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Original Research Article

Risk factors for syphilis infection among people attending designated STI/RTI clinics in Meghalaya

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ABSTRACT

Background: Syphilis remains a major public health concern in Meghalaya despite the availability of effective diagnostics and treatment. This study aimed to identify behavioral and sociodemographic risk factors associated with syphilis infection among attendees of designated STI/RTI clinics (DSRCs).
Methods: A matched case-control study was conducted across six DSRCs between May and June 2023, including 66 confirmed syphilis cases and 263 age-, sex-, and marital status-matched controls. Data on demographics, substance use, sexual behaviour and treatment-seeking were collected using structured interviews. Secondary record-based data (2017-2022) from all DSRCs were analysed to assess district-wise and temporal trends.
Results: Most participants were aged 26-35 years (cases: 48.5%; controls: 49.4%) and male (56.1% versus 57.8%). Alcohol use was reported by 56.1% (n=37) of cases and 41.8% (n=110) of controls. Extramarital sexual partnerships were common (72.1% versus 67.9%) and independently associated with syphilis (adjusted OR=2.86; p=0.026). Awareness of STI clinics was low (31.8% versus 35.7%). District-level analysis revealed the highest RPR positivity in East Jaintia Hills (up to 24%), followed by East Khasi Hills (20%) and West Jaintia Hills (9.6%).
Conclusions: Extramarital partnerships independently predicted syphilis infection. Strengthening behavioural interventions, partner notification, and district-focused screening is critical to curb transmission.

Keywords: Screening, Sexual behaviour, Syphilis

INTRODUCTION

Sexually transmitted infections (STIs) continue to pose a major public health challenge in India, particularly among vulnerable and underserved population. Syphilis, caused by *Treponema pallidum*, persists as a major public health challenge due to its protean manifestations and capacity for asymptomatic transmission. Despite effective treatment availability, rising seropositivity rates and diagnostic delays, particularly in resource-limited settings, call attention to the need for intensified surveillance, early detection, and targeted interventions to curb ongoing transmission.[1]

According to the National Family Health Survey-5 (NFHS), self-reported symptoms suggestive of presence of an STI/genital discharge/sore or ulcer in the past 12 months were reported by 12.3% of women and 9.3% of men in the reproductive age group (15-49 years), reflecting an increase from the figures documented in NFHS-4, where 11.2 % of women and 7.5% of men reported such symptoms.[2,3] These findings affirm a rising trend in symptomatic STI burden in India over recent years.

In 2022-23, the rapid plasma reagin (RPR) seropositivity rates recorded at designated STI (sexually transmitted infections)/RTI (reproductive tract infections) Clinics (DSRCs) were 1.3% among males, 0.3% among females, and 1.9% among individuals identifying as transgender or hijra. The overall RPR positivity stood at 0.7%, reflecting a continued upward trend when compared to the rates reported in previous years (0.49% in 2020-21) and (0.60% in 2021-22).[4] While the national adult HIV (human immunodeficiency virus) prevalence has stabilized at 0.20% in 2023, the north-east remains a hotspot, particularly in Mizoram (2.73%), Nagaland (1.37%), Manipur (0.87%) and Meghalaya (0.43%) where prevalence rates are significantly higher than the national average.[5]

A region-specific analysis using National HIV Sentinel Surveillance data confirmed a high syphilis prevalence in Meghalaya, with significant associations observed between infection and factors such as low educational attainment and socioeconomic disadvantage.[6]

These findings call for a deeper understanding of why syphilis remains prevalent in Meghalaya, so that real, targeted solutions can reach those most at risk and often overlooked and silence may be replaced with healing and intent.

METHODS

Study design

Permission was obtained from the Meghalaya AIDS Control Society and institutional ethics committee approval was obtained (NEIGR/IEC/M4/F1/2022).

Aims and objectives

Primary objectives

To identify the risk factors associated with syphilis infection among people attending STI clinic in Meghalaya. To analyse the time trends of syphilis detected (proportion) during the 2017-2022 using secondary data from all STI clinic (DSRCs) in the state of Meghalaya

Secondary objectives:

To assess awareness, treatment-seeking behavior, and partner notification practices related to syphilis among DSRC attendees in Meghalaya.

