

Determinants of Syphilis among Pregnant Women Attending Antenatal Care Clinic at Public Hospital in South West Shoa, Ethiopia, Unmatched Case-control Study, 2023

Bacha Merga Chuko^{1,*}, Fikru Assefa Kibrat², Zufela Sime Gari³, Ararso Tafese⁴, Teka Girma⁵, Shambal Negese Marami⁶, Gada Edea⁷

¹Department of Maternity and Neonatology, Ameya Primary Hospital, Waliso, Ethiopia

²Department of Anesthesia, Waliso General Hospital, Waliso, Ethiopia

³Departments of Midwifery, Waliso General Hospital, Waliso, Ethiopia

⁴Department of Public Health, College of Health Sciences, Ambo University, Ambo, Ethiopia

⁵Department of Public Health, College of Medicine and Health Sciences, Ambo University, Ambo, Ethiopia

⁶Department of Midwifery, College of Health Sciences, Metu University, Metu, Ethiopia

⁷Department of Nursing, College of Health Sciences, Ambo University, Ambo, Ethiopia

*Correspondence should be addressed to Bacha Merga Chuko, bachamerga11@gmail.com

Received date: August 16, 2024, **Accepted date:** October 03, 2024

Citation: Chuko BM, Kibrat FA, Gari ZS, Tafese A, Girma T, Marami SN, et al. Determinants of Syphilis among Pregnant Women Attending Antenatal Care Clinic at Public Hospital in South West Shoa, Ethiopia, Unmatched Case-control Study, 2023. Arch Obstet Gynecol. 2024;5(3):129-139.

Copyright: © 2024 Chuko BM, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Background: Syphilis is an infectious, sexually transmitted disease caused by the Spirochete *Treponema palladium*. Untreated maternal syphilis causes adverse pregnancy outcomes such as spontaneous miscarriage, low birth weight, neonatal death, and congenital syphilis. This is a limited case control study to identify determinants of syphilis infections at the study area.

Objectives: The aim of this study is to identify determinants of syphilis infections among pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023.

Methods: A facility based unmatched case-control study among 240 women (48 case and 192 control) with 1:4 ratios were conducted from March 10, 2023–May 20, 2023, among pregnant women attending antenatal care follow up at public hospital, South West Shoa. Cases were selected by convenience and systematic sampling techniques were employed to select control and data was collected by using structured and pretested questionnaire. The collected data were entered into Epi info version 7.2.2 and exported to SPSS version 25 for analysis. Variables having p-value <0.25 in the bi-variable analysis were entered into logistic regression model for multi variable analysis. Statistical significance was declared at p-value <0.05. Adjusted odd ratio along with 95% confidence interval was used to show strength of association. The results were presented using text, tables, and graphs.

Results: In this study 235 women (47 cases and 188 controls) had completed the interview resulting in a response rate of 97.92%. After multivariable logistic regression analysis, significantly associated factors with syphilis infection were status of current pregnancy [AOR = 2.697, 95% CI (1.003-7.249, ANC follow-up [AOR = 4.556, 95% CI (1.759-11.80)], history of STI [AOR = 3.080, 95% CI (1.347-7.043)], alcohol intake [AOR = 3.965, 95% CI (1.56-10.078)], age at first sexual intercourse [AOR = 8.951, 95% CI (3.70-21.646)], and multiple sexual partners [AOR = 2.754, 95% CI (1.065-7.118)].

Conclusion: Status of current pregnancy, ANC follow-up, history of STI, alcohol intake, age at first sexual intercourse, and multiple sexual

partners were variables significantly associated with syphilis infections among pregnant women. Therefore, health care providers and managers should focus to give health education on these determinants, and strengthening early diagnosis and treatment for syphilis infections among pregnant women.

Keywords: Syphilis infection, Pregnant women, Public hospitals, South West Shoa Zone

Abbreviations: ANC: Antenatal Care; AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; SPSS: Statistical Package for the Social Sciences; STI: Sexually Transmitted Infections; VDRL: Venereal Disease Research Laboratory test

Introduction

The term "sexually transmitted infection (STI)" refers to a pathogen that causes infection through sexual contact, whereas the word "sexually transmitted disease" refers to an identifiable clinical condition that has arisen from an infection [1,2]. Sexually transmitted infections are among the leading causes of sickness worldwide, with far-reaching health, social, and economic effects. Because of the quantity and possible difficulties of sexually transmitted illnesses, they are of public health relevance. They have a disproportionate impact on mothers' health and social well-being by having a considerable impact on their reproductive capacity [3].

Untreated syphilis is a disease that lasts for many years and is classified into two stages: Early syphilis includes primary syphilis, secondary syphilis, and early latent syphilis, whereas late syphilis includes late latent syphilis and tertiary syphilis [2].

Adult syphilis symptoms vary according to stage. Signs and symptoms of the main stage include a single or multiple sores at the location where syphilis entered the body (initial stage of syphilis). Sores that are firm, round, and painless are prevalent (though not always). During the secondary stage, skin rashes and/or mucous membrane lesions, such as sores in mouth, vagina, or anus, occur. The absence of visible evidence or symptoms of syphilis characterizes the latent period. Tertiary syphilis is exceedingly serious and can appear 10-30 years after the initial infection. Tertiary syphilis damages internal organs and can result in death [1,4].

