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Original Article

The prevalence and risk factors of sexually transmitted infections among correctional institution inmates in Manado, Indonesia

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Abstract

Background Correctional facilities are particularly vulnerable to the spread of sexually transmitted infections (STIs). This study aimed to test for syphilis, human immunodeficiency virus (HIV), and hepatitis B virus (HBV) in inmates at the Correctional Institution Manado, Indonesia, and to evaluate its associated risk factors.

Methods 94 inmates underwent venereal disease research laboratory (VDRL), anti-HIV, and HBsAg testing. Data collection encompassed socio-demographic characteristics, risk factors including age, educational level, marital status, number of sexual partners, sexual orientation, condom usage, intravenous drug use, other drug administration methods, and blood sampling for screening purposes.

Results Sociodemographics were predominantly marked by groups between 25–49 of age (63.8%), possessing an intermediate education (63.9%), married (46.8%), sexually monogamous (54.3%), identifying as heterosexual (95.7%), never using condoms (58.5%), abstaining from intravenous drug use (95.7%), and utilizing other drug types (64.9%). Among the participants, 12.8% tested positive for VDRL, 1.1% for anti-HIV, and 6.4% for HBsAg. Only one subject exhibited reactivity to both VDRL and HBsAg tests. There was a strong connection between marital status and HBsAg (p=0.007).

Conclusion The prison environment offered insights into STI dissemination in a high-risk population, emphasizing that spread prevention needs informative and therapeutic measures.

Key words
Correctional institution, syphilis, HIV, HBV.

Introduction

Correctional facilities are particularly vulnerable to the spread of sexually transmitted infections (STIs), manifesting prisoners and other incarcerated groups as high-risk populations for STIs, HIV, and viral hepatitis.[1–3] In 2014, among the 10.2 million incarcerated individuals worldwide, 3.8% were HIV-positive[3] (later increased to 4.3%),[4] 4.8% had chronic HBV,[3] and another 2.89% contracted syphilis.[5] Several aspects influence this concerning risk status in

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prisons, such as high traffic of inmates from and to high-risk environments, and reckless behaviors like illicit drug use and unsafe sexual activities.[6] Moreover, most of them experience limited access to medical care prior to incarceration.[7] Additionally, the risk of HIV via sexual transmission is heightened by syphilis outbreaks and its inadequate treatment.[8] Inmates are also influenced by pre-existing societal health problems and restricted educational opportunities.[9] All those STIs-induction-associated elements combined can lead to syndemics, which is a synergistic interaction of multiple infections, resulting in amplified infection rates in a population.[2]

Understanding the status and context of STI cases in correctional facilities is vital. It helps establish STI prevention and control initiatives while also educating vulnerable populations. Despite its significance, the current information availability in Manado, as one of the largest cities in Eastern Indonesia, underscores the urgency for increased awareness and information on this issue.

This study aimed to evaluate the prevalence and risk factors of STIs among inmates at the Class IIA Correctional Institution in Manado, North Sulawesi, Indonesia. By initial screening for syphilis, HIV infection, and hepatitis B infection using serological tests from the venereal disease research laboratory (VDRL), anti-human immunodeficiency virus (anti-HIV), and hepatitis B surface antigen (HBsAg), as well as assessing the behavioral risk factors associated with these diseases. Our findings will contribute to a more comprehensive understanding of STIs in correctional settings and inform future prevention efforts.

Methods

This cross-sectional study took place in June 2021 and focused on male adolescent inmates to conduct screening for VDRL, anti-HIV, and HBsAg tests, as well as to identify STI transmission-associated factors, particularly syphilis, HIV, and HBV infection within the prison population. The study received approval from the Research Ethics Council at Prof. Dr. R. D. Kandou Hospital, Manado, under reference number 102/EC/KEPK-KANDOU/VI/2021. Data collection occurred at the Class IIA male Correctional Institution in Manado. 93 participants are included in the sample size. Participants were selected based on these criteria: age ≥20, agreed to participate by signing an informed consent form, stay duration no shorter than six months, and had not been diagnosed with syphilis, hepatitis B, and HIV infection. Researchers conducted individual interviews with each prisoner, ensuring the discretion and confidentiality of participants' information. This information contained characteristics of the socio-demographics and high-risk behaviors, including age, educational levels (low, medium, or high education), marital status, number of sex partners, sexual orientation, condom use frequency, intravenous drug use, and other drug use. Subsequently, 10 mL of venous blood was collected in vacutainer-type tubes with no anticoagulants for serum separation, then stored at 20^0C for screening purposes, which included VDRL for syphilis, rapid test (anti-HIV) for HIV, and HBsAg test for Hepatitis B. The samples were examined at the Clinical Pathology Department of Prof. Dr. R. D. Kandou Hospital. Individuals who received confirmed results were directed to undergo additional examinations and clinical follow-ups in line with the recommended patient care sequence. The treatment adheres to the management protocols established by the Ministry of Health of the Republic of Indonesia.

