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Seroprevalence of syphilis and its predictors among pregnant women in Buno Bedele zone, southwest Ethiopia: a community-based cross-sectional study

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ABSTRACT

Objectives The study was aimed at assessing the prevalence of syphilis and associated factors among pregnant women with antenatal care follow-up.

Design A health facility-based, cross-sectional study.

Setting The study was conducted in 12 health facilities in Buno Bedele zone, southwest Ethiopia.

Participants Randomly selected 920 pregnant women who came to health facilities in the Buno Bedele zone for antenatal care services from May to August 2021 were included in the study. Women with previously diagnosed syphilis and those on treatment were excluded from the study.

Outcome measures Blood samples and data on sociodemographic and other risk factors for syphilis were collected. Sera were screened for syphilis using the one-step rapid syphilis diagnostic test kit, and positive tests were retested using the rapid plasma reagin test. Data were analysed using SPSS V.22. Bivariate and multivariate logistic regression analyses were used to identify risk factors for maternal syphilis at a p value less than 0.05.

Results The prevalence of syphilis among pregnant women was found to be 1.4% (95% CI: 0.8% to 2.3%, p=0.002). Women with no formal education (adjusted OR (AOR)=3.6; 95% CI: 1.02 to 13.2, p=0.047), husbands with a history of substance use (AOR=3.3, 95% CI: 1.04 to 10.7, p=0.042), more than one antenatal care visit (AOR=3.5, 95% CI: 1.07 to 10.5, p=0.038), age at marriage under 18 years (AOR=4.3, 95% CI: 2.2 to 7.9, p=0.045) and a woman's poor knowledge of syphilis (AOR=3.3, 95% CI: 1.04 to 10.4, p=0.042) were significantly associated with syphilis.

Conclusion The prevalence of maternal syphilis in this study area was found to be comparable with the national prevalence. Women's educational status, husbands' history of substance use, antenatal care, age at marriage and knowledge about syphilis were the independent predictors of syphilis. Emphasis shall be given to screening all pregnant women, education of women, lifestyle factors and avoiding early marriage.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study used a stratified multistage random sampling method with a high response rate.
- ⇒ This study provides preliminary data that will support future research.
- ⇒ The institutional-based nature of the study might not reflect the actual burden of the disease at the community level.
- ⇒ No clinical features of syphilis-positive pregnant women were assessed.

INTRODUCTION

Syphilis is a systemic, sexually transmitted infection (STI) caused by the *Treponema pallidum* bacteria. It can be transmitted from person to person through unprotected sexual contact with infectious lesions of mucous membranes or abraded skin, through blood transfusion or from a pregnant woman to her fetus via the bloodstream.[1] It causes ulcerative genital lesions that enhance the acquisition and sexual transmission of HIV infection.[2]

Despite widely available simple diagnostic tools and highly effective, low-cost treatment, syphilis remains an under-recognised public health issue in pregnant women worldwide, particularly in sub-Saharan Africa (SSA).[3] The WHO reported that 1.9 million pregnant women were infected with syphilis worldwide, with 66.5% of adverse fetal outcomes occurring in cases of untreated syphilis.[4] In areas where syphilis is prevalent, about half of the stillbirth rate may have been caused solely by this infection.[5]

An estimated 2.7% (0.1%–10.3%) of pregnant women in SSA are infected with syphilis, representing more than 900 000 pregnancies at risk each year.[6] Studies conducted in East African countries showed an adjusted mean prevalence of syphilis of 4.6%, the second highest prevalence after Southern Africa.[7–10]

Ethiopia is among the three SSA countries with the highest rates of maternal syphilis and adverse pregnancy outcomes.[11] It has been estimated that 5% of all fetuses each year are lost to abortion caused by syphilis in Ethiopia.[12] According to antenatal care (ANC)-based sentinel surveillance, syphilis

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prevalence in pregnancy has increased from 1% in 2012 to 1.2% in 2014[13] and as high as 3.7% in recent studies among ANC attendees in Gondar, Ethiopia[14] to 5.1% in 2018 in Yirgalem[10]; and studies in Jimma Specialized Referral Hospital and in Shashemene showed the same 1.1% prevalence of maternal syphilis.[15 16] This surveillance also shows that the overall prevalence of syphilis has increased to 1.2% in Ethiopia and 1.4% in the Oromia region of Ethiopia.[17] Infection of the fetus by syphilis from the infected mother results in congenital syphilis. If untreated for syphilis, 40% of these pregnancies will result in perinatal death. Even live-born neonates are infected and can develop acute systemic illness, bone deformities, developmental disabilities, blindness or deafness.[18]

A study in SSA reported an estimate of 205 901 adverse pregnancy outcomes, such as spontaneous abortion, stillbirth, low birth weight, neonatal death and congenital syphilis, due to untreated maternal syphilis.[11]

Those who are at high risk of syphilis, are previously untested or live in areas of high syphilis prevalence should be screened again early in the third trimester and at delivery and treated if positive.[16 18] The control of vertical transmission of syphilis is possible through timely screening of all pregnant mothers at the first prenatal visit.[19] However, in practice, there is considerable screening and therapeutic heterogeneity. In Ethiopia, pregnant women are tested only once for syphilis during ANC visits using a rapid plasma reagin (RPR) test,[4 20] which makes it difficult to understand the exact prevalence of the disease in pregnancy.