Syphilis has an average incubation period of 3 weeks (from exposure to the development of initial signs or symptoms), although it can be as little as 10 days or as long as 90 days. Serologic test results show negative during the incubation period, and the patient is not deemed infectious. However, without syphilis post-exposure treatment, those with incubating infection will develop primary syphilis lesions, a highly infectious stage of illness [1].

STIs are a major public health issue around the world, impacting quality of life and causing significant morbidity and mortality. Congenital syphilis imposed a significant morbidity and death burden [5]. Report from Centers for Disease Control during 2012–2016, showed the number of reported cases of

syphilis among pregnant women increased by 55% (9,551 to 14,838), and the number of cases among pregnant women was increased by 61%, (1,561 to 2,508) [6]. The burden of syphilis among pregnant women in sub-Saharan Africa was 2.9%. Syphilis infection among pregnant women has increased in East and Southern African regions (3.2%) [7]. In Ethiopia the magnitude of syphilis infection was in the ranged of 1.1% to 5.1% [8-11].

Multiple sexual partners, previous history of abortion, previous history of STI, substance use, starting first sexual practice before the age of 18 years, sexual partners' history of STI were risk factors of syphilis infection [11-13].

At any phase of syphilis infection, the infection can be transmitted to a fetus during pregnancy and can result in adverse pregnancy outcome or severe birth defects [5]. Syphilis continues to be a major cause of pregnancy loss and adverse pregnancy outcome among mothers who do not receive antenatal syphilis screening and treatment during pregnancy. Adverse pregnancy outcome such as stillbirths, and preterm were attributable to maternal syphilis [14]. Adverse pregnancy outcome like stillbirth, preterm birth, and low birth weight were related with untreated maternal syphilis during pregnancy [15].

Mother-to-child transmission of syphilis (congenital syphilis) is frequently fatal to the fetus if maternal infection is not detected and treated early enough in pregnancy. The fetus can be easily treated, and the danger of poor effects to the fetus is negligible if the mothers receive adequate treatment throughout early pregnancy [16]. Early detection and treatment of syphilis in pregnant women is critical for treating the infection and minimizing adverse pregnancy outcomes such as fetal and neonatal death [5].

Ethiopia has remarkable progress in screening and treatment of STIs like syphilis especially for pregnant women. Since mother to child transmission at birth is the most common way of transmission of syphilis infection, identifying syphilis among pregnant women in the area is very important for the prevention of vertical transmission to the new born [3].

Despite the implementation of different guidelines to control STIs in Ethiopia, the burden of syphilis during pregnancy is persisting. Although some studies were conducted in different parts of Ethiopia on syphilis infection among pregnant women,

less common determinants were identified. This variation could be due to study design in which cross-sectional study design was generally used. But there was a limited case control study on determinants of syphilis infection at the study area. Therefore, this study was aimed to address this gap by using case control study design to identify syphilis determinants among pregnant women attending ANC at Public hospital, South West Shoa.

Methods

Study area and study period

The study was carried out at public hospitals in South West Shoa Zone, Oromia region, Ethiopia. Southwest Shoa Zone is located 114 KM to the south of Addis Ababa. Southwest Shoa Zone comprised five government hospitals named Tullu Bollo General Hospital, Waliso General Hospital, Ameya Primary Hospital, Bantu Primary Hospital, Leman Primary Hospital, and one non-government hospital called Lukas Catholic Hospital which is found in Waliso, the capital city of the South West Shoa Zone. Last year's annual ANC reports were as follows: from Tullu Bollo general hospital (882), 804 were non-reactive and 78 were reactive, from Woliso General Hospital (918), 824 were non-reactive and 90 were reactive, from Ameya primary hospital (366), 294 were non-reactive and 72 were reactive, from Bantu primary hospital (432) 378 were non-reactive and 54 were reactive, and from Leman primary hospital (420) 360 were non-reactive and 66 were reactive.

Study period

The study was conducted in South West Shoa zone at five public hospitals from March 10, 2023–May 10, 2023.

Study design

Institutional based unmatched case control study design was conducted.

Source population

All pregnant women attending ANC at Public hospital in South West Shoa Zone.

Study population

Pregnant women those attending routine ANC follow up at five public hospitals in South West Shoa zone and tested positive for syphilis during ANC visits were considered as cases in this study. Pregnant women who were attending routine ANC follow up at five public hospitals in South West Shoa zone and tested negative for syphilis tests during laboratory services at ANC visits were considered as control group.

Inclusion criteria

All pregnant mothers who had attended ANC at five public

hospitals in South West Shoa zone and tested positive for syphilis tests during the study period were included. Those who were reported negative for the syphilis tests during the study period were also included.

Exclusion criteria

Pregnant mothers who had incomplete documentation during their ANC visits, and those who were critically ill and unable to communicate were excluded from the study.

Sample size determination

Sample size was determined by using Open Epi info version 7.2.5 using double population proportion exposure difference formulas by considering major determinants of syphilis infection such as history of multiple sexual partners and alcohol use [17], and a history of sexually transmitted infections and used a substance [13]. The confidence level was set at 95%, power at 80%, and ratio of cases to controls was 4. The final sample size calculated after adding 10% of non-response rate was 236. But to make 1:4 proportion of cases to controls, a total sample size of 240 was taken (48 cases and 192 controls).

