Infect Dis Trop Med 2024; 10: e1229

Impact of SARS-CoV-2 pandemic on sexually transmitted infections and treatment outcomes at a healthcare facility in Ile-Ife, Nigeria

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ABSTRACT:

— ***Objective:*** The SARS-CoV-2 pandemic had a variable impact on sexually transmitted infections (STIs) in different regions of the world. There are currently no data on the impact of the pandemic on STIs in Nigeria. This study estimated the impact of the SARS-CoV-2 pandemic on non-HIV STIs, sexual behaviors, and treatment outcomes at an STI clinic in Ile-Ife, Nigeria.

— ***Patients and Methods:*** A retrospective review of the records of symptomatic non-HIV STI patients, diagnosed between February 2017 and January 2023 was conducted. We compared the trends in STIs, sexual behaviors, and clinical outcomes before (February 2017-January 2020) and during (February 2020-January 2023) SARS-CoV-2 pandemic periods. The data between the two periods were compared using bivariate and multivariate statistical tests, and the level of statistical significance was set at p-value <0.05.

— ***Results:*** There was a remarkable decline (88.89%) in the number of consultations for new STIs during the early phase of the pandemic, followed by a gradual rise to pre-pandemic levels in the latter part of the pandemic. The observed decline was most significant for STIs with relatively short incubation periods, such as non-gonococcal urethritis (p=0.024) and genital scabies (p=0.030), which declined by -68.7% and -75.0%, respectively. STIs with relatively longer incubation periods, such as syphilis and genital warts, did not decline significantly from pre-pandemic levels (p>0.05). The intra-pandemic STI patients exhibited greater STI risk behaviors and were significantly more likely to default from care than the pre-pandemic counterparts (adj OR= 2.479, 95% CI: 1.256-4.890).

— ***Conclusions:*** Public health measures instituted to curb the spread of SARS-CoV-2 at the onset of the pandemic resulted in a significant decline in STI transmission in the early phase of the pandemic. However, increased STI risk behaviors and higher rates of default from clinical care during the peak pandemic period may have negated such benefits, resulting in a rapid increase in the incidence of new STIs with potentially worse treatment outcomes in the latter parts of the pandemic.

— ***Keywords:*** SARS-CoV-2 pandemic, Sexually Transmitted Infections (STIs), Sexual practices, Treatment outcomes, Default from care.

— ***Abbreviations:*** CI: Confidence Interval; HBV: Hepatitis B Virus; HIV: Human Immunodeficiency Virus; NGU: Nongonococcal urethritis; OR: Odds Ratio; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus-2; STI: Sexually Transmitted Infection.

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INTRODUCTION

Sexually transmitted infections (STIs) encompass a group of communicable diseases with significant impact on human sexual and reproductive health[1]. Although the majority of STIs are curable, the burden of untreated sexually transmitted infections remains high, with devastating long-term and far-reaching consequences[2]. At the public health level, untreated STIs are risk factors for transmission of HIV infection and serious pregnancy complications. Furthermore, many sexually transmitted infections have a propensity for becoming epidemic, particularly in situations that cause a breakdown in healthcare systems and control programs, such as may occur during pandemics, natural disasters, and socio-political crises.

The recent SARS-CoV-2 pandemic exposed inadequacies in healthcare systems and programs for preventing and controlling communicable diseases globally. The rapidity of spread and considerable morbidity and mortality associated with SARS-CoV-2 called for drastic measures to mitigate the pandemic. This resulted in the prioritization and diversion of healthcare resources toward the diagnosis, treatment, and prevention of COVID-19 in most parts of the world[3]. Consequently, the strain imposed on the health system resulted in the disruption of services dedicated to other prevention programmes[4]. Screening for non-COVID-19 related health problems declined significantly during the early phases of the pandemic, and the diagnosis of other common diseases was delayed, particularly in resource-limited settings[3,5-7]. Furthermore, patients' access to clinical care, treatment, and diagnostic services was impeded by travel restrictions, lockdowns, closure of health facilities, economic constraints, and avoidance of healthcare facilities due to fear of nosocomial SARS-CoV-2 infection. This led to increased morbidity and mortality from diverse communicable and non-communicable diseases in many countries[4,5,7-10].