Ethiopia has developed and implemented national STI prevention, care and treatment guidelines since 2001 to prevent and control STIs through the syndromic approach to screening and treatment, which is one of the services offered to pregnant women during focused ANC service visits.[12]

Despite the implementation of different guidelines to control STIs in Ethiopia, the burden of syphilis during pregnancy is persisting[7 21] and there is inconsistency in the quality and uptake of the service that might be affected by the knowledge of health workers as well as the pregnant women. There is also variation in the prevalence of syphilis between urban and rural areas, and the burden of this disease may change with time and frequency of visits, diagnosis and treatment, sociodemographic and socioeconomic factors, cultural practices, obstetric and gynaecological factors, and lifestyle and behavioural factors.[22] In addition, there is a scarcity of such data in Ethiopia, particularly in the study area. Thus, this study was designed to determine the magnitude of syphilis and associated factors among pregnant women in southwest Ethiopia.

METHODS

Study design and setting

A facility-based cross-sectional study was conducted in public health facilities in the Buno Bedele zone from May to August 2021. The Buno Bedele zone is 1 of the 20 zones found in the Oromia region, the largest region in Ethiopia (figure 1). The zone has Bedele town as a centre for the zone, which is located 480 km southwest of Addis Ababa, the capital of Ethiopia. The zone has nine districts and one town administration with a total population of 841 158, which is comprised of 428 991 females. Among the total population, 156 708 of them were females in the reproductive age group. One general hospital, 2 district hospitals and 32 health centres are available in the zone. There were 1139 pregnant women in the study area during the study period.

Sample size and sampling procedures

A single-population proportion formula was used to calculate the sample size: $n = \frac{(Z_{\alpha/2})^2 p(1-p)}{d^2}$. In the formula, n=is the required sample size, z=is the critical value for normal distribution at 95% CI, which equals 1.96 (z value at alpha=0.05), p=is the prevalence of syphilis, which was 1.1 from Jimma Teaching Hospital,[23] d=is absolute precision (margin of error) of 1%. With a design effect of 2 and non-response rate of 10%, the sample size was 920. Sample size calculation was also considered for factors associated with decision-making autonomy of women by considering different factors associated with syphilis in pregnant women using Epi-info V.7 software with the following assumptions made: two-sided confidence level of 95%, power 80%, exposed to unexposed ratio of 1:1, design effect of 2 and 10% non-response rate. The factors considered were taken from studies conducted in different parts of Ethiopia.[12 24 25] Accordingly, from the magnitude (920) and factors' (247) sample sizes, the largest sample size (920) was chosen.

A stratified multistage sampling method was used. First, all public health facilities were stratified into urban and rural health facilities based on geographical location. Twelve (34.3%) public health facilities were selected by a simple random sampling method from both (three from urban and nine from rural) strata. After proportional allocation of the sample among the selected public health facilities, all pregnant mothers who came for ANC follow-up during the data collection period were included until the desired sample was achieved (figure 2). For proportional allocation of study participants, the average number of clients who could attend ANC follow-up during the data collection period was estimated depending on the number of pregnant women who had ANC service in the last month from the data of the zonal service delivery Health Management Information System (HMIS) report for each selected health facility.

Data collection tools and methods

Data were collected from all pregnant women who came to the health facilities for ANC follow-up during the data collection period until the required sample size was attained. Pregnant women referred from health facilities outside the study area and those on treatment for syphilis during the study period were excluded. A structured and pretested questionnaire was used to collect

