend of syphilis at present times in both high-risk individuals as well as in general population (blood donors and antenatal mothers). There is also strong evidence on the increasing emergence of drug-resistant *N. gonorrhea* in India. As these two infections are highly infectious, mainly transmissible by sexual route, this may act as an alarming impending sign for the spread of STIs in the community. There is scarcity in literature on the trend analysis of other STIs excluding the HIV infections. This is probably due to the usage of syndromic approach for the management of STIs.

Hence, at present days, stringent monitoring of individual STIs is needed. To achieve this, the etiological diagnosis of STI cases should be given more importance than the syndromic approach at least in tertiary care setup. As our specialty includes both Dermatology and Venereology, dedicated and qualified physicians should be posted to handle the venereology cases. This will help in proper reporting and management of cases including the complicated ones.

The syndromic management is commonly used by all in Indian setup. Possible laboratory facilities should be provided in all setups to strengthen the surveillance. In addition, the etiological diagnosis given in the tertiary care setups may be projected to the syndromic cases reported from all over India. The laboratory facilities should be strengthened to confirm the diagnosis. Qualified microbiology medical officers and personnels should be posted in the laboratory instead of trained individuals. This may improve the surveillance of at least the highly transmissible STIs and hence help to plan the appropriate preventive strategies. The policy makers, who are monitoring the situation of STI in India, have already initiated the process of sharing and analyzing available data from program experts, experts from microbiology and laboratories, clinicians, professional national bodies like IASSTD and AIDS, IADVL and agencies working in the STI and HIV. These initiatives, as light house, will strengthen the STI surveillance program in India.

As these STIs carry epidemiological significance, the facilities for counseling, partner tracing and management and reporting should be strengthened. This should be done not only in Suraksha Clinic (formerly Designated STI/RTI Clinics) but also in the dedicated private STI clinics. The general practitioners and gynecologists trained in managing and referring STI cases should strictly adhere to the programmatic interventions.

Prevention of spread of STIs does not end alone with the diagnosis, treatment and partner treatment. Basically, STIs are acquired by behavioral concerns, strengthening of behavioral counseling services from the adolescence is needed, both by online and offline modes. In addition, online services and spreading of web-/mobile-based educational materials should have privacy and should be easily accessible, available and affordable. This will play a pivotal role in STI prevention in the community.

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### Conflicts of interest

There are no conflicts of interest.

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