There have been conflicting reports in literature on the impact of the SARS-CoV-2 pandemic on STIs in different parts of the world. On the one hand, some research findings suggest that the social and travel restrictions imposed by governments during the early parts of the pandemic may have interrupted the transmission of STIs[11-13]. On the other hand, it is possible that reduced access to diagnostic and treatment services, coupled with changes in sexual behaviors, including a reduction in the use of condoms, may have enhanced the spread of STIs despite restrictions imposed on interpersonal contact at the height of the pandemic[3,10,14]. As such, reports of reduced infection rates may reflect reduced testing and diagnosis rather than a true decrease in the incidence of STIs during the pandemic.

Although the infection and mortality rates of SARS-CoV-2 infection were lower than predicted in Africa, the reported indirect impact of the pandemic on other health indices is just as enormous as worse hit countries[7]. Studies[15,16] conducted in Africa reveal a significant negative impact of the pandemic on access to HIV testing, treatment, and care. However, very little is known about how the pandemic impacted the incidence, diagnosis, treatment, and clinical outcomes of non-HIV STIs in the region. Given the relative paucity of data on the trend of STIs during the pandemic in Nigeria and the relevance of locally and regionally generated data to the computation of national and global statistical data, we conducted a study to determine the impact of COVID-19 on the clinical pattern and outcomes of non-HIV STIs in Ile-Ife, South-Western Nigeria.

PATIENTS AND METHODS

This sub-study is part of a broader research initiative focusing on the patterns of sexually transmitted infections (STIs) and the sexual behaviors of patients attending an STI clinic in Ile-Ife. It involved a retrospective review of medical records of all new symptomatic patients at the STI clinic of OAUTHC in Ile-Ife, Nigeria, from February 2017 to January 2023. A semi-structured proforma was utilized to document socio-demographic characteristics, clinical symptoms, sexual behaviors, and clinical diagnosis. Follow-up records were maintained until the complete resolution of symptoms and discharge from the STI clinic. The patients were classified as defaulting if they missed 2 or more consecutive follow-up appointments or were entirely lost to follow-up.

All the subjects received the same standard protocol screening for STIs irrespective of the primary clinical diagnosis or the period of presentation. Investigations conducted include serological screening tests for syphilis, HIV, HBV, and Hepatitis C infection. Urethral, high vaginal, and/or cervical swabs were obtained for microscopic examination, culture, and sensitivity testing. Additional investigations were guided by the patient's clinical signs and symptoms. Patients who tested positive for HIV infection were excluded from this study because they were subsequently referred to the HIV treatment center for definitive diagnosis and enrolment into the donor-funded HIV treatment and prevention program.

The period of study was divided into two phases: (i) pre-SARS-CoV-2 pandemic period (a 3-year period, from February 1, 2017, to January 31, 2020); (ii) SARS-CoV-2 pandemic period (a 3-year period, from February 1, 2020, when the first case of COVID-19 was reported in Nigeria, to January 31, 2023).

Statistical Analysis

The patients' data were subjected to univariate, bivariate, and multivariate statistical analyses using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA) to determine the differences in sexual practices, clinical patterns, and outcomes of STIs between the study periods. Logistic regression analysis was conducted to determine the predictors of negative outcomes (default from care) in the study population. Complete case analysis was performed on variables with missing data since the cases with missing data were few and assumed to be missing completely at random. The level of significance was set at $p<0.05$.

RESULTS

Study Population Characteristics

A total of 205 eligible newly diagnosed STI patients were treated during the study period. The records of 198 subjects [126 pre-pandemic (63.64%) and 72 pandemic patients (36.36%)] contained sufficient relevant clinical information to be included in the data analysis, while 7 subjects were excluded due to missing information regarding the date of their initial visit.

The average number of new STI patients treated per year declined by 42.85% during the pandemic from 42.00±8.88 pre-pandemic levels (February 2017-January 2020) to 24.00±18.52 intra-pandemic levels (February 2020-January 2023) (p=0.204, 95% CI: 14.15-21.85). The maximum decline (88.89%) in STI visits occurred in the first year of the pandemic (Figure 1).

