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Self-reported sexually transmitted infections among men and women in Papua New Guinea: A cross-sectional study

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Abstract

Background and Aims: Sexually transmitted infections (STIs) pose a considerable concern for global healthcare systems. We examined the prevalence and correlates of self-reported STIs (SR-STIs) among men and women in Papua New Guinea.

Methods: A total of 7,195 women and 4,069 men from Papua New Guinea who participated in the 2016–2018 Demographic and Health Survey were included in this study. Percentages were used to summarize the prevalence of SR-STIs among men and women. A multivariable multilevel binary logistic regression was used to examine the correlates of SR-STIs in men and women.

Results: An overall 5.9% and 4.6% prevalence of SR-STIs were recorded among women and men, respectively, in Papua New Guinea. The odds of SR-STIs were higher among women who ever tested for HIV (aOR = 2.47, CI: 1.80–3.39), those who had first sex below 20 years (aOR = 1.76, CI: 1.10–2.80), those who watched television less than once a week (aOR = 1.83, CI: 1.13–2.95) and those from the Highlands and Momase regions (aOR = 5.55, CI: 3.30–9.33) compared to their counterparts who never tested for HIV, who had their first sexual intercourse when they were 20 years and above, who did not watch television at all, and those from the Southern Region. For men, the odds of SR-STIs were high among those who ever tested for HIV (aOR = 1.65, CI: 1.11–2.45), those with one (aOR= 2.08, CI: 1.05–4.14) and two or more (aOR = 3.77, CI: 1.49, 9.52) sexual partners excluding spouse in the 12 months preceding the survey, those living in the Highlands region (aOR = 2.52, CI: 1.48–4.29), and those living in communities with medium literacy level (aOR = 2.33, CI: 1.38–3.94) compared to their counterparts who had never tested for HIV, those with zero sexual partners excluding their spouse in the 12 months preceding the survey, those living in the Southern region, and those living in communities with low literacy levels.

Conclusion: We recommend that the National AIDS Council of Papua New Guinea through the National HIV and STI 2018–2022 Strategy program should be realigned

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to address these correlates and ensure that more sexual and reproductive health resources are provided to men and women in the Highlands and Momase regions.

KEYWORDS

Demographic and Health Survey, global health, HIV/AIDS, Papua New Guinea, sexually transmitted infections

1 | INTRODUCTION

Sexually transmitted infections (STIs) are a significant concern for global health systems.[1] Many resources and global efforts, such as the Sustainable Development Goals (SDGs), have been dedicated to reducing the incidence and prevalence of STIs. SDGs 3, 5, 10, and 17 highlight the need for global collaboration and accelerated efforts to curb STIs by 2030, particularly due to their profound effect on reproductive health.[2–4] Out of over 30 different parasites, viruses, and bacteria that can be transmitted sexually, global data shows that only eight of these pathogens contribute to the high incidence of STIs.[5] Syphilis, gonorrhea, chlamydia, and trichomoniasis are currently curable, while hepatitis B, herpes simplex virus, human immunodeficiency virus (HIV), and human papillomavirus are not. While STIs are primarily acquired through sexual contact, they can also be transmitted from mother to child during pregnancy, childbirth, or breastfeeding.[5] The World Health Organization reports that more than 1 million new STIs are acquired every day, with approximately 374 million new infections in 2020 alone.[6] However, the high incidence and prevalence of STIs are disproportionately distributed, with a greater burden on low-and middle-income countries (LMICs) such as Papua New Guinea (PNG).[7]

PNG, an island country in the southwestern Pacific Ocean, has one of the highest prevalence of STIs in the world.[8] Evidence suggests that between 2007 and 2010, an estimated 1.28% of persons aged 15–49 years in PNG had STIs and HIV. This prevalence was projected to increase to about 10% by 2025.[9] In 2020, the HIV prevalence in PNG was reported to be around 0.84%, and about 7.9% of women attending antenatal care had syphilis.[10] A cross-sectional prevalence survey of women attending their first antenatal care visit across three provinces found that 43% of them were diagnosed with chlamydia, gonorrhea, and/or trichomonas infection.[11] Among these, chlamydia had a prevalence of 22.9%, followed by trichomonas (22.4%), and gonorrhea (14.2%).[11]

In response to the threat of STIs and HIV in PNG, the National Acquired Immunodeficiency Syndrome (AIDS) Council of PNG launched the 2018–2022 National STI and HIV Strategy. The goal of this strategy is to coordinate efforts and implement sustainable programs to curb the rising incidence and prevalence of STIs. However, this effort is challenged by the dearth of current empirical evidence and findings on the prevalence and correlates of STIs. Some previous studies have relied on data generated over a decade ago, which may not accurately reflect current issues related to STIs in PNG.[8,9,11]

This study, therefore, draws on current Demographic and Health Survey (DHS) data to examine the prevalence and correlates of self-reported STIs (SR-STIs) in PNG. The findings would be valuable for stakeholders in tailoring programs, interventions, and allocating scarce resources to address the challenges of STIs in the country. These interventions include strengthening the 2018–2022 National STI and HIV Strategy, the National AIDS Council of PNG, and the PNG's Ministry of Health & HIV/AIDS.