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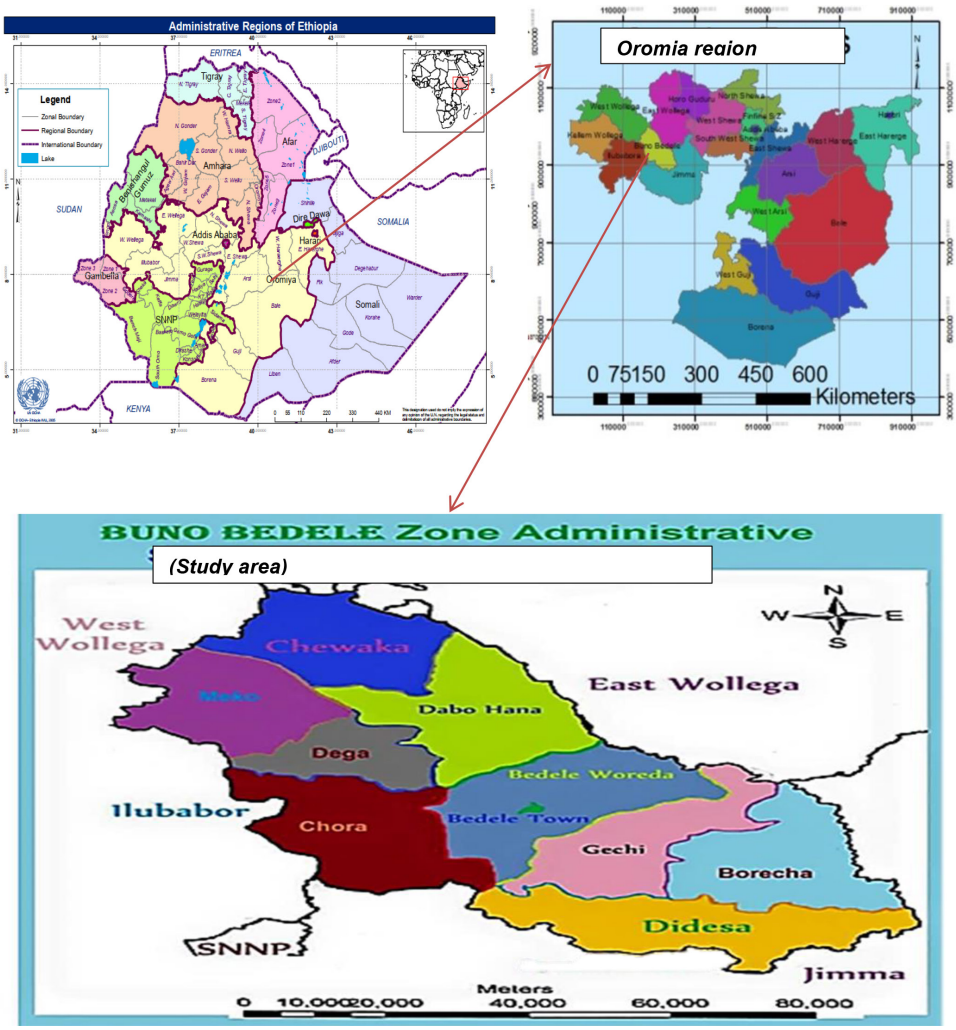

Figure 1 Map of the study area.

the data. Questions that assess sociodemographic factors, obstetric and gynaecological factors, behavioural factors, knowledge about syphilis, and medical and sociocultural factors were included in the questionnaire. The sociodemographic part of the questionnaire is adapted from the Ethiopian Demographic and Health Survey (EDHS) 2016.[15] The knowledge portion of this questionnaire is adapted from the Center for Disease Control's Knowledge and Awareness Questionnaire.[26] The knowledge of pregnant women about syphilis was assessed by using eight-item questions. Accordingly, women who answered six or more correct answers out of the total questions were considered to have good knowledge, and those who answered fewer than six correct answers were considered to have poor knowledge.[26] The rest of the questionnaire is adapted from the Family Health International Standard Behavior Surveillance Questionnaire[27] and the World Health Survey Questionnaire.[28]

Ten clinical nurses and 10 laboratory technicians were recruited for data collection and laboratory tests, respectively. Two days of training was given for data collectors and supervisors on the entire process of data collection and materials.

In a laboratory test, a syphilis rapid diagnostic test cassette (Wondfo one-step syphilis serum/plasma test cassette) and RPR (Syfacard, Murex Diagnostics, UK)[4 29] were used. Blood serum was used for the laboratory investigation. Blood samples were drawn following a laboratory procedure for obtaining venous blood (online supplemental annexes 1 and 2). Then, the serum was applied to the test kit and the testing procedure was undergone based on the test algorithm and instructions of the manufacturer. Blood samples (sera) were first tested by a one-step rapid diagnostic test cassette. Sera tested positive participants for one-step rapid diagnostic test cassette (rapid test) were retested for RPR, and those samples that tested positive for both the one-step rapid screening test and the RPR confirmatory tests were diagnosed with syphilis (online supplemental figure 1). Positive samples were appropriately stored at the optimum temperature (2–8°C) until confirmed. Only samples that tested positive for both the one-step rapid screening test and the RPR confirmatory test were considered to have probable active syphilis using the standard result interpretation procedure (online supplemental annex 3) by observing the test (T) and control (C) lines (online supplemental