Sampling technique and procedure

The number of study participants from each hospital was determined by proportional allocation to population size by using an average of two months from last year's ANC report taken from each hospital. To allocate sample size of the control group to each hospital an average of two months of non-reactive syphilis test reports from the previous year was used. Then the average two months non-reactive syphilis report of all hospitals from last year (N) was divided by total sample size of the control group (n) to obtain the interval (K), $K=N/n = 444/192 = 2.3 \sim 2$. The first study participant of the control group was determined by lottery method. Then, by using a systematic random sampling method, the data collectors had interviewed pregnant mothers every 2 days until the required sample size was obtained and case group was selected by convenience sampling technique (all mothers who were reactive for syphilis test) until 48 samples were reached (**Figure 1**).

Study variables

Dependent variable: Syphilis infection

Independent variable:

Socio-demographic characteristics: Age, residence, marital status, occupational status, and educational status.

Obstetrics characteristics: Abortion, still birth, ANC, parity, and multiple pregnancy.

Lifestyle related factors: Multiple partners, age at sexual intercourse started, substance use, and alcohol consumption.

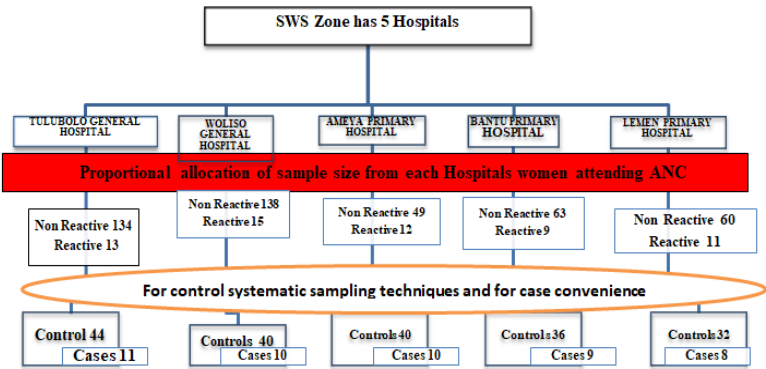


Figure 1. Proportional allocation of sample size to five South West Shoa zone Hospitals.

Sexual transmitted disease history related factors: History of STI.

Operational definition

Case group: Individuals who have the outcome of interest. Those who have syphilis infection in this study.

Control group: Individuals who do not have the outcome interest. Those who do not have syphilis infection in this study [18].

Data collection instrument and technique

A structured questionnaire was adapted after reviewing different kinds of literature. The questionnaire consisted of 7 items of socio-demographic characteristics, 9 items of obstetrics related factors, and 3 items of medical history related factors, 6 items of lifestyle related factors, and 2 items of serological test. Pregnant women who were tested and found reactive for RPR reagent during their ANC follow up were diagnosed as positive for active syphilis, while those who were nonreactive were determined to be negative for active syphilis [19]. The questionnaire contains 5 parts and 27 items.

The data were collected using a pre-tested structured face-to-face interview questionnaire and chart review prepared in Afan Oromo. The data were collected by four BSc midwives who are fluent in the local language and supervised by two senior midwives.

Data quality control (assurance)

To ensure quality, tools were adapted from related articles, pre-tested on 5% of the study participants at Holeta Primary Hospital. To ensure the consistency of the questionnaires, the English version was translated into Afan Oromo and again

retranslated back to English by an expert language translator. The data collectors and supervisors were recruited from outside the study hospitals to minimize bias and training was given regarding data collection procedure, tools, the purpose of study, and ethical consideration. Data collectors were strictly supervised. At the end of each day, the questionnaire was reviewed and checked for completeness by the supervisors, and necessary corrections were made.

The collected data were checked for completeness by the supervisors before data entry into the application and each approved questionnaire was properly coded and assigned a unique Identification number before being entered for analysis. Data were entered into Epi info to minimize errors, check duplicated entries, and to design a skipping pattern. Outlier and missed data were checked before data analysis using SPSS version 25.

Data processing and analysis

Multi co-linearity was checked by using variance inflation factors, the maximum value for variance inflation factors was 1.47, which is by far lower than tolerable cut off point 10 and tolerance test showed a range of 0.676-0.951. The goodness of fit (GOF) of the model was checked using Hosmer–Lermeshows GOF test. The p value of Hosmer –Lermeshows GOF test of our model is 0.78, indicating that the model was a good fit.

Descriptive analysis (like frequencies, percentages, means, and standard deviation) and inferential analysis was done. The bivariate and multivariable logistic regression analysis was done. A p-value <0.25 associated with study variables were transferred to multiple logistic regression models. AOR (adjusted odds ratio) with 95% confidence interval was computed, and the p-value <0.05 was considered statistically significant in the multivariable logistic regression analysis. The results were presented using text, tables, and charts.

Ethical consideration

An ethical clearance letter was obtained from Ambo University College of Health Science Ethical Review committee with Ref. number AU/PGC/630/2015 on 15/03/2023 and a supportive letter was obtained from the College of Health Science. Then, a permissions letter was obtained from the Zonal Health Bureau, South West Shoa Zone, and permissions for data collection were obtained from all hospitals. Verbal informed consent was obtained from the study participants before the interview. The study participants were informed about the purpose of the study and the importance of their participation in the study by providing information that may help in assessing syphilis infection services. The study participants were also informed that they could choose to skip or only partially answer questions they were uncomfortable with, and they could also stop at any time if they want to do so. The interview was conducted in a separate area with protected privacy. After

getting consent & their willingness to participate in the study, they were provided with the questionnaire and oriented on how to respond to the questions.

Results

Data was collected from 240 participants, and out of which 235 women had completed the interview, resulting in a response rate of 97.92%.