Study setting and duration

The study was conducted during May to June 2023 across 6 designated STI/RTI Clinics (DSRCs) located within public health institutions across Meghalaya, India. Participating sites included district hospitals and tertiary care hospital ensuring wide geographic representation.

Study population

The study population comprised clients aged 18 years and above attending DSRCs across Meghalaya. Both symptomatic and asymptomatic individuals undergoing routine STI screening were considered for inclusion.

Cases: clients diagnosed with syphilis, defined as being rapid plasma reagin (RPR)/ venereal disease research laboratory (VDRL) tests reactive with confirmatory *Treponema pallidum* hemagglutination (TPHA) test positivity, in accordance with National AIDS Control Organization (NACO) guidelines.

Controls: clients testing RPR/VDRL non-reactive, matched to cases based on age (±5 years), gender, and marital status.

Sampling technique and sample size calculation

Cases were enrolled using consecutive sampling until the required sample size was achieved. Systematic sampling was utilized to select frequency-matched controls.

Sample size was calculated assuming: 95% confidence level, 80% statistical power, odds ratio of 3, 1:4 case-to-control ratio, 10% non-response adjustment.

Estimated sample size was 138 (cases: 46 and controls: 92). The total sample size taken in this study was 329 (cases: 66 and controls: 263).

For the secondary data component, retrospective record-based data analysis all clients who attended DSRCs in Meghalaya between 2017 and 2022 were included for time trend analysis.

Data collection instruments and procedures

Data were collected using a pre-tested structured questionnaire. The instrument captured: socio-demographic characteristics; substance use (alcohol, tobacco, injectable and non-injectable drugs); high-risk sexual behaviour (e.g., condom use, number of sexual partners, engagement in unnatural sexual behaviour); self-reported STI symptoms; treatment-seeking behaviour and partner notification practices

All participants underwent routine syphilis screening (RPR/VDRL) as part of Suraksha Clinic protocols followed by confirmation with TPHA testing.

Trained counsellors, fluent in local languages, conducted face-to-face interviews in private settings following written informed consent.

Secondary data collection

A retrospective analysis was performed using record-based data from all DSRCs across Meghalaya (2017-

2022), including the total number of clients tested and proportion testing positive for syphilis serology. Site-specific trends and geographic variation in test positivity were examined.

Data analysis

Bivariate analysis was performed using Chi-square tests and odds ratios (ORs) with 95% confidence intervals. Multivariable analysis was conducted using conditional logistic regression, adjusting for potential confounders. A p value <0.05 was considered statistically significant.

RESULTS

The study included 66 syphilis positive cases (RPR/VDRL reactive followed with positive TPHA confirmatory test) and 263 controls selected from 8 DSRC/Suraksha Clinics in Meghalaya belonging to the districts of East Jaintia Hills, East Khasi Hills, Ri Bhoi and West Jaintia Hills.

Table 1: Socio-demographic profile among cases and controls.