2 | METHODS

2.1 | Data source and study design

We used data from the PNG DHS conducted from 2016 to 2018. The data were obtained from the individual and men recode files. DHS is a representative survey conducted periodically in LMICs globally.[12,13] The PNG DHS adopted a cross-sectional study design to collect data from respondents on health and social issues including STIs.[13] The respondents for the study were recruited using a two-stage sampling procedure. The selection of 800 census units constituted the initial stage of the sampling process. The probability proportional to the size of the census units was used to select the 800 census units. The second stage consisted of a random selection of 24 homes from each cluster, for 19,200 households. Data collection took place at the homes of the respondents. Data were gathered separately for men and women. A detailed sampling technique has been highlighted in the literature.[12,13] The study included 7,195 women and 4,069 men who had ever had sex. The data set used is freely available to download at https://dhsprogram.com/data/dataset_admin/index.cfm. In writing this paper, we complied with the Strengthening Reporting of Observational Studies in Epidemiology reporting criteria (Table S1).[14]

2.2 | Variables

2.2.1 | Outcome variable

SR-STIs was the outcome variable in this study. To assess this variable, the respondents who had ever had sex were asked whether they had an STI or symptoms of an STI (a bad-smelling, abnormal

discharge from the vagina/penis or a genital sore or ulcer) in the 12 months before the survey. The response options to this question were "0 = no", "1 = yes," and "8 = don't know." For this study, we used the definite responses (no and yes) in the final analysis. Previous studies using the DHS dataset adopted similar coding and categorization.[15–17]

2.2.2 | Explanatory variable

Nineteen variables were included in the study as explanatory variables. These variables were selected based on the following criteria: (i) their significant associations with SR-STIs[14–17] and (ii) availability in the PNG DHS. The variables were segregated into individual-level and community-level factors. The variables at the individual level consisted of the age of respondents, level of education, marital status, current working status, parity, age at first sex, ever tested for HIV, condom use during last sex with most recent partner, number of sexual partners in the last 12 months excluding spouse, comprehensive HIV knowledge, health insurance coverage, frequency of listening to radio, frequency of watching television, frequency of reading newspaper or magazine, and wealth index. Place of residence, region, community literacy level, and community socioeconomic status were the community-level variables. Tables 1 and 2 have information on the categories of the variables used in the study.

2.3 | Statistical analyses

We performed data extraction, cleaning, and analysis using Stata software version 16.0 (Stata Corporation). The prevalence of SR-STIs was estimated using percentages with 95% confidence interval (CI). To determine the distribution of SR-STIs across the explanatory variables, we adopted a cross-tabulation analysis technique and the results were presented in a tabular form using percentages and CIs. We used bivariate binary logistic regression analysis to examine the variables independently associated with SR-STIs. The results were presented using crude odds ratio (cOR), with 95% CIs. All the statistically significant variables were placed in a multilevel binary logistic regression models. The multilevel binary logistic analysis was used to examine the factors associated with SR-STIs in men and women. To do this, we built four models for each sample. Model I, which was an empty model with no explanatory variables, showed the variance in SR-STIs attributable to the primary sample units. Model II solely considered individual-level variables. Model III contained only community-level variables. The final model incorporated all of the explanatory variables (Model IV). The results of the multilevel binary logistic regression analyses were presented as adjusted odds ratio (aOR) with 95% CIs. Statistical significance was set at p-values less than 0.05. The data analyses were weighted to account for sampling probability and nonresponse. The analyses were also modified using Stata's "svy" function to account for the complex survey methodology and large standard errors.

2.4 | Ethical consideration

This study did not require ethical approval because it used publicly available data. According to the 2016-18 PNG DHS, the ICF Institutional Review Board granted ethical approval.

3 | RESULTS

3.1 | Prevalence and bivariate analysis of self-reported sexually transmitted infections

Tables 1 and 2 present the results on the prevalence of SR-STIs among women and men and its distribution across the explanatory variables. They also show the bivariate results on the association between SR-STIs and the explanatory variables. It was found that the prevalence of SR-STIs among women in PNG was 5.9% [4.8%, 7.3%]. There were differences in the distribution of SR-STIs across the explanatory variables. Results of the bivariate analysis showed that parity, health insurance coverage, community literacy level, age at first sexual intercourse, history of HIV testing, region of residence, frequency of watching television, and community socioeconomic status were statistically associated with SR-STIs among women (Table 1).

Among men, the prevalence of SR-STIs in PNG was 4.6% [3.7%, 5.7%]. Marital status, parity, comprehensive HIV/AIDS knowledge, history of HIV testing, number of sexual partners excluding spouse, frequency of listening to the radio, frequency of watching television, region of residence, and community literacy levels were associated with SR-STIs among men at Table 2.