Socio-demographic characteristics of the respondents

Age of the respondents ranged from 16-36 years with a mean age of 26.93 years (26.93 ± 3.95). Twenty two women (46.8%) from case group and 78 women (41.5%) from control group were between 24-29. About half of the cases 23 (49%), and 95 (50.5%) of controls had completed a diploma or higher educational status (Table 1).

Table 1. Socio-demographics characteristics of pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023(n=235).

Variable	Variable categories	Case N (%)	Control N (%)	Total N (%)
Age	≤ 24	15 (31.9)	61 (32.4)	76 (32.34)
	24-29	22 (46.8)	78 (41.5)	100 (42.55)
	30-35	6 (12.8)	9 (4.8)	15 (6.38)
	>35	4 (8.5)	40 (21.3)	44 (18.73)
Resident	Urban	27 (57.4)	107 (56.9)	134 (57.02)
	Rural	20 (42.6)	81 (43.1)	101 (42.98)
Marital status	Single	3 (6.4)	61 (32.4)	64 (27.2)
	Married	33 (70.2)	108 (57.5)	141 (60)
	Divorced	6 (12.8)	9 (4.8)	15 (6.4)
	Widowed	5 (10.6)	10 (5.3)	15 (6.4)
Educational status	No formal education	9 (19.1)	11 (5.9)	20 (8.51)
	Primary education	6 (12.8)	24 (12.8)	30 (12.77)
	Secondary education	9 (19.1)	58 (30.9)	67 (28.51)
	Diploma and above	23 (49)	95 (50.5)	118 (50.21)
Husband educational status	No formal education	5 (10.6)	10 (5.3)	15 (6.3)
	Primary education	18 (38.2)	73 (38.8)	91 (38.7)
	Secondary education	15 (31.9)	58 (30.9)	73 (31)
	Diploma and above	10 (21.3)	47 (25)	57 (24)
Occupational Status	Housewife	26 (55.3)	92 (48.9)	118 (50.21)
	Farmer	1 (2.1)	3 (1.6)	4 (17.39)
	Merchant	9 (19.1)	37 (19.7)	46 (19.57)
	Government employee	11 (23.4)	39 (20.7)	50 (21.28)
	Self-Employee	0 (0.0)	17 (9)	17 (7.23)

Husband occupational Status	Farmer	33 (17.6)	14 (29.8)	47 (20)
	Merchant	66 (35.1)	12 (25.5)	78 (33.19)
	Government employee	54 (28.7)	10 (21.3)	64 (27.23)
	Self-Employee	35 (18.6)	1 1(23.4)	46 (19.57)

Obstetrics characteristics of the respondents

Among the respondents, 37 women (78.7%) from case group and 141 women (75%) from control group were multiparous, while 10 women (21.3%) from case group and 47 women (25%) from control group were multigravida. Among 235 women, 34 women (72.3%) from case group and 166 women (88.3%) from control group had planned their current pregnancy. Seventeen women (36.2%) from case group had a history of still birth while 38 women (20.2%) had a history of still birth from the control group. About 150 women (79.8%) from control group and 30 (63.8) from case group had no history of still birth (Table 2).

Sexually transmitted disease history related factors

Based on the results of this study, more than half of the women in the case group (30 (63.8%)) and 61 women (32.4) in the control group had a history of STI, whereas 17 women

(36.2%) in the case group and 127 women (67.6%) in the control group did not have any history of STI. More than half of the women (25 (53.2%)) from the case group and 130 (69.1%) from control group had no history of hospital admission (Figure 2).

Lifestyle related factors

The study revealed that 16 (34%) pregnant women from case group and 34 (18.1%) from the control group consumed alcohol during pregnancy, while 31 (66%) from case group and 154 (81.9%) from the control group did not drink alcohol. More than two thirds of the women (32 (68.1%)) in the case group and one fourth from the control group (47 (25%)) had started sexual intercourse before 18 years of age. Regarding history of multiple sexual inter course, more than one third of the women (17 (36.2%)) from case group and majority (161 (85.6%)) from control group had no history of multiple sexual inter course (Table 3).

Table 2. Obstetrics characteristics of pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023 (n=235).				
Variable	Variable categories	Case N (%)	Control N (%)	Total N (%)
Parity	Primiparous	10 (21.3)	47 (25.0)	57 (24.26)
	Multiparous	37 (78.7)	141 (75.0)	178 (75.74)
Previous history of multiple pregnancy	Yes	30 (63.8)	150 (79.8)	180 (76.59)
	No	17 (36.2)	38 (20.2)	55 (23.40)
Status of current Pregnancy	Planned	34 (72.3)	166 (88.3)	200 (85.11)
	Unplanned	13 (27.7)	22 (11.7)	35 (14.89)
ANC follow-up	Yes	31 (66.0)	159 (84.6)	190 (80.85)
	No	16 (34.0)	29 (15.4)	45 (19.15)
Number of visit	First visit	16 (36.4)	34 (21.7)	50 (21.28)
	Second visit	16 (36.4)	82 (52.2)	98 (41.70)
	Third visit	9 (20.5)	20 (12.7)	29 (12.34)
	Fourth visit	3 (6.8)	21 (13.4)	24 (10.21)
History of abortion	Yes	36 (76.6)	110 (58.5)	146 (62.12)
	No	11 (23.4)	78 (41.5)	89 (37.87)
Still birth	Yes	17 (36.2)	38 (20.2)	55 (23.40)
	No	30 (63.8)	150 (79.8)	180 (76.59)
Neonatal death	Yes	0 (0.0)	10 (5.3)	10 (4.26)
	No	47 (100.0)	178 (94.7)	225 (95.74)