The pandemic and pre-pandemic patients were statistically similar with respect to education (p=0.500), marital status (p=0.390), and socio-economic status (p=0.396) but demonstrated significant differences in age distribution (p<0.001). Patients treated during the pandemic were significantly older, with a median age of 26 years (p=0.048). Overall, males exceeded females in both arms of the study, accounting for 59.6% of the study population (Table 1, Figure 2).

Effects of SARS-CoV-2 Pandemic on STI Pattern

The pandemic did not significantly alter the pattern of STIs. Anogenital warts remained the predominant STI diagnosis both before and during the pandemic. While the majority of the STI patients in both arms of the study had only one sexually transmitted infection, a diagnosis of multiple concomitant STIs was more frequent in the pre-pandemic cohort (26.2%) compared with the intra-pandemic cohort (15.3%; p=0.076). The number of patients treated for curable STIs, particularly genital scabies and non-gonococcal urethritis, declined significantly (p=0.005) during the pandemic period, while the percentage decline in the frequency of incurable STIs was comparatively less remarkable (p=0.155; Table 1).

Changes in Sexual Behavior, Illness Behavior, and Treatment Outcome

The cohort of patients presenting during the pandemic had a significantly higher median number of sexual partners in the preceding 3 months (p=0.000) and 6 months (p=0.005) compared with pre-pandemic counterparts. They were also more likely to engage in casual sexual relationships (OR: 1.748, 95% CI: 0.939-3.254) and have unprotected sexual intercourse (OR: 1.209, 95% CI: 0.639-2.288) compared to pre-pandemic patients (Table 2). Default from clinical care was 2.5 times more frequent in the intra-pandemic STI patient group (OR: 2.4783, 95% CI: 1.3088-4.6928). When subjected to regression analysis, presentation during the pandemic and level of education were the only significant factors that predicted default from care (Table 3).

DISCUSSION

Impact of SARS-CoV-2 Pandemic on Clinical Consultations and Pattern of STIs

The pandemic period was associated with a transient decline in STI consultations, but no discernible effects on the general pattern of STIs were registered during

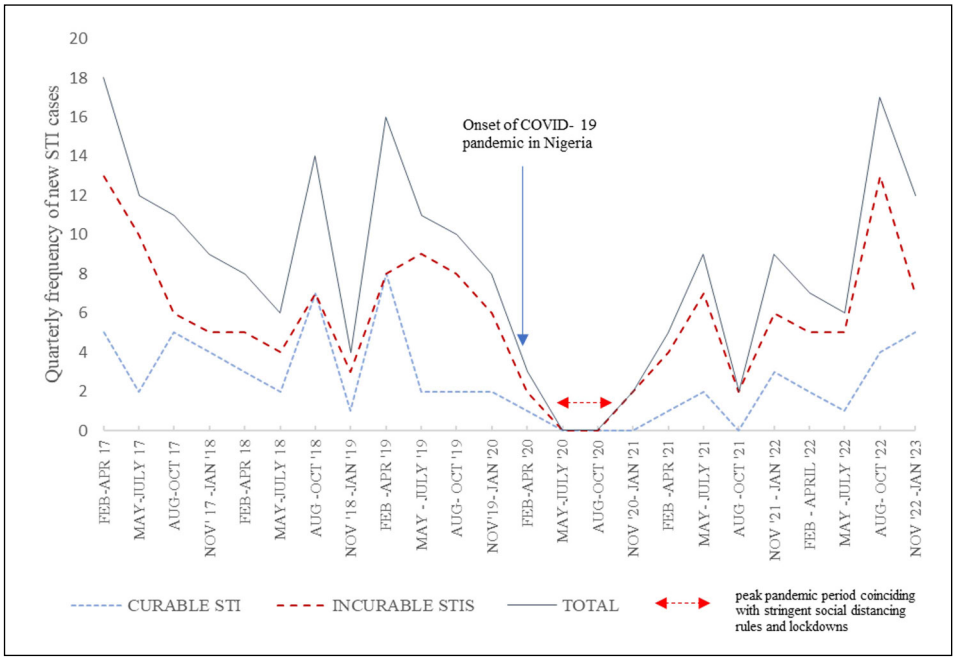

Figure 1. Impact of COVID-19 on physical consultations for Sexually Transmitted Infections in Ile-Ife. Visits for incurable sexually transmitted infections (STIs) exceeded curable throughout the period of study. The difference was, however, more marked during the pandemic due to a more remarkable (-62.67%) decline in consultations for curable STIs compared with a less steep decline (-36.9%) and more rapid post-peak rise in cases with incurable STIs.