3.2 | Factors associated with self-reported sexually transmitted infections among women in Papua New Guinea

Model IV of Table 3 shows the results of the factors associated with SR-STIs among women in PNG. Women with at least one child were less likely to self-report STIs compared to their counterparts with zero children, with the least odds among those with two children (aOR = 0.32, CI = 0.17-0.58). However, women who had ever tested for HIV (aOR = 2.47, CI: 1.80–3.39), those whose first sexual intercourse occurred before age 20 (aOR = 1.76, CI: 1.10–2.80), those who watched television less than once a week (aOR = 1.83, CI: 1.13–2.95), and those living in the Highlands (aOR = 5.55, CI: 3.30–9.33) and Momase (aOR = 2.06, CI = 1.11–3.84) regions were more likely to self-report STIs compared to their counterparts who never tested for HIV, who had first sex when they were 20 years and above, those who did not watch television at all, and those from the Southern region.

TABLE 1 Prevalence and bivariate results of SR-STIs among in Papua New Guinea

Variable	Weighted *N* (%)	SR-STIs % [95% CI]	cOR [95% CI]
Prevalence		5.9 [4.8–7.3]	
Women's age (years)			
15–19	442 (6.1)	6.2 [3.1–12.0]	1.0
20–24	1,364 (19.0)	7.1 [4.2–11.7]	1.15 [0.47–2.84]
25–29	1,466 (20.4)	6.5 [4.6–9.0]	1.05 [0.48–2.32]
30–34	1,309 (18.2)	5.7 [4.0–7.9]	0.91 [0.40–2.06]
35–39	1,190 (16.5)	4.9 [3.4–7.2]	0.78 [0.35–1.75]
40–44	839 (11.7)	6.0 [3.9–9.1]	0.96 [0.47–1.99]
45+	585 (8.1)	4.3 [2.7–7.0]	0.69 [0.31–1.55]
Level of education			
No education	1,391 (19.3)	6.8 [4.7–9.7]	1.0
Primary	3,612 (50.2)	5.3 [3.9–7.3]	0.77 [0.46–1.28]
Secondary	1,833 (25.5)	5.4 [3.5–8.2]	0.78 [0.41–1.47]
Higher	358 (5.0)	11.4 [4.3–27.0]	1.76 [0.56–5.50]
Marital status			
Previously married	225 (3.1)	7.1 [3.8–13.2]	1.0
Never married	488 (6.8)	5.5 [2.6–11.2]	0.75 [0.27–2.13]
Married	5,408 (75.2)	5.9 [4.6–7.6]	0.82 [0.40–1.68]
Cohabiting	1,074 (14.9)	5.9 [4.3–8.0]	0.82 [0.41–1.64]
Current working status			
Not working	4,723 (65.6)	5.3 [4.1–6.7]	1.0
Working	2,472 (34.4)	7.2 [5.1–10.2]	1.40 [0.89–2.20]
Parity			
Zero	1,204 (16.7)	7.8 [5.5–10.9]	1.0
One	1,259 (17.5)	7.1 [5.1–9.7]	0.90 [0.58–1.38]
Two	1,114 (15.5)	4.2 [3.0–6.0]	0.52* [0.31–0.89]
Three	1,207 (16.8)	7.6 [4.6–12.2]	0.97 [0.55–1.71]
Four or more births	2,411 (33.5)	4.4 [3.3–5.8]	0.54** [0.36–0.81]
Covered by health insurance			
No	6,853 (95.2)	6.1 [4.9–7.6]	1.0
Yes	342 (4.8)	2.6 [1.4–4.9]	0.42* [0.20–0.85]
Age at first sex			
20 years and above	2,529 (35.1)	3.7 [2.7–5.0]	1.0
Below 20 years	4,666 (64.9)	7.2 [5.6–9.1]	2.02** [1.35–3.01]
Condom used during last sex with most recent partner			
No	6,849 (95.2)	5.8 [4.7–7.1]	1.0
Yes	346 (4.8)	8.1 [3.7–16.9]	1.43 [0.65–3.18]
Ever tested for HIV			
No	3,888 (54.0)	3.8 [2.9–5.1]	1.0
Yes	3,307 (46.0)	8.4 [6.7–10.5]	2.33*** [1.71–3.18]

TABLE 1 (Continued)