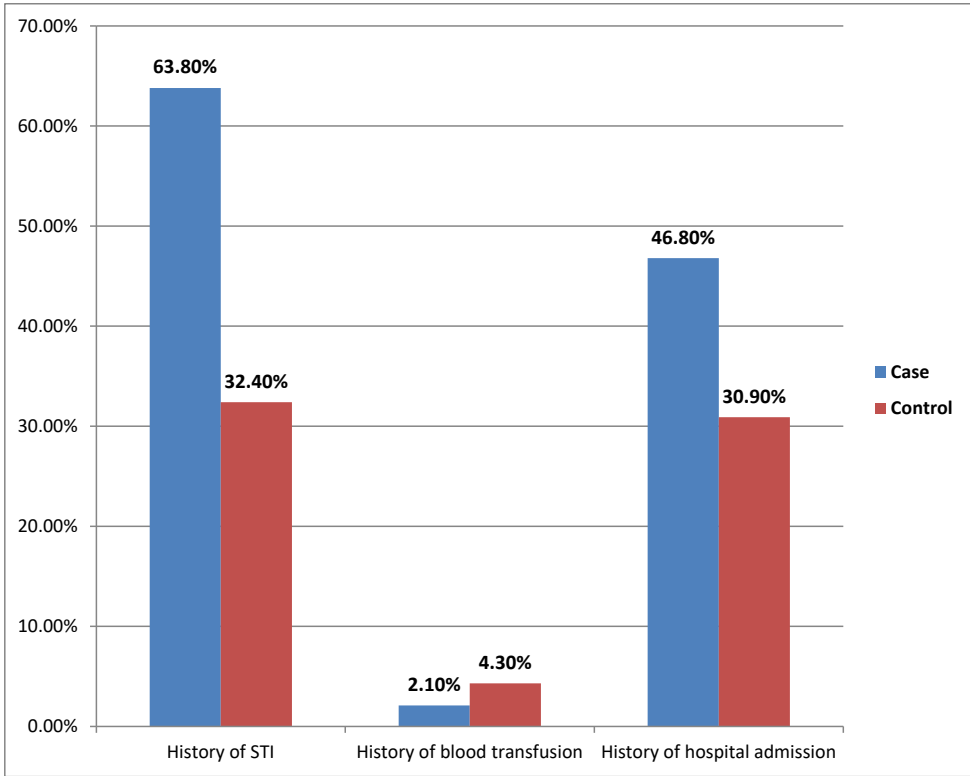


Figure 2. History of sexually transmitted diseases among pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023.

Table 3. Lifestyle of pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023 (n=235).				
Variable	Variable categories	Case N (%)	Control N (%)	Total N (%)
Alcohol consumption	Yes	16 (34.0)	34 (18.1)	50 (21.28)
	No	31 (66.0)	154 (81.9)	185 (78.72)
Partner's alcohol consumption	Yes	24 (51.1)	56 (29.8)	80 (34.04)
	No	23 (48.9)	132 (70.2)	155 (65.96)
Addictive substance	Yes	16 (34.0)	34 (18.1)	50 (21.28)
	No	31 (66.0)	154 (81.9)	185 (78.72)
Age at sexual intercourse started	<18	32 (68.1)	47 (25.0)	79 (33.62)
	>18	15 (31.9)	141 (75.0)	166 (70.64)
Multiple partners	Yes	17 (36.2)	27 (14.4)	44 (18.72)
	No	30 (63.8)	161 (85.6)	191 (81.28)
Multiple partners within last three months	Yes	2 (4.3)	3 (1.6)	5 (2.13)
	No	45 (95.7)	185 (98.4)	230 (97.87)
History of Coerce sexual intercourse	Yes	1 (2.1)	3 (1.6)	4 (1.71)
	No	46 (97.9)	185 (98.4)	231 (98.29)
HIV test results	Yes	5 (10.6)	6 (3.2)	11 (4.68)
	No	42 (89.4)	182 (96.8)	224 (95.32)

Bivariable binary logistic regression analysis of factors associated with syphilis infection

There were about 14 candidate variables in the bivariate analysis model with p-value <0.25. These were: educational status, previous history of multiple pregnancy, status of current pregnancy, ANC follow-up, history of abortion, still birth,

history of STI, history of hospital admission, alcohol intake history, partner's alcohol intake, using addictive substance, age at first sexual intercourse, multiple sexual partners, and maternal HIV co-infection were identified as candidate variables for multivariable logistic regression analysis. Then the above variables were entered into multivariable logistic regression for analysis (**Table 4**).