The data analysis was carried out using Statistical Packages for the Social Sciences

(SPSS) version 26.0, supported by Microsoft Excel. To calculate the sample size, we employed the proportion (percentage), assuming an unknown prior proportion value, a significance level (α) of 0.05, and an effect size of 0.102. To assess the association between socio-demographic and behavioral factors with serological test results, we utilized the Exact-Fisher statistical test and the Chi-square test. A *p*-value of less than 0.05 suggested statistical significance.

Results

This study evaluated 94 male inmates at the Class IIA Correctional Institution in Manado, aiming to comprehensively understand their socio-demographic characteristics, behavioral risk factors, and the prevalence of STIs. The findings presented in **Table 1** show that inmates were predominantly between 25-49 years old (63.8%), possessed an intermediate education (63.9%), and were married (46.8%).

Table 2 reveals that most participants were sexually monogamous (54.3%), identified as heterosexual (95.7%), and engaged in sexual contact without condoms (58.5%). Additionally, a substantial proportion of the participants were not intravenous drug users (95.7%), but reported the consumption of other types of drugs (64.9%).

Table 1 Socio-demographic profiles Class IIA Correctional Institution inmates in Manado, North Sulawesi, Indonesia (n=94).

Characteristics	*Number (%)*
Age group (years)	
20 – 24	12 (12.8)
25 – 49	60 (63.8)
≥ 50	22 (23.4)
Educational level	
Low	32 (34)
Medium	60 (63.9)
High	2 (2.1)
Marital status	
Single	37 (39.4)
Married	44 (46.8)
Disrupted marriage (divorced)	13 (13.8)

Table 2 Behavior risk attributes of Class IIA Correctional Institution inmates in Manado, North Sulawesi, Indonesia (n=94).

Characteristics	*Number (%)*
Number of sex partners in the last 12 months	
1	51 (54.3)
>1	2 (2.1)
0	41 (43.6)
Sexual orientation	
Heterosexual	90 (95.7)
Homosexual	1 (1.1)
Bisexual	3 (3.2)
Condom usage during sexual intercourse with partner(s)	
Never	55 (58.5)
Always	18 (19.1)
Sometimes	21 (22.4)
Intravenous drug users	
Yes	4 (4.3)
No	90 (95.7)
Other drug use methods	
Yes	61 (64.9)
No	33 (35.1)

In **Table 3**, the seroprevalence assessments indicate that 12.8% of subjects showcased reactivity to the VDRL test (syphilis), 1.1% to anti-HIV, and 6.4% to HBsAg (hepatitis B). Notably, one participant tested reactive for both VDRL and HBsAg, suggesting a potential co-infection.

Table 4 delves deeper into the significant connection between marital status and HBsAg test reactivity (p=0.007), insinuating that marital status may contribute to the risk of contracting hepatitis B.

Discussion

Prisons often propitiously facilitate the spread of syphilis, HIV, and hepatitis B.[10] As such, screening becomes crucial for prevention and early detection. In our study, most of the participants were sexually active, married

Table 3 Seroprevalence of VDRL, anti-HIV, and HBsAg among Class IIA Correctional Institution inmates in Manado, North Sulawesi, Indonesia.