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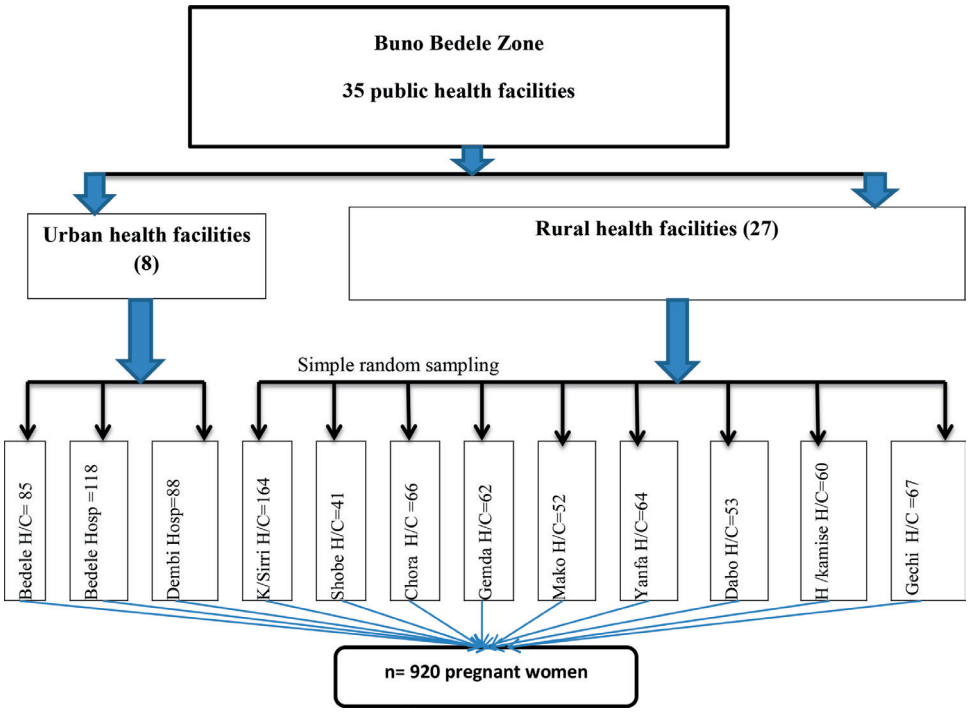

Figure 2 Schematic representation of the sampling procedure. HC, health centre; Hosp, hospital.

figure 2) .The specimens were labelled appropriately using the patient's identification number.

Data processing and analysis

The collected data were cleaned, coded and entered into Epi-data V.3.1, and exported to SPSS V.22 for analysis. The data were explored for inconsistencies and missing values. After categorising and defining variables, a descriptive analysis was carried out for each independent variable, and the results were presented in tables, figures, frequencies and percentages. The laboratory results were coded and a descriptive measure was taken to compute the prevalence of syphilis and the CI. Then laboratory results were compared with each independent variable to assess the significant association at a p value of <0.25 for bivariate analysis. Variables that remain statistically significant at 95% CI in bivariable logistic regression were entered into the multivariable binary logistic regression model to get the final model at a p value of <0.05. The independent variables were tested for multicollinearity by using collinearity diagnostics like variance inflation factor and a tolerance test, in which the values of both tests were found to be within the normal range.

RESULTS

Sociodemographic characteristics

A total of 920 sampled individuals were interviewed, making a 100% response rate. All of them consented to being interviewed and provided clinical samples. The mean age of the respondents was 26.95 years, with 5.5 SDs and an age range of 16–40 years. Among all respondents, 326 (35.4%) were in the age group of 20–24 years. Most of them (99.2%) were currently married and rural dwellers (63.3%). Of the respondents, 73 (7.93%) of pregnant women had no formal education, and 25 (2.7%) of the respondents' husbands had no formal education. The majority (76.1%) of the women were housewives, and about half (49.7%) of the husbands were farmers. Four hundred forty-six (48.76) earned between 1000 and 5000 Ethiopian birr (ETB) per month, while 375 (40.7%) earned less than 1000 ETB, as indicated in table 1.

Knowledge of pregnant women about syphilis

Knowledge was assessed by a series of eight questions that had 1 point each, as indicated in table 2. Out of the respondents, 305 (33.1%) have scored a maximum score of 8 and only 1 (0.1%) has scored a minimum score of 1. About 130 (14.1%) of the respondents do not know that syphilis can be transmitted by an unprotected sexual act, whereas 223 (24.2%) of the respondents do not know about transplacental transmission of syphilis. The majority of the respondents (86.8%) know that syphilis is curable, but 161 (17.5%) do not know that syphilis could increase the risk of HIV transmission. Of the respondents, 720 (78.3%) had good knowledge of syphilis, but 200 (21.7%) had poor knowledge.