Table 4. Binary logistics regression analysis of pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023 (n=235).					
Variables	Variables Category	Case N (%)	Control N (%)	COR 95% CI	P-value
Educational status	No formal education	9 (19.1)	11 (5.9)	3.379 (1.25-1.254)	0.016
	Primary education	6 (12.8)	24 (12.8)	1.033 (0.38-2.82)	0.950
	Secondary education	9 (19.1)	58 (30.9)	0.641 (.28-1.48)	0.298
	Diploma and above	23 (49)	95 (50.5)	1	
Previous history of pregnancy	Yes	30 (63.8)	150 (79.8)	1	
	No	17 (36.2)	38 (20.2)	2.237 (1.12-4.48)	0.023
Status of current pregnancy	Planned	34 (72.3)	166 (88.3)	1	
	Unplanned	13 (27.7)	22 (11.7)	2.885 (1.32-6.29)	0.008
ANC follow-up	Yes	31 (66.0)	159 (84.6)	1	
	No	16 (34.0)	29 (15.4)	2.830 (1.38-5.82)	0.005
History of abortion	Yes	36 (76.6)	110 (58.5)	2.321 (1.11-4.84)	0.025
	No	11 (23.4)	78 (41.5)	1	
Still birth	Yes	17 (36.2)	38 (20.2)	2.237 (1.12-4.48)	0.023
	No	30 (63.8)	150 (79.8)	1	
History of STI	Yes	30 (63.8)	61 (32.4)	3.674 (1.88-7.17)	0.000
	No	17 (36.2)	127 (67.6)	1	
History of hospital admission	Yes	22 (46.8)	58 (30.9)	1.972 (1.023-3.78)	0.041
	No	25 (53.2)	130 (69.1)	1	
Alcohol consumption	Yes	16 (34.0)	34 (18.1)	2.338 (1.15-4.75)	0.019
	No	31 (66.0)	154 (81.9)	1	
Partner's alcohol consumption	Yes	24 (51.1)	56 (29.8)	2.460 (1.28-4.72)	0.007
	No	23 (48.9)	132 (70.2)	1	
Addictive substance	Yes	16 (34.0)	34 (18.1)	2.338 (1.15-4.75)	0.019
	No	31 (66.0)	154 (81.9)	1	
Age at sexual intercourse started	<18	32 (68.1)	47 (25.0)	6.40 (3.19-12.84)	0.000
	>18	15 (31.9)	141 (75.0)	1	
Multiple partners	Yes	17 (36.2)	27 (14.4)	3.379 (1.64-6.95)	0.001
	No	30 (63.8)	161 (85.6)	1	
HIV test results	Yes	5 (10.6)	6 (3.2)	3.611 (1.05-12.46)	0.041
	No	42 (89.4)	182 (96.8)	1	
Key: *: Statistically Significant; 1: Reference; COR: Crude Odd Ratio; AOR: Adjusted Odd Ratio; CI: Confidence Interval					

Multiple binary logistics regression analysis of factors associated with syphilis infection

After entering the variables with a p-value of <0.25 into multivariable analysis, the variables found to be significantly linked with syphilis infection were status of current pregnancy, ANC follow-up, history of STI, alcohol intake history, age at first sexual intercourse, and multiple sexual partners.

According to this study, the odds of syphilis infection were 2.697 times higher in pregnant women than women who did not plan their current pregnancy [AOR = 2.697, 95% CI (1.003-7.249)]. The odds of syphilis infection were 4.556 times more likely among pregnant women who had no ANC follow-up than pregnant women who had ANC follow-up [AOR = 4.556, 95% CI (1.759-11.80)]. The odds of syphilis infection were 3.080 times higher in pregnant women who had a history of STI [AOR = 3.080, 95% CI (1.347-7.043)].

Similarly, the odds of syphilis infection were 3.965 times higher among pregnant women who consumed alcohol than pregnant women who did not drink alcohol [AOR = 3.965, 95% CI (1.56-10.078)]. Likewise, pregnant women who had their

first sexual intercourse before the age of 18 were 8.951 times more likely to have syphilis infection than women who had their first sexual intercourse after 18 years old [AOR = 8.951, 95% CI (3.70-21.646)]. In addition, the odds of syphilis infection were 2.754 times higher in pregnant women who had multiple sexual partners [AOR = 2.754, 95% CI (1.065-7.118)] (Table 5).

Discussion

This study has attempted to analyze the determinants of syphilis infection among pregnant women attending ANC by incorporating as many risk factors as possible in order to reduce risks and complications related to syphilis infection.

The study identified that, status of current pregnancy, ANC follow-up, history of STI, alcohol intake history, age of first sexual intercourse, and multiple sexual partners were significantly associated determinant factors with syphilis infection among pregnant women attending ANC at public hospital of South West Shoa, Zone.

According to this study, pregnant women with a previous history of STI was more likely to have syphilis infection

Table 5. Multiple logistics regression of pregnant women attending ANC clinic at Public hospital in South West Shoa, Ethiopia, 2023 (n=235).						
Variables	Variables Category	Case N (%)	Control N (%)	COR 95% CI	AOR 95% CI	P value
Previous history of multiple pregnancies	Yes	30 (63.8)	150 (79.8)	1	1	0.080
	No	17 (36.2)	38 (20.2)	2.237 (1.12-4.48)	2.229 (0.91-5.47)	
Status of current pregnancy	Planned	34 (72.3)	166 (88.3)	1	1	0.049*
	Unplanned	13 (27.7)	22 (11.7)	2.885 (1.32-6.29)	2.697 (1.03-7.25)	
ANC follow-up	Yes	31 (66.0)	159 (84.6)	1	1	0.002*
	No	16 (34.0)	29 (15.4)	2.830 (1.38-5.82)	4.556 (1.76-11.80)	
History of abortion	Yes	36 (76.6)	110 (58.5)	2.32 (1.11-4.84)	2.22 (0.87-5.65)	0.096
	No	11 (23.4)	78 (41.5)	1	1	
History of STI	Yes	30 (63.8)	61 (32.4)	3.67 (1.88-7.17)	3.08 (1.35-7.04)	0.008*
	No	17 (36.2)	127 (67.6)	1	1	
History of hospital admission	Yes	22 (46.8)	58 (30.9)	1.97 (1.023-3.78)	2.31 (0.98-5.40)	0.054
	No	25 (53.2)	130 (69.1)	1	1	
Alcohol consumption	Yes	16 (34.0)	34 (18.1)	2.34 (1.15-4.75)	3.96 (1.56-10.08)	0.004*
	No	31 (66.0)	154 (81.9)	1	1	
Age at sexual intercourse started	<18	32 (68.1)	47 (25.0)	6.40 (3.19-12.84)	8.95 (3.70-21.65)	0.001**
	>18	15 (31.9)	141 (75.0)	1	1	
Multiple sexual partners	Yes	17 (36.2)	27 (14.4)	3.38 (1.64-6.95)	2.75 (1.07-7.12)	0.037*
	No	30 (63.8)	161 (85.6)	1	1	
Key: *: Statistically Significant; **: Strongly Statistically Significant; 1: Reference; COR: Crude Odd Ratio; AOR: Adjusted Odd Ratio; CI: Confidence Interval						