Variable	*n (%)*
VDRL	
Reactive	12 (12.8)
Non-reactive	82 (87.2)
Anti-HIV	
Reactive	1 (1.1)
Non-reactive	93 (98.9)
HBsAg	
Reactive	6 (6.4)
Non-reactive	88 (93.6)
Co-infection of VDRL and HBsAg	
Present	1 (1.1)
Absent	93 (98.9)

adolescents with a moderate education. This differs from the findings in two incarceration facilities in Brazil where most of the inmates were single and/or working-age adults with low educational backgrounds.[11,12] However, our evidence aligns with that observed in a Class 1 penitentiary in Semarang, another major city in Indonesia.[13] This suggests that varying demographics among prison populations may impact the model of interventions required, and strategies to address STIs in prison should be tailored based on population profiles. Correctional facilities are instrumental to the development of our community, not only to punish offenders but also to rehabilitate and reintegrate them into society. They often come from diverse backgrounds and social standings. Participants reported mostly having one sexual

Table 4 Association of socio-demographic profile and behavioral factors with VDRL, anti-HIV, and HBsAg seroprevalence.

Characteristic	*VDRL reactive*		*Anti-HIV*		*HBsAg*		*p-value*		
	No	*Yes*	*No*	*Yes*	*No*	*Yes*	*VDRL*	*HIV*	*HBsAg*
Age (year)									
20-24	11	1	12	0	12	0	0,326[b]	0,375[b]	0,258[b]
25-49	53	7	59	1	55	5			
≥ 50	18	4	22	0	21	1			
Marital status									
Single	32	5	36	1	37	0	0.458[b]	0,229[b]	0,007[b]*
Married	39	5	44	0	41	3			
Divorced	11	2	13	0	10	3			
Education level									
Low	27	5	32	8	30	2	0.372[b]	0.375[b]	0.415[b]
Medium	53	7	59	1	56	4			
High	2	0	2	0	2	0			
Sexual partners									
0	35	6	41	0	37	4	0.396[b]	0.326[b]	0.244[b]
1	45	6	50	1	49	2			
≥ 2	2	0	2	0	2	0			
Sexual orientation									
Bisexual	3	1	4	0	4	0	0.353[b]	0.486[b]	0.417[b]
Heterosexual	78	11	88	1	83	6			
Homosexual	1	0	1	0	1	0			
Condom uses									
Sometimes	21	0	21	0	19	2	0.051[b]	0.349[b]	0.400[b]
Always	16	2	18	0	17	1			
Never	45	10	54	1	52	3			
Intravenous drug users									
No	79	11	89	1	84	6	0.426[a]	0.957[a]	0.756[a]
Yes	3	1	4	0	4	0			
Other drug use methods									
No	51	10	61	0	58	3	0,132a	0.351[a]	0.352[a]
Yes	31	2	32	1	30	3			

partner, heterosexual, and never using condoms during intercourse. The latter may be the case due to these participants being in a sexually monogamous relationship. One study in Lubuk Pakam Prison, Indonesia, found that most inmates did not exhibit high-risk sexual behaviors.[14] Although the 94 subjects were practically non-intravenous drug users, over half of them used cheaper and more readily available alternatives, such as marijuana and glue.

The prevalence of VDRL seropositivity in our study was 12.8%, which is significantly higher than rates reported in previous studies conducted in prisons and detention centers across 13 provinces in Indonesia (5.1%),[15] Lubuk Pakam Prison (6.3%),[14] and Western Amazon Prisons (8.9%),[16] all of which used treponemal test and anti-TP. However, the VDRL test used in our study was non-treponemal testing commonly employed for initial screening and has high sensitivity, which may lead to false-positive results.[17] Consequently, accurate diagnosis of syphilis requires confirmatory testing with treponemal tests. Our findings signify that syphilis seroprevalence in Manado is higher than those in Brazil and Mexico with similar testing employed.[18,19] This result is concerning as many inmates with short stays are unaware of their health conditions, posing threats to public health.[20]

It is essential to note that *Treponema pallidum*, the causal agent of syphilis, spreads hematogenously and rapidly within the body,[21] causing serious complications if left untreated.[22] Additionally, concurrent HIV and syphilis infections may promote additional CD4 drop or increase HIV viral load, potentially exacerbating HIV infection.[20]