Sociocultural and behavioural characteristics of pregnant women

Only 10 (1%) of the respondents have a history of tattooing and 24 (2.6%) have a history of body piercing in the last 12 months. More than half (53.2%) of the women were married when they were above 18 years of age. Among all the respondents, only 24 (2.6%) had a history of extramarital affairs, but only 3 (12.5%) of them used condoms during the encounter. Pregnant women who drink alcohol make up 2.1% of those who use

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Table 1 Sociodemographic characteristics of pregnant women attending public health facilities in Buno Bedele zone, southwest Ethiopia, 2021

Variable	Category	Frequency	Per cent
Age	Under 20	204	22.1
	20–24	326	35.4
	25–29	228	24.7
	30–34	91	9.89
	35–39	64	6.95
	40–44	7	0.76
Marital status	Currently married	913	99.2
	Currently unmarried*	7	0.76
Educational status	No formal education	73	7.93
	Formal education†	847	92.06
Husband's educational status	No formal education	25	2.7
	Formal education	895	97.3
Occupation	Employed	216	23.4
	Housewife	700	76.1
	Student	4	
Husband's occupation	Employed	358	38.9
	Merchant	69	7.5
	Driver	21	2.3
	Soldier	12	1.3
	Farmer	457	49.7
	Student	3	
Place of residence	Urban	337	36.6
	Rural	583	63.4
Monthly income	<1000 ETB	375	40.7
	1000–5000 ETB	446	48.47
	>5000 ETB	99	10.76

*Currently unmarried: single, separated, widowed and divorced.
†Formal education: primary and secondary complete.
ETB, Ethiopian birr.

substances, but 43 (4.7%) of those do not. Concerning the behavioural status of respondents' husbands, 267 (29%) of the respondents' husbands have a history of substance use, but only 73 (7.93%) of them drink alcohol, as shown in table 3.

Medical and gynaecological characteristics of pregnant women

Among all the respondents, 19 (2.06%) had a history of blood transfusion and 43 (4.7%) had a history of tooth extraction. Regarding obstetric history, 616 (67%) of the respondents were multigravida and 214 (34.9%) had only one child, whereas 399 (65.08%) of them had two children. Concerning ANC visits, 778 (84.5%) of pregnant mothers were on their first ANC visits and 142 (15.4%) were on more than one ANC visit. Fifteen (1.6%) of the respondents have a history of STIs. Fourteen (16.6%) of those with STIs reported vaginal discharge, while four (16.6%) reported anogenital warts.

Mothers whose husbands have a history of STIs accounted for 34 (3.69%) of the respondents. Only 60 (6.52%) of the mothers experienced pregnancy-related problems, with 33 (46.4%), 21 (29.5%), and 3 (4.22%) experiencing abortion, stillbirth, and intrauterine fetal death, respectively, as indicated in table 4.

Prevalence of syphilis among pregnant women

Among the 920 respondents, 13 (1.4%) (95% CI: 0.8% to 2.3%) pregnant women were found to be reactive to syphilis test. Pregnant women in the 20–24 age category had a 1.8% syphilis seroprevalence, and all cases of syphilis were among married pregnant women. A high prevalence of syphilis (6.67%) was observed among pregnant women with no formal education. Syphilis prevalence of 1.98% was found among pregnant women who reside in rural areas while it was 0.31% among urban residents.

Factors associated with syphilis among pregnant women

In the binary logistic regression analysis, variables such as woman's educational status, husband's educational status, residence, woman's knowledge, blood transfusion history, age when first married, habit of drinking alcohol, habit of using substances, husband's habit of using substances, history of STI, husband's history of STI and pregnancy-related problems were considered as potential candidates for multivariate logistic regression. In the final model, women with no formal education, women with poor knowledge about syphilis, age at first marriage under 18 years, more than one ANC visit and husbands' substance use were significantly associated with syphilis seroprevalence at a p value less than 0.05. Pregnant women whose husbands have a history of substance use have a 3.3 times higher risk of contracting syphilis than those whose husbands do not have a history of substance use (adjusted OR (AOR)=3.3, 95% CI: 1.04 to 10.7). In contrast to routine ANC screening at only the first prenatal visit, pregnant women who come for ANC visits more than once have 3.5 times more chance of getting syphilis than those mothers who come for their first ANC visits (AOR=3.5, 95% CI: 1.07 to 10.5). Pregnant women who had no formal education were 3.6 times more likely to get infected with syphilis than those who had formal education (AOR=3.6, 95% CI: 1.02 to 1.2). Pregnant women who married when they were under the age of 18 years were 4.3 times more likely to contract syphilis than those who marry above the age of 18 years (AOR=4.3, 95% CI: 2.2 to 7.9). Concerning knowledge about syphilis, pregnant women who had poor knowledge about syphilis were 3.3 times more likely to acquire syphilis than those with good knowledge of syphilis (AOR=3.3, 95% CI: 1.04 to 10.4), as indicated in table 5.