Characteristics	Cases (%)	Controls (%)
Among all the participants (cases =66 and controls =263)		
Age group (years)		
18-25	24 (36.4)	97 (36.9)
26-35	32 (48.5)	130 (49.4)
>36	10 (15.1)	36 (13.7)
Gender		
Male	37 (56.1)	152 (57.8)
Female	29 (43.9)	111 (42.2)
Marital status		
Married	55 (83.3)	222 (84.4)
Separated/widowed	6 (9.1)	12 (4.6)
Unmarried	5 (7.6)	29 (11)
Educational status		
Graduate	5 (7.6)	42 (16)
Higher secondary	6 (9.1)	36 (13.7)
Secondary	32 (48.5)	106 (40.3)
Primary	18 (27.3)	74 (28.1)
No formal education	5 (7.5)	5 (1.9)
Occupation		
Self-employed	19 (28.8)	53 (20.2)
Daily wagerer	15 (22.7)	76 (28.9)
Homemaker	13 (19.7)	57 (21.7)
Others	14 (21.2)	70 (26.6)
No response	5 (7.6)	7 (2.6)
Residence		
City	5 (7.6)	21 (8)
Town	9 (13.6)	41 (15.6)
Village	52 (78.8)	201 (76.4)
Among married and separated/widowed (cases =61 and controls =234)		
Number of children		
0	22 (36)	46 (19.8)
1-3	32 (52.5)	115 (49.1)
≥4	7 (11.5)	31 (13.2)
No response	0 (0)	42 (17.9)
Spouse occupation		
Self-employed	7 (11.5)	26 (11.1)
Daily wages	15 (24.6)	53 (22.6)
Homemaker	18 (29.5)	71 (30.3)
Others	5 (8.2)	23 (9.9)
No response	16 (26.2)	61 (26.1)
Spouse travelling for work/resides in another location		
Yes	6 (9.8)	25 (10.7)
Sometimes	4 (6.6)	0 (0)
No	35 (57.4)	148 (63.2)
No response	16 (26.2)	61 (26.1)

From the 10-DSRCs/Suraksha Clinics functional in Meghalaya, cases were found only in 6- DSRCs/Suraksha Clinics located in 4 districts in the State namely in East Jaintia Hills, East Khasi Hills, Ri Bhoi and West Jaintia Hills. The study included data collected from six different Dermatology Specialty Referral Centres (DSRCs) located across three districts of Meghalaya. Khliehriat Community Health Centre in East Jaintia Hills (EJH) contributed 15 cases and 59 controls. Ganesh Das Maternal & Child Hospital in East Khasi Hills (EKH) contributed 9 cases and 36 controls. NEIGRIHMS, also located in East Khasi Hills (EKH), contributed 7 cases and 28 controls. Nongpoh Civil Hospital in Ri Bhoi district contributed 12 cases and 48 controls. Shillong Civil Hospital, another centre from East Khasi Hills (EKH), contributed 11 cases and 44 controls. Jowai Civil Hospital in West Jaintia Hills (WJH) contributed 12 cases and 48 controls.

The socio-demographic profile (Table 1) of the participants among both the cases and controls, found that nearly half of the participants (48.5% and 49% respectively) belong to the age group of 26-35years (age range 18-47years) and males (56.1% and 57.8% respectively) were dominant in this study. Majority of participants in this study were married (83.3% and 84.4% respectively). A great number of the participants were found to have completed their secondary education (48.5% and 40.3% respectively) and majority of them were self-employed among the cases and daily wagerers among the control (28.8% and 28.9% respectively). More than half of the participants resided in villages (78.8% and 76.4% respectively).

The study assessed substance use patterns, specifically alcohol, drug, and injectable drug use among both participants and their spouses or sexual partners. Among the participants, alcohol consumption was the most common form of substance use, reported by 56.1% (n=37) of cases compared to 41.8% (n=110) of controls. Drug use was relatively uncommon, reported by 7.6% (n=5) of cases and 7.2% (n=19) of controls, while injectable drug use was reported by 6.1% (n=4) of cases and 5.3% (n=14) of controls.

Among the spouses or sexual partners, substance use was even lower. Alcohol use was reported by 21.3% (n=13) of case partners and 26.1% (n=61) of control partners, whereas none of the case partners reported drug or injectable drug use. Among the control partners, only 0.9% (n=2) reported drug use and 0.4% (n=1) reported injectable drug use.

Participants belonging to the high-risk groups (HRGs) were 13.6% and 12.5% among the cases and controls respectively. The majority of the participants had sexual partners apart from their spouse among both the cases and controls (72.1% and 67.9% respectively) and among those who had sexual intercourse and were engaged in anal or oral sex were 9.8% and 7.7% respectively.