We discovered that the seroprevalence of anti-HIV was 1.1%, which is comparable to previous studies in Indonesia (1.1%)[15] and Salvador (BA), Brazil (1.2%).[12] This rate is also higher than those in Lubuk Pakam (0.9%)[14] and Mexico City (0.7%),[23] but lower than those in the State of Parana (1.6%)[11] and Rio Grande do Sul, Brazil (4.9%).[18] The predicament of inmates being generally six times more susceptible to HIV infection (although rates vary by region),[4] increases transmission risk in prison.[24] Therefore, prioritizing HIV prevention and treatment in prisons becomes fundamental.[29,30] It can be fostered by implementing early rapid HIV testing to raise awareness, advocating counseling to maintain their health,[25] continuously receiving high-quality medical care,[26] and inclusive services, including antiretroviral therapy (ART), despite challenges in the prison system.[25] This aligns with UNAIDS' new vision that includes achieving the 95-95-95 testing and treatment targets for all.[27]

The seroprevalence of HBsAg in this study was 6.4%, which was higher than the rate observed in Lubuk Pakam (5%),[14] Rio Grande do Sul (2.5%),[18] and Salvador (BA) (0.5%).[12] Contrarily, our current data is nearly thrice lower compared to that in the Nigerian prison (16.1%),[28] even more significant in comparison to the West and Central African prisons (23.5%).[3] Additionally, Bhadoria[29] reported an HBV prevalence of 8% in India. Geographical locations and high-risk behavioral factors might create these variations.

Our study also identified one individual with concurrent syphilis and HBV infections, in which comparable evidence was found in 2 inmates (0.4%) in Salvador.[12] Co-infection like this can have serious clinical consequences that may hinder certain treatments or even exacerbate the medication side effects.[18]

The multivariable analysis of several socio-demographic characteristics and behavioral risk factors indicated a higher likelihood of

individuals testing reactive for VDRL, anti-HIV, and HBsAg among the sexually active group (age 25-49 years old), although this was statistically insignificant. A notable association was observed between marital status (married or divorced) and the seroprevalence of HBsAg (p=0.007), while VDRL prevalence remained consistent among both single and married individuals. Meanwhile, anti-HIV was prevalent among unmarried subjects, but the relationship between these two variables lacked statistical significance. Other socio-demographic features and risk factors displayed no significant impact. All individuals testing reactive to all three tests reported never using condoms during activity. Furthermore, some HBsAg-reactive subjects also reported using non-intravenous drugs. Surprisingly, some individuals with no sexual partners were also reactive to VDRL and HBsAg tests, which was a contrast to the case in Guanajuato prison.[19] Conversely, intravenous drug use was the main driver for HIV infection according to the previous study in Indonesia.[15] This implies that those infections are transmissible through both sexual and non-sexual conduct.

The present study has several limitations. They include: the findings' applicability was context-dependent, the research design was cross-sectional, preventing full evaluation of certain aspects, and the serological tests for non-treponemal and anti-HIV markers were limited. Therefore, future research should involve larger and more diverse sample sizes, leverage longitudinal studies, and utilize more specific diagnosis techniques.

Safeguarding inmate health is key to promoting public health. Periodic screening needs to be established for early detection and health maintenance, also cost-effective and holistic preventive initiatives that include the utilization of evidence-based educational tools are to be instituted.[30] In this respect, various health organizations have already introduced more comprehensive and inclusive health intervention packages to address the need for all-encompassing healthcare standards in prison systems.[10] While employing multimodal treatment can generate the most potent impacts in combating STIs,[27] establishment of multi-component strategies is pivotal to the success of the overall STIs and HIV management program.

Conclusion

In an effort to understand the prevalence of infectious diseases among inmates, we provide insight into the potential transmission of diseases within prisons and the broader community. The study revealed that the majority of participants were between 25 and 49 years old, possessed an intermediate educational background, were married, sexually monogamous, identified as heterosexual, had unprotected sexual encounters, did not engage in intravenous drug use, and had consumed other types of drugs. Some individuals tested positive for VDRL, anti-HIV, and HBsAg, with one participant being reactive to both VDRL and HBsAg tests. A notable association was found between marital status and HBsAg test reactivity. This study signifies the potential of inmates to become a vector for spreading infectious diseases to the general population. It is essential to conduct regular screenings for STIs and HIV upon inmates' arrival and maintain this practice throughout their sentences. Future research should involve larger and more diverse sample sizes, employ long-term study designs, and use advanced serological methods. Exploring further the demographics profiles is also important. The establishment of a multifaceted approach that is all-encompassing can control and limit the dissemination of these diseases, benefiting both the prisoners' families and the wider community.

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