Variable	Weighted *N* (%)	SR-STIs % [95% CI]	cOR [95% CI]
Comprehensive HIV and AIDS knowledge			
No	4,597 (63.9)	5.5 [4.5–6.7]	1.0
Yes	2,598 (36.1)	6.7 [4.7–9.5]	1.24 [0.84–1.83]
Number of sexual partners excluding spouse, in last 12 months			
Zero	6,526 (90.7)	5.9 [4.8–7.2]	1.0
One or more	669 (9.3)	6.8 [3.9–11.4]	1.17 [0.68–2.00]
Frequency of listening to radio			
Not at all	4,177 (58.0)	5.5 [4.2–7.2]	1.0
Less than once a week	1,530 (21.3)	7.1 [4.5–11.1]	1.32 [0.74–2.34]
At least once a week	1,488 (20.7)	6.0 [3.7–9.5]	1.09 [0.61–1.95]
Frequency of watching television			
Not at all	5,159 (71.7)	5.3 [4.1–6.8]	1.0
Less than once a week	778 (10.8)	8.5 [6.0–11.9]	1.65* [1.08–2.53]
At least once a week	1,258 (17.5)	7.0 [4.2–11.4]	1.34 [0.74–2.45]
Frequency of reading newspaper or magazine			
Not at all	4,216 (58.6)	5.7 [4.4–7.3]	1.0
Less than once a week	1,567 (21.8)	8.0 [5.1 - 12.4]	1.44 [0.82–2.56]
At least once a week	1,412 (19.6)	4.5 [2.3–8.5]	0.79 [0.36–1.72]
Wealth index			
Poorest	975 (13.5)	5.0 [2.9–8.5]	1.0
Poorer	1,222 (17.0)	5.0 [3.3–7.4]	1.00 [0.50–2.02]
Middle	1,431 (19.9)	6.5 [4.6–9.1]	1.33 [0.72–2.46]
Richer	1,653 (23.0)	6.2 [4.7–8.2]	1.26 [0.66–2.40]
Richest	1,915 (26.6)	6.4 [3.7–10.8]	1.29 [0.58–2.87]
Place of residence			
Urban	1,083 (15.1)	4.7 [3.4–6.7]	1.0
Rural	6,112 (84.9)	6.1 [4.9–7.7]	1.32 [0.85–2.04]
Region			
Southern region	1,417 (19.7)	1.8 [1.2–2.6]	1.0
Highlands region	2,908 (40.4)	10.5 [8.5–12.9]	6.46*** [4.10–10.18]
Momase region	1,737 (24.2)	3.8 [2.0–6.9]	2.15* [1.01–4.58]
Islands region	1,133 (15.7)	2.7 [1.9–3.9]	1.54 [0.90–2.64]
Community literacy level			
Low	3,158 (43.9)	7.9 [6.0–10.3]	1.0
Medium	2,091 (29.1)	4.8 [3.6–6.4]	0.59* [0.35–0.90]
High	1,946 (27.0)	4.0 [2.2–7.0]	0.48* [0.24–0.94]
Community socioeconomic status			
Low	2,703 (37.6)	4.7 [3.4–6.4]	1.0

(Continues)

TABLE 1 (Continued)

Variable	Weighted *N* (%)	SR-STIs % [95% CI]	cOR [95% CI]
Medium	2,021 (28.1)	7.5 [5.3–10.5]	1.66* [1.01–2.75]
High	2,471 (34.3)	6.0 [4.0–9.0]	1.31 [0.75–2.29]

Note: *, **, and *** indicate that variable are statistically significant.

Abbreviations: AIDS, acquired immunodeficiency syndrome; CI, confidence interval; HIV, human immunodeficiency virus; SR-STIs, self-reported sexually transmitted infections; 1.0, reference category; N, sample; %, percentage.

TABLE 2 Prevalence and bivariate results of SR-STIs among in Papua New Guinea

Variable	Weighted *N* (%)	SR-STIs % [95% CI]	cOR [95% CI]
Prevalence		4.6 [3.7–5.7]	
Men's age (years)			
15–19	251 (6.2)	5.8 [3.1–10.4]	1.0
20–24	596 (14.7)	6.9 [4.7–10.2]	1.22 [0.57–2.58]
25–29	763 (18.7)	5.0 [3.0–8.2]	0.86 [0.41–1.81]
30–34	728 (17.9)	4.5 [2.9–6.8]	0.77 [0.35–1.66]
35–39	714 (17.5)	3.7 [2.4–5.8]	0.63 [0.29–1.24]
40–44	562 (13.8)	3.2 [1.8–5.6]	0.54 [0.23–1.24]
45+	455 (11.2)	3.3 [1.9–5.7]	0.56 [0.25–1.24]
Level of education			
No education	474 (11.7)	3.5 [1.9–6.5]	1.0
Primary	1,917 (47.1)	4.4 [3.2–6.0]	1.25 [0.61–2.55]
Secondary	1,401 (34.4)	5.3 [3.7–7.5]	1.53 [0.76–3.07]
Higher	277 (6.8)	4.2 [2.2–7.6]	1.18 [0.47–2.94]
Marital status			
Previously married	128 (3.1)	9.1 [4.5–17.5]	1.0
Never married	866 (21.3)	7.3 [5.1–10.4]	0.78 [0.34–1.81]
Married	2,691 (66.1)	3.1 [2.2–4.3]	0.32* [0.14–0.73]
Cohabiting	385 (9.5)	7.3 [4.9–10.6]	0.78 [0.34–1.71]
Current working status			
Not working	1,844 (45.3)	4.3 [3.2–5.7]	1.0
Working	2,225 (54.7)	4.9 [3.6–6.5]	1.15 [0.76–1.72]
Parity			
Zero	1,157 (28.4)	7.3 [5.1–10.3]	1.0
One	552 (13.6)	3.8 [2.3–6.3]	0.51* [0.27–0.94]
Two	510 (12.5)	2.3 [1.3–4.1]	0.30*** [0.16–0.58]
Three	542 (13.3)	3.6 [2.1–6.0]	0.47* [0.25–0.89]
Four or more births	1,308 (32.2)	3.8 [2.8–5.2]	0.50* [0.31–0.81]
Covered by health insurance			
No	3,742 (92.0)	4.7 [3.8–5.8]	1.0
Yes	327 (8.0)	3.7 [1.6–8.4]	0.78 [0.33–1.82]