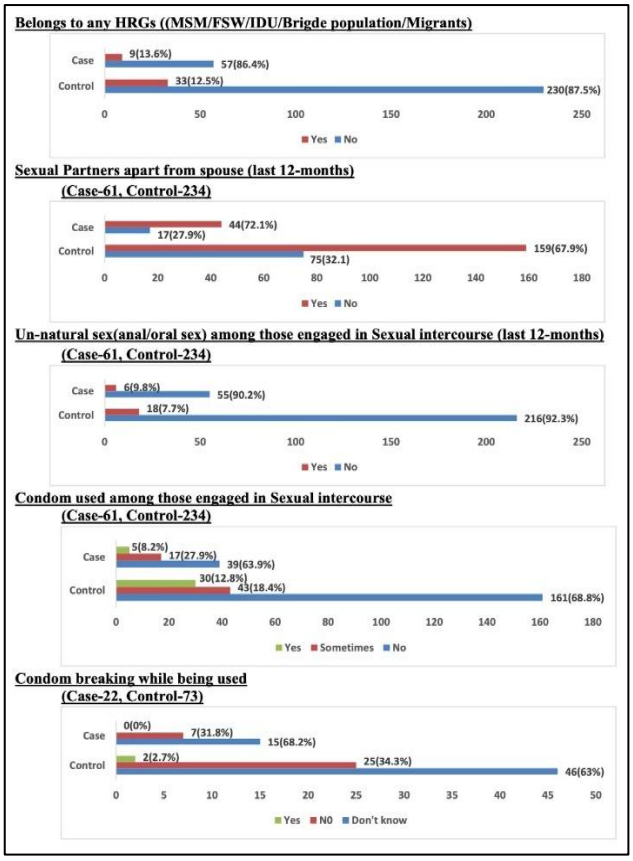

Figure 1: Sexual behaviour among the participants.

Condom use among those involved in sexual intercourse was 36.1% and 31.2% among cases and control respectively and among these who were using condom, none of the cases experienced breaking of condom and 2.7% reported the same among controls (Figure 1).

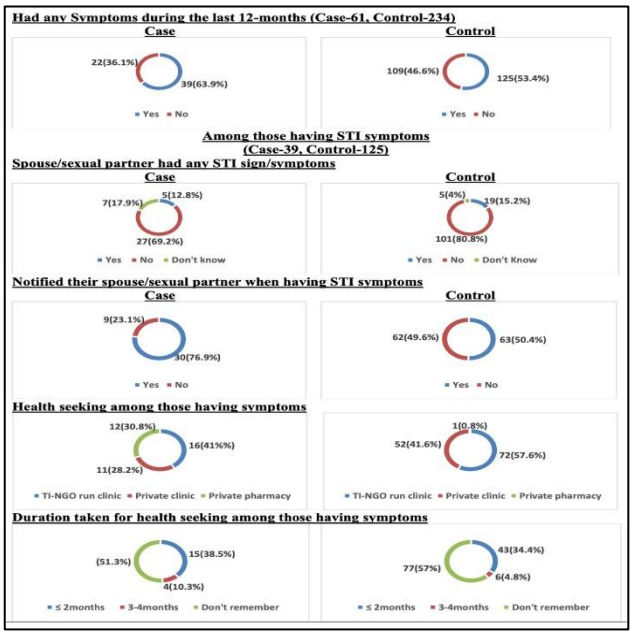

Figure 2: STI symptoms and their health seeking behaviour.

Table 2: Association of few selected factors with syphilis (RPR/VDRL reactive): a) bivariate with unadjusted OR; b) conditional logistic regression with adjusted OR.

a) Bivariate with unadjusted OR			
Variables	**Odds ratio**	**95% CI**	**P value**
Gender (male)	1.78	0.242 to 13.071	0.57
Marital status (married)	1.281	0.61 to 2.71	0.52
Marital status (separated/widowed)	2.2	0.707 to 6.78	0.17
Education (Primary)	1.22	0.569 to 2.61	0.62
Ever alcohol consumption	2.7	1.28 to 5.5	0.008
Tobacco consumption	0.8	0.42 to 1.49	0.478
Have sexual partner apart from spouse	2.87	1.3 to 6.3	0.009
b) Conditional logistic regression with adjusted OR			
Variables			
Gender (male)	1.39	0.19-9.8	0.749
Marital status (married)	1.25	0.42-3.57	0.71
Marital status (separated/widowed)	1.04	0.23-4.7	0.95
Education	1.28	0.51-3.22	0.61
Ever alcohol use	1.71	0.67-4.33	0.26
Harmful substance use	0.86	0.08-8.86	0.92
History of IDU	0.63	0.031-12.73	0.76
Tobacco consumption	0.53	0.23-1.27	0.15
Have sexual partner apart from spouse	2.86	1.13-7.26	0.026
Heard of STI	1.16	0.46-2.89	0.74

OR: Odds ratio; IDU: intravenous drug abuser; STI: sexually transmitted infection.