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Table 2 Knowledge of pregnant women about syphilis in Buno Bedele zone, southwest Ethiopia, 2021

Items used to assess knowledge	Yes, n (%)	No, n (%)
Syphilis is mainly transmitted through sexual contact	790 (85.9)	130 (14.1)
Syphilis is curable	799 (86.8)	121 (13.2)
A man or woman who looks healthy may have syphilis	808 (87.8)	112 (12.2)
Using condoms consistently in sexual contact can prevent the transmission of syphilis	785 (85.3)	135 (14.7)
Syphilis infection can increase the risk of HIV transmission or acquisition	759 (82.5)	161 (17.5)
Sexual partners of patients with syphilis need to attend a hospital for serological examination	791 (86.0)	129 (14.0)
Syphilis-infected woman can transmit the infection to their newborn	697 (75.8)	223 (24.2)
Having dinner or shaking hands with patients with syphilis can transmit syphilis	292 (31.7)	628 (68.3)
Knowledge about syphilis		
	Good	720 (78.3)
	Poor	200 (21.7)

DISCUSSION

Syphilis still affects a high proportion of pregnant women worldwide, causing serious health problems and even death to their babies, yet this infection could be prevented by early testing and treatment.[30] In SSA, the prevalence of syphilis among pregnant women ranges from 2.5% to 18%, with the highest prevalence in the age group 35–49 years.[31] According to a 2007 WHO report, syphilis infection rates in pregnant women in Africa range from 3% to 15%.[4]

Table 3 Sociocultural and behavioural characteristics of pregnant women who attend ANC follow-up in public health facilities in Buno Bedele zone, southwest Ethiopia, 2021

Variables	Categories	Frequency	Per cent
History of tattooing	Yes	10	1.08
	No	910	98.9
History of body piercing	Yes	24	2.6
	No	896	97.3
Age at first marriage	Under 18 years	430	46.7
	Above 18 years	490	53.2
History of extramarital affairs	Yes	24	2.6
	No	896	97.3
Use condom during extramarital affairs (n=24)	Yes	3	12.5
	No	21	87.5
Habit of drinking alcohol	Yes	19	2.1
	No	901	97.9
Habit of using substances	Yes	43	4.67
	No	877	95.3
Husband's habit of drinking alcohol	Yes	73	7.93
	No	847	92
Husband's habit of using substances	Yes	267	29
	No	653	71

ANC, antenatal care.

The prevalence of syphilis in this study was 1.4% (95% CI: 0.8% to 2.3%). This figure is comparable with the national prevalence of syphilis of 1.2% based on the 2014 round of ANC sentinel surveillance.[17] This finding is also in line with other studies conducted in Ethiopia: Jimma Referral Hospital (1.1%)[23] and that of Shashemene (1.1%).[16] However, this finding was slightly lower than the study that was conducted at Bahir Dar Felege Hiwot Referral Hospital, which was 2.6%.[28] Other studies outside Ethiopia also show that the prevalence of syphilis has no major difference. The seroprevalence of syphilis reported in Brazil was 1.02%[32] and that in Pakistan was 0.9%.[33] However, syphilis prevalence in this study area was lower than in previous studies done in Bangladesh (2.96%)[34] and South Sudan (22.1%).[7] The observed difference in the prevalence of syphilis in these study areas might be due to the difference in sociodemographic characteristics of the study population, the sample size, differential access to syphilis diagnosis and treatment, level of knowledge and level of income.[10] Irresponsible use of antibiotics for the treatment of a wide variety of systemic infections may lead to the advent of drug resistance to them. Ineffective treatment of syphilis could also contribute to this variation.[35] The availability of different factories in the zone, like the Bedele brewery factory, and neighbouring zones like the Arjo-Didesa sugar factory, is assumed to be the reason for the high prevalence of syphilis in the study area because these factories have a high proportion of sexually active population. Additionally, the accessibility of low-priced alcoholic drinks and heavy drinking habits of the population around the factories; the high burden of commercial sex workers and the transit of long-distance drivers in the area could increase the risk. The involvement of a large number of young women in the factories as daily labour and in small-scale trading like coffee shops and alcoholic

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Table 4 Medical and gynaecological characteristics of pregnant women who attend ANC follow-up in public health facilities in Buno Bedele zone, southwest Ethiopia, 2021