TABLE 2 (Continued)

Variable	Weighted *N* (%)	SR-STIs % [95% CI]	cOR [95% CI]
Age at first sex			
20 years and above	1,408 (34.6)	3.8 [2.6–5.6]	1.0
Below 20 years	2,661 (65.4)	5.0 [3.9–6.5]	1.33 [0.83–2.13]
Condom used during last sex with most recent partner			
No	3,558 (87.4)	4.3 [3.3–5.5]	1.0
Yes	511 (12.6)	6.7 [4.1–11.0]	1.62 [0.90–2.89]
Ever tested for HIV			
No	2,921 (71.8)	3.7 [2.9–4.7]	1.0
Yes	1,148 (28.2)	6.9 [5.0–9.5]	1.94*** [1.34–2.80]
Comprehensive HIV and AIDs knowledge			
No	2,488 (61.1)	5.2 [4.0–6.8]	1.0
Yes	1,581 (38.9)	3.6 [2.6–4.9]	0.67* [0.45–0.99]
Number of sexual partners excluding spouse, in last 12 months			
Zero	2,954 (72.6)	3.2 [2.5–4.2]	1.0
One	838 (20.6)	6.7 [4.7–9.4]	2.13*** [1.40–3.22]
Two or more	277 (6.8)	12.6 [7.6–20.2]	4.32*** [2.42–7.71]
Frequency of listening to radio			
Not at all	1,676 (41.2)	3.3 [2.3–4.6]	1.0
Less than once a week	932 (22.9)	6.4 [4.6–8.9]	2.01** [1.22–3.32]
At least once a week	1,461 (35.9)	4.9 [3.6–6.8]	1.53 [1.00–2.33]
Frequency of watching television			
Not at all	2,414 (59.3)	3.4 [2.6–4.5]	1.0
Less than once a week	635 (15.6)	5.9 [3.8–9.0]	1.76* [1.03–3.03]
At least once a week	1,020 (25.1)	6.5 [4.6–9.1]	1.94** [1.29–2.90]
Frequency of reading newspaper or magazine			
Not at all	1,452 (35.7)	4.0 [2.8–5.7]	1.0
Less than once a week	1,046 (25.7)	5.4 [3.9–7.6]	1.37 [0.82–2.32]
At least once a week	1,571 (38.6)	4.5 [3.2–6.5]	1.13 [0.72–1.79]
Wealth index			
Poorest	630 (15.5)	4.6 [2.5–8.3]	1.0
Poorer	759 (18.7)	4.0 [2.6–6.2]	0.87 [0.40–1.90]
Middle	802 (19.7)	5.0 [3.4–7.4]	1.10 [0.52–2.34]
Richer	814 (20.0)	4.4 [2.6–7.4]	0.96 [0.41–2.23]
Richest	1,064 (26.1)	4.8 [3.0–7.6]	1.05 [0.47–2.34]
Place of residence			
Urban	599 (14.7)	6.1 [3.8–9.5]	1.0
Rural	3,470 (85.3)	4.3 [3.4–5.6]	0.70 [0.40–1.22]
Region			
Southern region	811 (19.9)	4.1 [2.8–6.0]	1.0

(Continues)

TABLE 2 (Continued)

Variable	Weighted *N* (%)	SR-STIs % [95% CI]	cOR [95% CI]
Highlands region	1,515 (37.2)	7.3 [5.5–9.7]	1.85* [1.11–3.07]
Momase region	1,178 (29.0)	2.0 [0.9–4.4]	0.48 [0.19–1.20]
Islands region	565 (13.9)	3.4 [2.3–5.0]	0.83 [0.47–1.47]
Community literacy level			
Low	1,499 (36.8)	2.9 [2.0–4.0]	1.0
Medium	1,401 (34.5)	7.0 [5.1–9.6]	2.56*** [1.56–4.21]
High	1,168 (28.7)	3.9 [2.4–6.3]	1.39 [0.76–2.54]
Community socioeconomic status			
Low	2,193 (53.9)	4.6 [3.4–6.1]	1.0
Medium	360 (8.9)	3.8 [2.1–6.9]	0.83 [0.41–1.68]
High	1,516 (37.2)	4.8 [3.2–7.2]	1.05 [0.61–1.79]

Note: *, **, and *** indicate that variable are statistically significant.