compared to those who had no previous history of STI. This study was comparable to the study conducted in hospitals of Wolaita zone, Southern Ethiopia which revealed that pregnant women who had STI were more likely to develop syphilis infection than those who had no STI [13]. This may be due to the fact that both STI and syphilis infection can be transmitted through unprotected sexual contact and women with current or past STI are at a greater risk for syphilis infection. Nonetheless, this study findings were not in line with a previous study conducted at Felege Hiwot Referral Hospital, Bahir Dar, northwest Ethiopia[11].

This study identified that; pregnant women who had no ANC follow up had higher odds of syphilis infection than those who had ANC follow up. It was supported by a study conducted in west Arsi zone, Ethiopia [20]. This could be due to the fact that women who had no ANC follow up may become pregnant either without planning or by unsafe sexual intercourse.

Additionally, the findings of this study showed that alcohol intake was the determinant of syphilis infection. Pregnant women who were intoxicated with alcohol were more likely to have syphilis infection than women who were not intoxicated with alcohol. This was similar to a previous study conducted at Jinka town public health facilities, Southern Ethiopia [17]. This may be due to the fact that alcohol consumption exposes the women for unsafe sexual practice.

Furthermore, this study also showed that women who had started their sexual intercourse before the age of 18 years were more likely to have syphilis infection than those who had started their sexual intercourse after the age of 18. This was supported by a study conducted at Dilla University Referral Hospital, Ethiopia [12]. This might be due to the societal norm of women marrying early or starting sexual activity at a young age, resulting in a higher risk of having many sexual partners and becoming more susceptible to syphilis infections.

The present study revealed that women with multiple sexual partners had higher odds to contract syphilis than women with no multiple sexual partners. This finding was similar with the study carried at Dilla University Referral Hospital, Ethiopia [12] and Jimma University Specialized Hospital, Ethiopia [10]. This might be due to the fact that the nature of the disease is asymptomatic in most of the cases and the partners might not seek treatment for the infections. Therefore, engaging in unprotected sex increases the chances of acquiring the diseases.

The findings of the current study showed that pregnant women who were unplanned with their current pregnancy had higher odds of contracting syphilis infection than women who had planned their current pregnancy. This might be as a result of women who had unplanned pregnancy may become pregnant by unsafe sexual intercourse which expose them to STIs like syphilis.

Conclusion

Syphilis infection is a significant public health concern that is linked with multiple factors. The findings of this study suggested that status of current pregnancy, ANC follow-up, history of STI, alcohol intake, age at first sexual intercourse, and multiple sexual partners were significantly associated determinants with syphilis infection among pregnant women attending ANC at Public hospital, South West Shoa. It is important to identify and address these factors in order to reduce new syphilis infections by preventing their impact. Health facilities (Hospitals) should strengthen routine laboratory testing of syphilis infection in all pregnant women attending ANC, as well as provide treatment to prevent new syphilis infections. Encourage screening and treatment of symptomatic and asymptomatic STIs in all pregnant women according to guidelines. Health care workers should provide community health education on risk factors of syphilis infections such as alcohol intake, age at first sexual intercourse started, and multiple sexual partners. Professionals who are working at antenatal care services should conduct routine investigation of syphilis infections and provide early treatment when necessary. Special attention should be given to the pregnant mother with a history of STI, alcohol intake, sexual intercourse started before 18 years old, and having multiple sexual partners. Pregnant mothers should avoid alcohol and having multiple sexual partners. Furthermore, they would need to prevent STI and seek prompt medical help if tested positive for any STI.

What is Already Known on This Topic

Magnitude of syphilis infection among pregnant women.

What This Study Adds

Determinants of syphilis infection among pregnant women. The factors that led to pregnant women contracting syphilis.

Funding

There is no funding for this study.

Declaration of Conflict of Interest

Authors declare no conflict-of-interest with respect to this study.

Data Availability

The corresponding author is willing to provide the dataset that was used in this study based upon reasonable request.

Author Contributions

All the authors contributed to the proposal development,

questionnaires, data collecting process, analysis, and interpretation.

Data curation: Bacha Merga Chuko, Fikru Assefa Kibrat, Taka Girma, Zufela Sime Gari and Ararso Tafese

Format analysis: Bacha Merga Chuko, Fikru Assefa Kibrat, and Ararso Tafese, Gada Edea and Shambel Negese Marami.