Variables	Categories	Frequency	Per cent
History of blood transfusion	Yes	19	2.06
	No	901	97.9
History of tooth extraction	Yes	43	4.67
	No	877	95.3
Number of pregnancy	Primigravida	304	33
	Multigravida	616	67
Number of children	One	214	34.9
	More than one	399	65.08
Number of ANC visits	First	778	84.5
	Above first visit	142	15.4
History of STI	Yes	15	1.6
	No	905	98.3
Types of STI (N=21)	Genital wart	4	16.6
	Genital ulcer	3	12.5
	Vaginal discharge	14	58.3
Husband's history of STI	Yes	34	3.69
	No	886	96.3
Pregnancy-related problems	Yes	60	6.52
	No	860	93.4
Types of pregnancy-related problems (N=70)	Abortion	33	46.4
	Stillbirth	21	29.5
	Obstructed labour	10	14.08
	Caesarean section	3	4.22
	IUFD	3	4.22

ANC, antenatal care; IUFD, intrauterine fetal death; STI, sexually transmitted infection.

beverage houses around the factories was assumed to increase the exposure to syphilis.

The husbands' history of using psychoactive substances like chat and inhalants has an association with the prevalence of syphilis. This is supported by studies in China (1.9%)[36] and 1.7% of syphilis prevalence among pregnant mothers whose husbands use substances in Pakistan.[33] In contrast, the study conducted on the prevalence of syphilis in northeast Brazil indicates that 17.9% of syphilis prevalence in mothers whose partners use drugs was much higher than in this study and related studies.[37] This major difference might be due to geographical variation, differences in income, accessibility to such a substance, culture, educational status, occupational habits and low law enforcement. Even if this problem has geographical variation, it accounts for the hidden part of maternal syphilis exposure because substance users are usually involved in risky sexual behaviours that may place them at an increased risk of sexually transmitted diseases (STDs) due to promiscuity, multiple sexual partnerships and unprotected sex.[1] Furthermore, substance use is associated with an increase in the risk of blood-borne infections causing STDs.[36]

The odds of syphilis infection were three times higher in pregnant women who had poor knowledge of syphilis than those with good knowledge, which is supported by a study done in Sudan.[38] This is due to the fact that poor knowledge about syphilis may result from women's limited access to preventative interventions, education and mass media, as well as their socioeconomic vulnerabilities that might make them prone to acquiring the disease.[26 38]

The frequency of ANC follow-up has a major effect on maternal syphilis. According to this study, the prevalence of syphilis is higher among mothers who came for more than one ANC follow-up than among those who came for the first ANC follow-up. This finding contrasts with a 5.9% prevalence of syphilis in more than one ANC visit in Yirgalem Hospital[10] and a much lower 12.9% prevalence in Gondar's Sede Muja district.[8] Similarly, a study conducted in Belo Horizonte-MG, Brazil, in 2010–2013, showed 5.9% of maternal syphilis prevalence in more than one ANC visit.[39] The high syphilis seroprevalence in women who visited the clinic more than once suggests that those women were not properly screened or treated during their first ANC visit and may be at risk of reinfection following the first ANC follow-up due to partner involvement in risky sexual behaviour.[10 40]

Based on the findings of these studies, pregnant women's educational status has a significant effect on the prevalence of maternal syphilis. One in 20 (5.47%) of the syphilis prevalence among pregnant women was accounted for by women who had no formal education. However, 64.1% of syphilis prevalence was found in pregnant women who had no formal education, in a study conducted at Dilla University Referral Hospital.[41] Similarly, in a Nigerian study,[42] pregnant women with no formal education accounted for 75% of the seropositive rate. This might be explained by the fact that women with low educational level might not have adequate knowledge about the transmission and prevention mechanisms of syphilis and where to go for treatment. Therefore, they might be exposed to the disease unintentionally. The basis of this major difference in prevalence in different study settings may be due to minimum access to the lowest level of education, level of income, cultural constraints and lack of awareness.[39]

Based on the findings of this study, pregnant women who married when they were under 18 years old had a higher prevalence than those who married when they were above 18 years. Similarly, a study in Bangladesh showed

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Table 5 Multivariate analysis for association of maternal syphilis in pregnant women attending ANC at public health facilities in Buno Bedele zone, southwest Ethiopia, 2021