Table 3 (A) and (B). Time trends of the number of syphilis tests conducted and the number of patients found reactive during 2017-2022 in the 10 DSRCs/Suraksha Clinics in Meghalaya record-based data.

A

	Tura Civil Hospital			Nongpoh Civil Hospital			Shillong Civil Hospital			NEIGRIHMS Shillong			Khliehriat Civil Hospital		
Year	**Teste**	**Reactiv**	**%**	**Teste**	**Reactive**	**%**	**Tested**	**Reactive**	**%**	**Tested**	**Reactive**	**%**	**Tested**	**Reactiv**	**%**
2017-18	4374	38	0.9	824	66	8	1467	286	19.	453	12	2.	495	65	13
2018-19	3804	30	0.8	860	38	4.	1692	343	20.	721	33	4.	455	60	13
2019-20	3036	4	0.1	957	54	5.	1478	299	20.	577	26	4.	791	187	24
2020-21	2288	10	0.4	860	33	3.	802	141	17.	250	15	6	583	140	24
2021-22	2633	15	0.6	835	61	7.	1188	192	16.	327	17	5.	512	109	21

B

	Jowai Civil Hospital			Ganesh Das Hospital			Nongstoin Civil Hospital			Williamnagar Civil Hospital			Baghmara Civil Hospital		
Year	**Tested**	**React**	**%**	**Tested**	**Reactiv**	**%**	**Tested**	**Reactive**	**%**	**Teste**	**Reactive**	**%**	**Teste**	**Reactiv**	**% +**
2017-18	1789	154	8.61	2254	67	2.97	477	21	4.4(	271	1	0.37	131	2	1.53
2018-19	1905	156	8.19	1881	49	2.61	673	27	4.01	254	8	3.15	289	0	0
2019-20	1718	128	7.45	1639	22	1.34	629	11	1.75	394	2	0.51	484	0	0
2020-21	1181	136	11.5	604	18	2.98	633	13	2.05	94	1	1.06	472	1	0.21
2021-22	1604	155	9.66	1484	48	3.23	509	5	0.98	467	5	1.07	609	2	0.32

Regarding awareness of diseases that can be transmitted through sexual intercourse, only 33.3% (n=22) of the cases had heard of such diseases, while 66.7% (n=44) had not. In comparison, among the controls, 35.7% (n=94) were aware of sexually transmitted diseases, and 64.3% (n=169) were not aware.

When asked about awareness of the availability of places or clinics for STI treatment, 31.8% (n=21) of the cases were aware of such facilities, whereas 62.8% (n=45) were not. Similarly, among the controls, 35.7% (n=94) were aware of STI treatment clinics, while 64.3% (n=169) lacked such awareness.

A great number of the participants among both cases and controls (63.9% and 53.4% respectively) had the STI symptoms and among these, majority (76.9% and 50.4% respectively) do notify their spouse/sexual partner about having the symptoms, whereas the spouse/sexual partners reporting STI symptoms were 12.8% and 15.2% respectively among cases and controls. Regarding health seeking behaviour among the participants for treatment/consultation during the last time they had any of the symptoms of STI, majority of the participants sought advice/medicine from non-governmental organization/targeted intervention (NGO/TI) run clinic for any symptoms of STI among both the cases (41%) and controls (57%) (Figure 2).

Multivariate analysis

Conditional logistic regression revealed that only having a sexual partner apart from one's spouse remained independently associated with syphilis (p=0.026) (Table 4). Alcohol use lost significance in the adjusted model (p=0.26), and variables such as gender, education, and STI awareness did not contribute independently (Table 2b).