Table 1. Differences in socio-demographic characteristics and pattern of sexually transmitted infections in the study population before and during the COVID-19 pandemic period.

	Pre-pandemic period (n=126)	Intra-pandemic period (n=72)	% change[a,b]	*p*-value	OR^	95% CI
Sex						
Female	47 (37.3)	33 (45.8)	+22.79%[a]			
Males	79 (62.7)	39 (54.2)	-13.56%[a]	0.120	0.703	0.391-1.265
Total	126 (63.6)	72 (36.4)	-42.77%[a]			
Education						
Secondary or lower	21 (16.7)	12 (16.7)	--			
At least tertiary	105 (83.3)	60 (83.3)	--	0.500	1.000	0.460-2.175
Age group						
<20 years	10 (7.9)	3 (4.2)	-46.84%[a]			
20-29 years	91 (72.2)	46 (63.9)	-11.50%[a]			
30-39 years	9 (7.1)	15 (20.8)	+192.96%[a]	<0.001	1.749[e]	0.394-2.481
≥ 40 years	16 (12.7)	8 (11.1)	-12.60%[a]			
Social class						
Lower social class (III-V)	100 (79.4)	56 (77.8)	-2.02%[a]	0.396	0.9	0.544-1.221
Upper social class (I-II)	26 (20.6)	16 (22.2)	-7.77%[a]		1.099	0.544-1.221
Marital status						
Single	95 (75.4)	53 (73.6)	-2.39%[a]			
Married	31 (24.6)	19 (26.4)	+7.32%[a]	0.390	1.099	0.566-2.131
Employment status						
Unemployed or schooling	78 (61.9)	40 (55.6)	-10.18%[a]		0.9	
Employed	48 (38.1)	32 (44.4)	+16.54%[a]	0.191	1.300	0.722-2.340
Pattern of STIs						
Incurable STIs	84 (66.7)	53 (73.6)	-36.90%[b]	0.155	1.395	0.734-2.650
Anogenital warts	79 (62.7)	50 (69.4)	-36.71%[b]	0.169	1.352	0.729-2.508
Genital Herpes	6 (4.8)	3 (4.2)	-50.00%[b]	0.423	0.870	0.211-3.588
Co-Morbid HBV	9 (7.1)	1 (1.4)	-88.89%[b]	0.055	0.183	0.023-1.476
Curable STIs	75 (59.5)	28 (38.9)	-62.67%[b]	**0.005**	0.433	0.239-0.783
Genital scabies	28 (22.2)	7 (9.7)	-75.0%[b]	**0.030**	0.378	0.156-0.914
Urethral discharge syndrome	46 (36.5)	15 (20.8)	-67.39%[b]	**0.023**	0.458	0.233-0.899
Gonococcal urethritis	11 (8.7)	4 (5.6)	_-63.64%[b]	0.417	0.615	0.188-2.007
NGU[c]	35 (27.8)	11 (15.3)	-68.67%[b]	**0.024**	0.469	0.221-0.994
Primary Syphilis	10 (7.9)	3 (4.2)	-22.37%[b]	0.155	0.504	0.134-1.896
Other curable STIs[d]	4 (3.2)	5 (6.9)	+25.00%[b]	0.115	2.276	0.591-8.764

[a] = % change in annual proportions (intra-pandemic proportion-pre-pandemic proportion divided by pandemic proportion x 100%).
[b] = % change in annual incidence (interpandemic frequency-pre-pandemic frequency divided by pandemic frequency x 100%).
[c] = NGU = Non-Gonococcal Urethral/Vaginal Discharge.
[d] = Other curable sexually transmitted diseases: lymphogranuloma venereum, chancroid, and genital molluscum contagiosum.
[e] = Adjusted Odds ratio estimated using regression analysis and determined for age group 30-39 years.
OR^ = Unadjusted Odds Ratio.

the period of study. During both phases of the study, the three most common sexually transmitted infections were anogenital warts, non-gonococcal urethritis, and genital scabies. The proportion of patients with other less frequent sexually transmitted illnesses (genital molluscum contagiosum, lymphogranuloma venereum, and chancroid), however, increased slightly (+25.0%) during the pandemic, but this difference was not statistically significant (p=0.155).