Variable	Categories	Syphilis Yes, n (%)	Syphilis No, n (%)	COR (95% CI)	AOR (95% CI)
Husband's habit of substance use	Yes	8 (2.99)	259 (97)	4.0 (1.3 to 12.4)	3.3 (1.04 to 10.7)*
	No	5 (0.76)	648 (99.2)	1	1
Drinking alcohol	Yes	1 (5.2)	18 (94.7)	4.2 (0.5 to 33.4)	2.9 (0.3 to 32.5)
	No	12 (1.32)	889 (98.6)	1	1
Substance use	Yes	2 (4.6)	41 (95.3)	3.8 (0.8 to 17.9)	1.3 (0.2 to 8.3)
	No	11 (1.25)	866 (98.7)	1	1
Number of pregnancy	Multigravida	11 (1.78)	605 (98.2)	2.7 (0.6 to 12.5)	2.4 (0.5 to 11.4)
	Primigravida	2 (0.65)	302 (99.3)	1	1
ANC visits	More than one	5 (3.5)	137 (96.4)	3.5 (1.1 to 10.9)	3.5 (1.07 to 10.5)*
	First	8 (1)	770 (98.9)	1	1
Residence	Rural	12 (2.05)	571 (97.9)	7.06 (0.9 to 54.5)	5.1 (0.6 to 42.4)
	Urban	1 (0.29)	336 (99.7)	1	1
Woman's education	No formal education	4 (5.47)	69 (94.5)	5.3 (1.6 to 17.9)	3.6 (1.02 to 13.2)*
	Formal education	9 (1.06)	838 (98.9)	1	1
Husband's education	No formal education	2 (8)	23 (92)	6.9 (1.5 to 33.3)	1.2 (0.2 to 7.9)
	Formal education	11 (1.2)	884 (98.7)	1	1
Blood transfusion history	Yes	1 (5.26)	18 (94.7)	4.1 (0.5 to 33.4)	6.5 (0.7 to 61.9)
	No	12 (1.33)	889 (98.6)	1	1
STI history	Yes	1 (6.66)	14 (93.3)	5.3 (0.64 to 43.7)	1.6 (0.15 to 17.2)
	No	12 (1.32)	893 (98.6)	1	1
Husband's STI history	Yes	2 (5.8)	32 (94.1)	4.9 (1.05 to 23.3)	2.3 (0.4 to 13.7)
	No	11 (1.24)	875 (98.7)	1	1
Pregnancy complications	Yes	2 (3.3)	58 (96.6)	2.6 (0.57 to 12.3)	1.03 (0.2 to 6.8)
	No	11 (1.27)	849 (98.7)	1	1
Age at marriage	Under 18	11 (2.55)	419 (97.4)	6.4 (3.4 to 7.80)	4.3 (2.2 to 7.9)*
	Above 18	2 (0.4)	488 (99.5)	1	
Knowledge	Poor	6 (3)	194 (97)	3.15 (1.04 to 9.5)	3.3 (1.04 to 10.4)*
	Good	7 (0.9)	713 (99.02)	1	1

*Statistically significant association at p value less than 0.05.
ANC, antenatal care; AOR, adjusted OR; COR, crude OR; STI, sexually transmitted infection.

a 4.2% syphilis prevalence for those who were married under 18 years of age and 1.17% for those pregnant women who were married above 18 years.[43] This might be due to the fact that women who were married under 18 years of age have longer duration of sexual exposure, which is a predisposing factor for syphilis. Furthermore, this kind of marriage hinders female adolescents from school engagement, which results in a loss of knowledge regarding sexual and reproductive health, healthy sexual practices, health-seeking behaviour and the decision-making capacity of the mother.[39]

The study was conducted by taking a representative sample of pregnant women from both urban and rural health facilities in the Buno Bedele zone, which makes it favourable for generalisation. Since this is an institutional-based cross-sectional study, the reported prevalence of syphilis might not reflect the actual burden of the disease at the community level. The study might be susceptible to recall bias. Besides, social desirability bias might exist as the study is sensitive in nature and involved face-to-face interviews.

CONCLUSION

The prevalence of maternal syphilis in this study area was 1.4% (95% CI: 0.8% to 2.3%). It was found to be comparable with the national prevalence of syphilis, which was 1.2% from the 2014 round ANC based sentinel surveillance. Pregnant women with no formal education, husbands' substance use, more than one ANC visit, age at first marriage of under 18 years, and mothers' poor knowledge of syphilis were significantly associated with maternal

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syphilis. Strengthening counselling during ANC services that involve men could be used to raise awareness of women, reduce substance use by husbands and avoid early marriage in the study area. Besides, screening all pregnant women for syphilis more than once in pregnancy is recommended, possibly at the first and last ANC visits.

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Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was conducted in accordance with the Declaration of Helsinki. Ethical clearance was obtained from the Institutional Review Board of Mettu University (reference number: CHS/039/20). An official letter of cooperation from Mettu University was used to communicate with the respective administrative bodies in the study area. After getting a letter of permission to carry out the study from each administrative body, all study participants were informed about the study to ensure that they had all the necessary information needed to make an informed choice. Informed written consent was obtained from each study subject prior to interview.

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