Abbreviations: AIDS, acquired immunodeficiency syndrome; CI, confidence interval; HIV, human immunodeficiency virus; SR-STIs, self-reported sexually transmitted infections; 1.0, reference category; N, sample, %, percentage.

TABLE 3 Factors associated SR-STIs sexually transmitted infections among in Papua New Guinea

Variables	Model I	Model II aOR [95% CI]	Model III aOR [95% CI]	Model IV aOR [95% CI]
Fixed effect results				
Parity				
Zero		1.00		1.00
One		0.58* [0.37–0.91]		0.59* [0.37–0.93]
Two		0.30*** [0.16–0.55]		0.32*** [0.17–0.58]
Three		0.53** [0.34–0.83]		0.55** [0.35–0.86]
Four or more births		0.39*** [0.25–0.62]		0.41*** [0.26–0.65]
Ever tested for HIV				
No		1.00		1.00
Yes		2.60*** [1.89–3.58]		2.47*** [1.80–3.39]
Age at first sex				
20 years and above		1.00		1.00
Below 20 years		1.81* [1.14–2.87]		1.76* [1.10–2.80]
Covered by health insurance				
No		1.00		1.00
Yes		0.16 [0.01–2.09]		0.17 [0.01–2.68]
Frequency of watching television				
Not at all		1.00		1.00
Less than once a week		1.84* [1.15–2.97]		1.83* [1.13–2.95]
At least once a week		1.10 [0.68–1.77]		1.08 [0.66–1.77]

TABLE 3 (Continued)

Variables	Model I	Model II aOR [95% CI]	Model III aOR [95% CI]	Model IV aOR [95% CI]
Region				
Southern region			1.00	1.00
Highlands region			6.24*** [3.83–10.19]	5.55*** [3.30–9.33]
Momase region			1.97* [1.06–3.64]	2.06* [1.11–3.84]
Islands region			1.53 [0.88–2.65]	1.63 [0.91–2.92]
Community literacy level				
Low			1.00	1.00
Medium			1.12 [0.75–1.68]	1.02 [0.66–1.57]
High			1.07 [0.64–1.80]	1.05 [0.59–1.88]
Community socioeconomic status				
Low			1.00	1.00
Medium			1.59* [1.04–2.42]	1.47 [0.95–2.27]
High			1.37 [0.88–2.14]	1.20 [0.76–1.92]
Random effect results				
PSU variance (95% CI)	1.761 [1.333–2.328]	1.807 [1.284–2.543]	1.192 [0.844–-1.682]	1.356 [0.908–2.025]
ICC	0.349	0.354	0.266	0.292
Wald χ^2	Reference	74.09 (<0.001)	88.07 (<0.001)	133.19 (<0.001)
Model fitness				
Log-likelihood	−1435.2641	−1361.3662	−1399.5377	−1333.4942
AIC	2874.528	2744.732	2817.075	2702.988
N	7195	7195	7195	7195
Number of clusters	752	752	752	752

Abbreviations: 1, reference category; AIC, Akaike's Information Criterion; aOR, adjusted odds ratios; CI, confidence Interval; cOR, crude odds ratio; HIV, human immunodeficiency virus; ICC, intraclass correlation coefficient; PSU, primary sampling unit.
*$p < 0.05$.; **$p < 0.01$.; ***$p < 0.001$.

3.3 | Factors associated with self-reported sexually transmitted infection among in Papua New Guinea

Table 4 presents the results regarding the factors associated with SR-STIs among men in PNG. In the complete model (Model IV), men who had ever tested for HIV (aOR = 1.65, CI: 1.11–2.45), those with one (aOR = 2.08, CI: 1.05–4.14); and two or more (aOR = 3.77, CI: 1.49, 9.52) sexual partners excluding spouse in the 12 months preceding the survey, those living in the Highlands region (aOR = 2.52, CI: 1.48–4.29), and those living in communities with medium literacy level (aOR = 2.33, CI: 1.38–3.94) were more likely to self-report STIs compared to those who had never tested for HIV, those with zero sexual partners excluding their spouse in the 12 months preceding the survey, those living in the Southern region, and those living in communities with low literacy levels. However, men with two children had lower odds of SR-STIs compared to their counterparts who had no children (aOR = 0.34, CI: 0.13–0.92).

4 | DISCUSSION

Our study assessed the prevalence and correlates of SR-STIs among men and women in PNG.[18] The prevalence of SR-STIs was 5.9% and 4.6% among women and men, respectively. Parity, ever tested for HIV, age at first sex, frequency of watching television, region of residence, number of sexual partners, and community literacy level were significant correlates of SR-STIs among men and women in PNG.