Secondary data analysis (2017-2022)

Retrospective data analysis from DSRC records showed stark inter-district differences in test positivity rates (Table 3a and 3b). East Jaintia Hills showed the highest sero-positivity for syphilis followed by East Khasi Hills and West Jaintia Hills in the last three years. Testing volumes dropped in 2020-21 due to the pandemic but rebounded by 2021-22. In contrast, William Nagar, Baghmara, and Tura sites consistently showed positivity rates under 1.5%.

DISCUSSION

Despite being a preventable and curable infection, syphilis continues to haunt the public health scene with its quiet persistence and clinical elusiveness. This study reveals critical insights into the epidemiology, behavioural risk factors, and service delivery gaps associated with syphilis in Meghalaya and portrays a significant association between syphilis and factors such as extra-marital sexual partnerships and alcohol use prior to sex.

Extramarital sexual partnerships emerged as the most significant independent predictor of syphilis infection among DSRC attendees in Meghalaya, with affected individuals nearly three times more likely to test positive (OR: 2.86). This association persisted even after adjusting for confounding factors, underscoring the role of partner concurrency within ostensibly low-risk populations. Our data resonate with those of Medhi et al, who reported a 21.1% syphilis prevalence among female sex workers in Dimapur, Nagaland, with risk amplified by low condom use (36.5% with occasional clients; 27% with regular clients), marital disruption, and substance use.[7] These behavioural vulnerabilities were similarly reflected in the work of Kakchapati et al, who found higher syphilis prevalence among older, widowed, and street-based sex workers in Nepal.[8] In our study participants, 72.1% of cases reported extramarital partnerships, and 9.1% were widowed or separated, both higher than among controls. Condom use remained suboptimal with 36.1% in cases, 31.2% in controls, despite recognised exposure to risk. These parallels suggest that sexual risk is diffusely distributed, extending beyond conventional key populations into the general clinic-attending population. The convergence of behavioural and structural vulnerabilities across both settings underscores the need for context-sensitive, behaviour-focused interventions that address partner concurrency, unstable relationships, and low-risk perception.

Our findings also share several thematic parallels with the study by Macêdo et al, which examined risk factors for syphilis among women attending maternity hospitals in Recife, Brazil.[9] Both studies highlight the contribution of marital instability and multiple sexual partnerships to syphilis vulnerability. The Brazilian study identified low educational attainment (OR=2.02) as an independent predictor, a marker of systemic marginalisation. However, in our participants, only 27.3% of cases had primary education, nearly identical to the 28.1% among controls, with no significant association on multivariate analysis. These differences suggest that while structural vulnerability plays a role across both settings, in our population, behavioural patterns such as extramarital sexual partnerships and marital disruption appear more proximate drivers of infection than classic socioeconomic indicators.

Similarly, while early substance use, particularly drug use, was a strong predictor in the Brazilian context (OR=3.04), in our study, alcohol use prior to sex, though common, did not retain independent association with syphilis after multivariate adjustment.[9] Likewise, although Narain et al discuss methamphetamine and recreational drugs like amyl nitrate use as contributing factors to the resurgence of syphilis in India, alcohol use was more relevant in our setting.[10] In our study, alcohol appeared to act less as an independent risk factor and more as a behavioural enabler, increasing risk through impaired judgment and reduced condom negotiation.

The Sankalak report documents significant progress in partner testing within HIV programmes, however, similar frameworks for syphilis remain lacking.[11] In our study, although 76.9% of cases reported notifying their partners, actual partner follow-up and treatment were rarely achieved, reflecting missed opportunities for breaking transmission chains. Partner notification, though acknowledged as a linchpin of STI containment, lacked the structured support necessary to ensure its effectiveness.