The most profound decline in patient volume occurred in the early phase of the pandemic, when an 88.89% decline in new-STI patient volume was observed. Statistically significant reductions were observed in the incidence rate (IR) of curable STIs compared to incurable STIs during the early phase of the pandemic (Figure 1). This period corresponded with the onset of the pandemic in Nigeria, when public health measures to control the spread of the SARS-CoV-2 virus, such as lockdowns and enforcement of social distancing, were most stringent. A gradual rise in the number of new STI cases to near pre-pandemic levels was observed in the latter phases of the pandemic, which also coincided with progressively less stringent social restrictions. A similar trend in STI consultations during the SARS-CoV-2 pandemic was reported by Tao et al[17], who documented a 55% decline in absolute STI visits

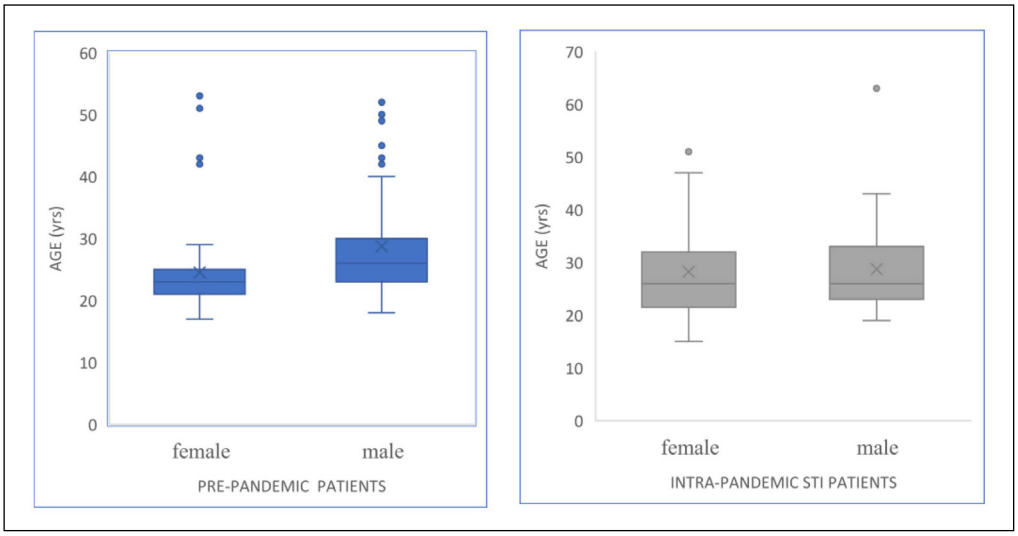

Figure 2. Box plot showing age distribution of the study population. The mean age of female STI patients (24.53±7.698) was significantly lower than males (28.72±8.967; p=0.009) in the pre-pandemic period. There was no significant age difference between males and females during the pandemic. However, the median age of patients seen during the pandemic was significantly greater than pre-pandemic patients (p=0.048).

and a 62% reduction in treatment visits during the early phase of the pandemic. Similar to our findings, their investigation indicated that the peak period of the pandemic was when the greatest decline (84.0%) in absolute STI clinic visits occurred[17].

We observed large variations in the percentage decrease in the frequency of different STIs during the pandemic. The percentage reduction was most profound for curable STIs with short incubation periods, such as gonorrhea (-63.6%), non-gonococcal urethritis (-68.7%), and genital scabies (-75.0%). STIs with relatively longer incubation periods, such as syphilis (-22.4%) and genital warts (-36.7%), had a less remarkable percentage reduction in occurrence. A similar disparity in diagnosis-specific percentage reduction in STI incidence was reported by by Sentis et al[13], who documented a maximum percentage reduction in the incidence of chlamydia infection (-72.0%) compared with a remarkably lower percentage reduction in the incidence of syphilis (-22.0%) during the SARS-CoV-2 pandemic period.