Investigation: Bacha Merga Chuko, Fikru Assefa Kibrat, Taka Girma, Zufela Sime Gari, Ararso Tafese, Gada Edea and Shambel Negese Marami.

Methodology: Bacha Merga Chuko, Fikru Assefa Kibrat, Ararso Tafese, Gada Edea and Shambel Negese Marami.

Revising the manuscript. Bacha Merga Chuko, Fikru Assefa Kibrat, Taka Girma, Zufela Sime Gari and Shambel Negese Marami.

Final version of the article was checked by all authors.

Consent

Informed consent was taken from every study participant before the actual data collection started.

Acknowledgments

We would like to thank Ambo University, College of Health Science, Department of Public Health for funding and data collectors for their contribution to accomplishing this research.

References

1. New York City Department of Health and Mental Hygiene, and the New York City STD Prevention Training Center. The Diagnosis and Management of Syphilis: An Update and Review. March 2019.
2. WHO Guidelines for the Treatment of *Treponema pallidum* (Syphilis). Geneva: World Health Organization; 2016.
3. MOH. National guidelines for the management of sexually transmitted infections using syndromic approach [Internet]. Federal Ministry of Health. Addis Ababa, Ethiopia. 2015.
4. CDC. Syphilis - CDC fact sheet. 2016. Available from <https://www.cdc.gov/std/syphilis/syphilis-factsheet-july-2014.pdf>
5. Curry SJ, Krist AH, Owens DK, Barry MJ, Caughey AB, Davidson KW, et al. Screening for syphilis infection in pregnant women: US Preventive Services Task Force reaffirmation recommendation statement. *JAMA.* 2018 Sep 4;320(9):911-7.
6. Trivedi S, Williams C, Torrone E, Kidd S. National Trends and Reported Risk Factors Among Pregnant Women With Syphilis in the United States, 2012-2016. *Obstet Gynecol.* 2019 Jan;133(1):27-32.
7. Hussen S, Tadesse BT. Prevalence of Syphilis among Pregnant Women in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *Biomed Res Int.* 2019 Jul 16;2019:4562385.
8. Kebede E, Chamiso B. Prevalence of syphilis in pregnancy in Addis Ababa. *East Afr Med J.* 2000 Apr;77(4):212-6.
9. Azeze B, Fantahun M, Kidan KG, Haile T. Seroprevalence of syphilis amongst pregnant women attending antenatal clinics in a rural hospital in north west Ethiopia. *Genitourin Med.* 1995 Dec;71(6):347-50.
10. Fikadu B, Gebrish S, Asfaw T. Sero-Prevalence of Syphilis among Pregnant Women Attending Antenatal Careclinic at Jimma Univeristy Specialized Hospital, Ethiopia. *International Journal of Research.* 2019;5(1):28-31.
11. Tareke K, Munshea A, Nibret E. Seroprevalence of syphilis and its risk factors among pregnant women attending antenatal care at Felege Hiwot Referral Hospital, Bahir Dar, northwest Ethiopia: a cross-sectional study. *BMC Res Notes.* 2019 Jan 31;12(1):69.
12. Hailu K, Gebretsadik A. Determinants of gonorrhea and syphilis infections among pregnant women attending antenatal clinic at Dilla University Referral Hospital, Ethiopia: Unmatched case-control study. *Womens Health (Lond).* 2020 Jan-Dec;16:1745506520940095.
13. Lendado TA, Tekle T, Dawit D, Daga WB, Diro CW, Arba MA, et al. Determinants of syphilis infection among pregnant women attending antenatal care in hospitals of Wolaita zone, Southern Ethiopia, 2020. *PLoS One.* 2022 Jun 3;17(6):e0269473.
14. Watson-Jones D, Changalucha J, Gumodoka B, Weiss H, Rusizoka M, Ndeki L, et al. Syphilis in pregnancy in Tanzania. I. Impact of maternal syphilis on outcome of pregnancy. *J Infect Dis.* 2002 Oct 1;186(7):940-7.
15. Wan Z, Zhang H, Xu H, Hu Y, Tan C, Tao Y. Maternal syphilis treatment and pregnancy outcomes: a retrospective study in Jiangxi Province, China. *BMC Pregnancy Childbirth.* 2020 Oct 27;20(1):648.
16. WHO Guideline on Syphilis Screening and Treatment for Pregnant Women. Geneva: World Health Organization; 2017.
17. Enbiale M, Getie A, Haile F, Tekabe B, Misekir D. Magnitude of syphilis sero-status and associated factors among pregnant women attending antenatal care in Jinka town public health facilities, Southern Ethiopia, 2020. *PLoS One.* 2021 Sep 10;16(9):e0257290.
18. Gutema GL, Abeya SG, Ayele GA. Determinants of Syphilis Infection among Women Seeking Antenatal Care and Delivery Services in Olenchity Primary Hospital : A Case-Control Study. *International Journal of Clinical Dermatology.* 2020;3(1):8-14.
19. Henao-Martínez AF, Johnson SC. Diagnostic tests for syphilis: New tests and new algorithms. *Neurology: Clinical Practice.* 2014 Apr;4(2):114-22.
20. Wubete M, Mohammed M, Mengistu M, Mekonnen R. Prevalence of syphilis among pregnant women attending antenatal clinic of BULCHANA health center, SHASHEMENE, West ARSI zone, Ethiopia. *International Journal of Medical and Biomedical Studies.* 2019;3(2):90.