According to NFHS-5, HIV-related knowledge and practices demonstrate significant inter-state variability across Northeast India, with Meghalaya consistently underperforming on key indicators. In Meghalaya, only 14.5% of women and 15.9% of men possess comprehensive knowledge of HIV/AIDS, substantially lower than the national averages of 21.6% and 30.7%, respectively. In contrast, higher levels of awareness are observed in Mizoram (64.1% of women and 65.6% of men) and Manipur (50.6% of women and 55.9% of men). HIV testing coverage remains limited in Meghalaya, with only 24.1% of women and 5.3% of men ever tested, compared to 57% and 35.9% in Mizoram. Stigmatizing attitudes persist, with merely 6.7% of women and 9.5% of men in Meghalaya expressing fully accepting views toward individuals living with HIV, markedly lower than the corresponding figures in Manipur (49.7% and 59.8%).[3] These concerning HIV indicators are mirrored in the regional epidemiology of other STIs. A 10-year DSRC-based retrospective study by Srivastava et al from Safdarjung Hospital, New Delhi, reported a declining trend in syphilis, with VDRL positivity falling from 1.56% to 1.05% and latent syphilis comprising 92.8% of diagnosed cases.[12] In contrast, our Meghalaya-based DSRC study revealed no such decline, with persistently high caseloads documented across multiple districts, particularly in East Jaintia Hills. According to the National Health Profile 2021, Meghalaya reported a total of 263 syphilis cases, comprising 73 males and 190 females, during the year 2020.[13] While this absolute number appears modest compared to high-burden states such as Andhra Pradesh (10,671 cases), Telangana (3,137), and Uttar Pradesh (706), the implication becomes clearer when viewed in relation to Meghalaya's comparatively small population base. The per capita incidence is substantially elevated, indicating a disproportionately high burden. In contrast, several neighbouring northeastern states, including Arunachal Pradesh, Mizoram, and Tripura, reported negligible or zero cases, a pattern more suggestive of underreporting or surveillance limitations than genuine epidemiological differences. This aligns with the findings of our study, which revealed higher case-loads in DSRC registers than officially documented. It also reinforces the necessity for robust, district-level reporting mechanisms, particularly in geographies where health service coverage, laboratory confirmation capacity, and syndromic reliance may skew disease visibility. Integrating such granular state-level data helps surface hidden epidemics, often obscured in national aggregates, and positions Meghalaya as a sentinel region for intensified STI surveillance and intervention strategies.

Our study was limited by its facility-based design, excluding individuals who sought care outside DSRCs or in the private sector. Data from high-prevalence pockets may not represent the broader population. Additionally, reliance on self-reported behavioural data may introduce recall or social desirability bias, affecting the accuracy of risk associations.

Our findings from Meghalaya mirror global concerns highlighted by the World Health Organisation (WHO) regarding the resurgence of syphilis and the widening gaps in prevention and surveillance.[14] Persistent behavioural risks and district-level burden underscore the urgency for decentralised, stigma-free, and community-driven approaches with strengthening of routine screening, partner services, and local engagement in reversing this trend. Despite setbacks, the WHO underscores that with integrated, people-centred services and strengthened commitment to shared strategies, the 2030 elimination targets for STIs remain within reach.[15] Progress demands intensified political will, empowered communities, and universal access; where evidence guides action and no individual is left behind.

CONCLUSION

This study highlighted that extramarital sexual partnerships were independently associated with syphilis infection among DSRC attendees in Meghalaya, while alcohol use, though common, did not remain significant after adjustment. Suboptimal condom use, low awareness about STIs, and weak partner notification systems further amplify transmission risks. District-level differences indicate persistent high-burden pockets, particularly in East Jaintia Hills, underscoring the need for granular, district-focused interventions.

Recommendations

Strengthen routine syphilis screening across DSRCs with district-level monitoring. Introduce structured partner notification and treatment services. Enhance community-based awareness campaigns to address low STI knowledge and stigma. Integrate behaviour-focused interventions that specifically address partner concurrency and unstable marital relationships. Reinforce collaboration between SACS, NACO, and community-based organizations to ensure sustained and decentralized service delivery. By addressing both behavioural and structural drivers, Meghalaya can serve as a model for integrated STI control and contribute to achieving the 2030 WHO elimination targets.

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