The observed disparities in percentage decline in STIs with short incubation periods relative to those with longer incubation periods in this study support the perspective that reductions in reported cases of STIs during the pandemic documented by previous researchers[13,17,18] may be a true reflection of interrupted transmission of STIs during the pandemic rather than an artefactual decline as proposed by some other authors[13]. This is because STIs with short incubation periods represent a better measure of recently acquired infections and, thus, a more accurate reflection of active STI transmission in the population. In contrast, STIs with relatively longer incubation periods are more reflective of long-standing infections that may have been acquired prior to the onset of the pandemic. Furthermore, the steady rise in the frequency of both curable and incurable STIs observed in the latter aspect of the pandemic coinciding with more relaxed public health measures and resumption of near-normal activities suggests renewed active transmission of STIs in the population.

Although lower transmission rates may explain the significant reduction in the frequency of STIs in this study, other factors appear to have contributed, albeit less significantly, to the observed reduction in STIs during the pandemic period. For instance, the pandemic patient cohort in this study was significantly older than the pre-pandemic cohort. Although the reason for this demographic shift is uncertain, we hypothesize that increased emotional maturity and relative financial independence associated with age may have enabled older patients to navigate the restrictions imposed by the pandemic better than younger patients, ultimately improving their access to healthcare relative to younger adults. This theory is further supported by the higher rates of employment and socioeconomic status in the pandemic cohort compared to the pre-pandemic cohort in this study. We think that STI patients with higher socio-economic status may have had better access to healthcare during the pandemic compared to those of lower socio-economic status. In other words, the SARS-CoV-2 pandemic may have increased and exposed healthcare inequality among STI patients.

Impact of SARS-CoV-2 Pandemic on Sexual Behaviors and STI Treatment Outcomes

Quite surprisingly, and contrary to earlier reports[13,18-20] on the impact of the SARS-CoV-2 pandemic on sexual behaviors, there was a significant increase in some STI-risk behaviors among pandemic patients compared with pre-pandemic patients. Patients treated during the pandemic had a significantly higher median number of sexual partners in the preceding months (Table 2). The intra-pandemic cohort were also more likely to engage in casual sexual relationships (OR: 1.75, 95% CI: 0.939-3.254) and have unprotected sexual intercourse (OR: 1.21, 95% CI: 0.633-2.311). They were also more likely to have informed their partner(s) of their STI symptoms or diagnosis (OR: 1.55, 95% CI: 0.847-2.832). However, among those who were yet to notify their partner(s) of their STI symptoms/diagnosis, the pandemic cohort was 2.00 times less willing to notify their partners than the pre-pandemic group (OR: 2.01, 95% CI: 0.647-6.215).

Table 2. Comparison of sexual practices and treatment outcome in the study population.

	Pre-pandemic period	Pandemic period	Total	*p*-value	OR^	Lower	Upper
Median number of sexual partners							
In the preceding month	0.00	1.00	0.00	**0.051***			
In the preceding 3 months	0.00	1.00	0.00	**<0.001***			
In the preceding 6 months	0.00	1.00	0.50	**0.005***			
Minimum to Maximum no of sexual partners in the preceding 3 months	0-15	0-9	0 -15				
History of Casual sex (n = 179)							
No	75 (66.4)	35 (53.0)	110 (61.5)	**0.039**	1.7481	0.9392	-3.2538
Yes	38 (33.6)	31 (47.0)	69 (38.5)				
Missing data	13	6	19				
Relationship with most recent partner (n = 179)							
Non causal	91 (80.5)	51 (77.3)	142 (79.3)	0.301	1.2166	0.5802	-2.5510
Casual	22 (19.5)	15 (22.7)	37 (20.7)				
Missing data	13	6	19				
Condom use behaviour (n = 198)							
Use condom No	32 (25.4)	21 (29.2)	53 (26.8)	0.282	1.2096	0.6331	-2.3110
Use condom Yes	94 (74.6)	51 (70.8)	145 (73.2)				
Consistency of condom use							
Occasional	77 (81.9)	44 (86.3)	121 (83.4)	0.251	1.3878	0.5340	-3.6062
Always	17 (18.1)	7 (13.7)	24 (16.6)				
Condom use in last intercourse							
No	86 (68.3)	52 (72.2)	138 (69.7)				
Yes	40 (31.7)	20 (27.8)	60 (30.3)	0.280	1.2093	0.6391	-2.2882
Informed partner of symptoms/ diagnosis (n = 198)							
No	55 (43.7)	24 (33.3)	79 (39.9)	0.077	1.5493	0.8474	-2.8325
Yes	71 (56.3)	48 (66.7)	119 (60.1)				
Willing to inform partner							
No	36 (65.5)	19 (79.2)	55 (69.6)				
Yes	19 (34.5)	5 (20.8)	24 (30.4)	0.114	2.0056	0.6471	-6.2154
Symptom duration (n = 180)							
≤ 3 weeks	10 (8.3)	7 (10.0)	17 (8.9)	0.349	0.8181	0.297	-2.256
>3 weeks	110 (91.7)	63 (90.0)	173 (91.1)				
Missing data	6	2	8				
Treatment outcome (n = 198)							
Cured or improved clinical	57 (45.2)	18 (25.0)	75 (37.9)	**0.002**	2.4783	1.3088	-4.6928
Default	69 (54.8)	54 (75.0)	123 (62.1)				