The study's 5.9% prevalence of SR-STIs among women is higher than the 3.5% reported in Ethiopia and lower than the 7.4% prevalence in Kenya[19,20] The prevalence reported in this study is, however, lower than the findings reported from Ghana.[21] Globally, efforts are being made to increase awareness, testing, and treatment of STIs, including HIV. The United Nations Program on HIV/AIDS has urged countries to expedite action towards the 2030 target of 95-95-95 which aims to diagnose 95% of all HIV-positive individuals, provide antiretroviral therapy for at least 95% of those diagnosed and

TABLE 4 Factors associated with SR-STIs among in Papua New Guinea

Variables	Model I	Model II aOR [95% CI]	Model III aOR [95% CI]	Model IV aOR [95% CI]
Fixed effect results				
Marital status				
Previously married		1.00		1.00
Never married		0.70 [0.17, 2.83]		0.74 [0.19, 2.99]
Married		0.93 [0.23, 3.81]		0.96 [0.24, 3.82]
Cohabiting		2.63 [0.65, 10.61]		2.57 [0.64, 10.37]
Parity				
Zero		1.00		1.00
One		0.48 [0.21, 1.09]		0.49 [0.22, 1.13]
Two		0.32* [0.12, 0.85]		0.34* [0.13, 0.92]
Three		0.57 [0.24, 1.34]		0.56 [0.24, 1.34]
Four or more births		0.54 [0.26, 1.16]		0.57 [0.26, 1.23]
Ever tested for HIV				
No		1.00		1.00
Yes		1.80** [1.22, 2.64]		1.65* [1.11, 2.45]
Comprehensive HIV knowledge				
No		1.00		1.00
Yes		0.69 [0.45, 1.05]		0.73 [0.48, 1.11]
Number of sexual partners excluding spouse, in last 12 months				
Zero		1.00		1.00
One		2.08* [1.03, 4.18]		2.08* [1.05, 4.14]
Two or more		4.56** [1.82, 11.39]		3.77** [1.49, 9.52]
Frequency of watching television				
Not at all		1.00		1.00
Less than once a week		1.45 [0.79, 2.68]		1.39 [0.74, 2.63]
At least once a week		1.66* [1.02, 2.71]		1.53 [0.95, 2.48]
Frequency of listening to radio				
Not at all		1.00		1.00
Less than once a week		1.39 [0.79, 2.47]		1.40 [0.78, 2.51]
At least once a week		1.00 [0.55, 1.84]		1.02 [0.56, 1.85]
Region				
Southern region			1.00	1.00
Highlands region			2.85*** [1.69, 4.82]	2.52*** [1.48, 4.29]
Momase region			0.47 [0.22, 1.02]	0.54 [0.25, 1.16]
Islands region			0.98 [0.54, 1.78]	1.01 [0.57, 1.78]
Community literacy level				
Low			1.00	1.00
Medium			3.21*** [1.95, 5.27]	2.33** [1.38, 3.94]
High			2.23** [1.26, 3.97]	1.43 [0.73, 2.78]

TABLE 4 (Continued)

Variables	Model I	Model II aOR [95% CI]	Model III aOR [95% CI]	Model IV aOR [95% CI]
Random effect results				
PSU variance (95% CI)	1.841 [1.316–2.575]	1.534 [1.050–2.241]	1.398 [0.965–2.025]	1.292 [0.861–1.938]
ICC	0.359	0.318	0.298	0.282
Wald χ^2	Reference	65.80 (<0.001)	52.28 (<0.001)	114.43 (<0.001)
Model fitness				
Log-likelihood	−698.39028	−654.49476	−672.97093	−636.80085
AIC	1400.781	1342.99	1359.942	1317.602
N	4069	4069	4069	4069
Number of clusters	742	742	742	742

Abbreviations: 1, Reference category; AIC, Akaike's Information Criterion; aOR, adjusted odds ratios; CI, confidence interval; cOR, crude odds ratio; HIV, human immunodeficiency virus; ICC, intraclass correlation coefficient; PSU, primary sampling unit.
*$p < 0.05$.; **$p < 0.01$.; ***$p < 0.001$.

achieve viral suppression for at least 95% of those treated.[22] PNG should also strive towards this goal. Possible reasons for the observed prevalence include gender power imbalances in sexual relationships and high incidence of sexual violence in PNG[23], low levels of condom use,[24] low prevalence of male circumcision,[25] limited access to STI treatment services, and limited success in behaviour change interventions among both the general population and at-risk groups.[8] Other studies have also cited poor healthcare services and inadequate health infrastructure especially in the highlands region as barriers to healthcare including STI treatment services in PNG.[26,27]

The finding that women who had their first sexual intercourse before the age 20 are at a greater risk of SR-STIs is consistent with findings from previous studies that have also shown higher odds of SR-STIs among persons who had early sexual debut.[16,21,28–32] It has been reported that individuals who have sex at an early age are often at a greater risk of exposure to risky sexual behaviours, such as non-condom use, alcohol use during sex, and having multiple sexual partners, which increases their risk of STIs.[21] Furthermore, adolescents are known to frequently engage in risky sexual behaviours[33], which could plausibly explain the finding. The fact that having multiple sexual partners is a risky sexual behaviour that increases the risk of STIs plausibly explains why in this study, men with one or more sexual partners excluding their spouse in the last 12 months preceding the survey had a higher likelihood of SR-STI. This finding is also consistent with findings of previous studies.[19,26,34,35]

Men and women in PNG who lived in the Highlands region were more likely to have SR-STIs compared to those who lived in the Southern regions. Several studies have also reported poor health outcomes for those living in the Highlands region in PNG.[26,27] Unlike the Southern region, the Highlands region is one of the poorest regions of PNG.[36] The Southern region of PNG is known for its development, medical infrastructure, and many social amenities. It is also houses the administrative capital of PNG, Port Moresby, which is characterized by high socioeconomic development and numerous infrastructural developments such as good schools, good road network, and advanced healthcare system compared to the Highland region, which is less developed and lacks many social amenities.[37–39] Previous studies have reported that the region of residence has the potential to influence health outcomes and this study corroborates with such findings.[40,41] In this instance, lack of health infrastructure, quality healthcare, and development in the Highlands region could hinder access to sexual health information, care, and utilization of healthcare services. This, in turn, could prevent the adoption of healthy sexual lifestyles and behaviours such as the access and use of condoms, regular health screening and testing for STIs, and seeking treatment after a positive test.

The study found that women in PNG who were exposed to mass media (television) were more likely to self-report STIs. Specifically, women who watched television at least once a week had higher odds of SR-STIs compared to their counterparts who did not watch at all. This finding is consistent with previous studies conducted among women in sub-Saharan Africa and undergraduate students in Nigeria[15,42] Plausibly, television often broadcasts health messages that encourage women to get tested, which leads to more women knowing and reporting their status. However, television programs may also contain sexual explicit content that can entice women to engage in risky sexual behaviors, thus increasing the risk of SR-STIs as reported in literature.[42]

The study also found that parity is significantly associated with the odds of SR-STIs in men and women in PNG. Those with one or more children had lower odds of SR-STIs. This is likely because individuals with one or more children are more likely to be married or cohabiting and therefore may have only their spouse as their sexual

partner, thereby reducing their risk of STIs. It is worth noting that the demographic characteristics of the study respondents, as presented in Tables 1 and 2, show that about two-thirds of the respondents were either married or cohabiting. This could plausibly explain why men and women with more than one child have lower odds of SR-STIs.

4.1 | Strengths and limitations

The study provides a nationally representative coverage of SR-STIs among men and women. Therefore, the findings and recommendations can be applied to to all men and women in PNG. Furthermore, the study benefits from the use of well-trained enumerators for data collection, the appropriate statistical tool for analysis, and the use of a probability method to select respondents. These factors contribute to the robustness of this study's findings.

However, there are some limitations. The study employed a cross-sectional design, which means that causal inferences cannot be made. Furthermore, because respondents self-reported their responses on a sensitive topic such as STIs, there is a possibility of social desirability bias in the responses.

5 | CONCLUSION

Our study found that SR-STIs are prevalent among both men and women in PNG. Parity, HIV testing history, age at first sex, frequency of watching television, region of residence, number of sexual partners, and community literacy level were found to be significant correlates of SR-STIs among men and women in PNG. To address these issues, we recommend that the National AIDS Council of PNG realign their 2018–2022 National HIV and STIs Strategy program. This realignment should focus on improving accessibility and affordability of family planning services, reproductive health services, and HIV testing centers. Efforts should also be made to increase access to mass media, such as television, so that health programs, awareness campaigns, and educational materials reach men and women regardless of their place of residence. Additionally, we recommend that the National Department of Health of PNG allocate more resources and services for sexual and reproductive health in the Highlands regions.

AUTHOR CONTRIBUTIONS

Justice Kanor Tetteh: Conceptualization; methodology; validation; writing—original draft; writing—review and editing. **Richard Gyan Aboagye**: Conceptualization; data curation; formal analysis; methodology; software; validation; writing—original draft; writing—review and editing. **Addae Boateng Adu-Gyamfi**: Methodology; validation; visualization; writing—original draft; writing—review and editing. **Seth Christopher Yaw Appiah**: Methodology; validation; visualization; writing—original draft; writing—review and editing. **Abdul-Aziz Seidu**: Conceptualization; formal analysis; methodology; supervision; validation; writing—original draft; writing—review and editing. **Frank Lamadoku Attila**: Methodology; validation; visualization; writing—original draft; writing—review and editing. **Bright Opoku Ahinkorah**: Conceptualization; data curation; formal analysis; methodology; software; validation; writing—original draft; writing—review and editing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data set supporting the conclusions of this article is available online at https://dhsprogram.com/data/dataset/PapuaNewGuinea.

ETHICS STATEMENT

ICF Institutional Review Board approved the survey. Informed consent was obtained from all the respondents before the commencement of interviews with each respondent. Further information about the DHS data usage and ethical standards are available at http://goo.gl/ny8T6X.

TRANSPARENCY STATEMENT

The lead author Richard Gyan Aboagye affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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