* = Independent median *t*-test. OR^ = Unadjusted Odds Ratio.

It is uncertain whether the increased STI-risk behaviors recorded among the pandemic STI patient cohort are related to the negative impact of the pandemic on mental health and intimate relationships with increased rates of break-ups, new partner seeking, or simultaneous engagement in sexual relationships with multiple partners. We theorize that it is more likely that the patients presenting with new STI infections during the pandemic represent a pool of individuals with long-standing high-risk sexual behaviors that persisted into the pandemic period. Furthermore, Gleason et al[20] reported that more than half of individuals who participated in casual sex before the pandemic continued with such behaviors during the pandemic. As such, the pandemic control measures may have had more impact on reducing sexually transmitted infections among those with low-risk sexual behaviors but not as much on those with high-risk behaviors.

In this study, the pandemic period was also associated with an increased incidence of negative treatment outcomes (default). Default from the STI clinic was significantly higher during the pandemic (75.0%) compared to the pre-pandemic period (54.8%, p=0.002). A logistic regression model was developed to identify the variables associated with default from care (Table 3). Factors such as the period of presentation (pandemic/pre-pandemic) and other variables associated with defaulting from care among STI patients, such as age, sex, socio-econom-

Table 3. Binary regression analysis of variables associated with treatment outcomes in the study population.

	Cured/ Improved	Defaulted	Wald	Sig.	Exp (B)	95% CI for EXP (B)	
						Lower	Upper
Period of Presentation							
Pre-pandemic (n=126)	57 (45.2)	69 (54.8)					
Pandemic (n=72)	18 (25.0)	54 (75.0)	6.857	**0.009**	2.479	1.256	4.890
Sex							
Female (n=80)	29 (36.3)	51 (63.7)					
Male (n=118)	46 (39.0)	72 (61.0)	0.216	0.642	0.858	0.449	1.639
Age bracket							
<26 years (n=106)	44 (41.5)	62 (58.5)					
26 years and above (n=92)	31 (33.7)	61 (66.3)	0.088	0.766	1.131	0.502	2.548
Marital Status							
Married (n=50)	19 (38.0)	31 (62.0)					
Single (n=148)	56 (37.8)	92 (62.2)	0.017	0.897	0.940	0.366	2.415
Social Economic Status							
Upper socioeconomic status (n=42)	14 (33.3)	28 (66.7)					
Lower socioeconomic status (n=156)	61 (39.1)	95 (60.9)	0.650	0.420	1.752	0.448	6.856
Level of education							
Secondary education or lower (n=33)	17 (51.5)	16 (48.5)					
Tertiary or higher education (n=165)	58 (35.2)	107 (64.8)	3.901	**0.048**	3.309	1.009	10.847
Employment Status							
Unemployed or schooling (n=118)	46 (39.0)	72 (61.0)					
Employed (n=80)	29 (36.3)	51 (63.7)	0.966	0.326	2.022	0.497	8.235
Type of STI							
Curable STIs							
No (n=96)	34 (35.4)	62 (64.6)					
Yes (n=102)	41 (40.2)	61 (59.8)	0.318	0.573	0.800	0.369	1.736
Incurable STIs							
No (n=61)	22 (36.1)	39 (63.9)					
Yes (n=137)	53 (38.7)	84 (61.3)	0.724	0.395	0.697	0.304	1.601
Informed partner(s) about STI							
No (n=79)	27 (34.2)	52 (65.8)	1.639	0.200	1.513	0.803	2.850
Yes (n=119)	48 (40.3)	71 (59.7)					

* = Independent median *t*-test. OR^ = Unadjusted Odds Ratio.

ic status, level of education, and the type of sexually transmitted infection[20], were integrated into the model. Two independent predictors of default from care were identified: presentation during the pandemic period (p=0.009) and higher levels of education (p=0.048). Patients treated during the pandemic were 2.5 times more likely to default from care than the pre-pandemic cohort (adj OR: 2.479, 95% CI: 1.256-4.890). Possible reasons for the increased rate of default during the pandemic include challenges associated with healthcare access due to lockdown measures, fear of contracting SARS-CoV-2 in the hospital setting, and economic hardships imposed by the pandemic. Additionally, the reduced strength of hospital staff and the diversion of resources toward emergency healthcare services, especially in the early phase of the pandemic, also impacted the quality of follow-up services, including patient tracing.

Interestingly, STI patients with higher levels of education exhibited a default rate 3.3 times greater than those with lower levels of education (adj OR: 3.309, 95% CI: 1.009-10.847). The reason for the higher default rate among the more educated patients is unknown. It is possible that those with higher educational attainment perceived themselves as more adept at managing their health problems or had better access to informational resources such as the Internet for exploring alternative care options. The prompt and effective response of certain STIs, such as genital scabies and gonorrhea, to single-dose treatment regimens might have contributed to the observed loss of follow-up. Furthermore, because the initiation of treatment for most STIs occurs during the initial visit, the clinical improvement experienced by patients following the initial consultation may have reduced their motivation to return for follow-up evaluation. However, irrespective of the underlying motive, default from care is a major cause of concern, particularly among STI patients, as it could lead to increased treatment failure, relapse, and development of treatment resistance. Defaulting also impedes contact tracing, increases the risk of transmission, and contributes to the overall negative impact of STIs, including long-term chronic sequelae such as infertility and chronic pelvic pain.

Study Limitations

This was a hospital-based study, and as such, the reported data represents a pattern of STIs among patients reporting for STI treatment at an STI treatment facility and may not reflect the true incidence or pattern at the community level. Furthermore, the scope of this research is limited to non-HIV-infected STI patients, and as such, the findings of this research do not capture the impact of the pandemic on clinical patterns and outcomes in HIV-infected STI patients.

CONCLUSIONS

The SARS-CoV-2 pandemic had a significant impact on STI dynamics in our study population. Public health measures introduced to curb the spread of SARS-CoV-2 in the early phases of the pandemic may have interrupted transmission of sexually transmitted infections, thereby causing a decline in the incidence of STIs during the early phases of the pandemic. However, a paradoxical increase in risk behaviors for STIs alongside an alarmingly high default rate among STI patients treated during the pandemic may, in the long term, have contributed not only to a reversal in transmission rates but also to an increase in the risk of negative outcomes in the later phases of the pandemic. Larger multi-center studies are required to provide a national perspective on the impact of the SARS-CoV-2 pandemic on STIs in Nigeria.

Funding:
No funding was received for this study.

Authors' Contributions:
Atinuke Ajani and Fatai Olanrewaju conceived and designed the study. All the listed authors contributed to data collection. Fatai Olanrewaju collated the data, Atinuke Ajani performed the statistical analysis and drafted the initial manuscript. All authors contributed substantially to the revision of the final manuscript and take responsibility for the manuscript.

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Conflict of Interest:
The researchers have no conflict of interest to declare.

Data Availability:
The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Approval:
The Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex reviewed and approved this study (IRB/IEC/0004553). Protocol number: NHEC/17/03/2021.

Informed Consent:
Informed consent for this arm of the study was waived because it did not require direct patient contact or interaction and thus did not interfere with patient care or require additional or exceptional patient-related activities. Permission to utilize patients' records was obtained from the Head of the Medical Records Unit of the Hospital.

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