

Determinants of gonorrhoea and syphilis infections among pregnant women attending antenatal clinic at Dilla University Referral Hospital, Ethiopia: Unmatched case-control study

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Abstract

Objective: This study was designed to determine the risk factors associated with gonorrhoea and syphilis infections among pregnant women attending antenatal care clinic at Dilla University Referral Hospital.

Method: A hospital-based unmatched case-control study (64 cases and 128 controls) with 1:2 ratios was conducted from 29 January 2018 to 20 June 2018, at the antenatal care clinic of the Dilla University Referral Hospital. Venous blood and vaginal swab were collected to screen for gonorrhoea and syphilis. A pretested interviewer-administered questionnaire was used to gather data on sociodemographic and predisposing factors. Logistic regression analysis used to identify risk factors for sexually transmitted infections among pregnant women at 95% confidence interval and p -value < 0.05 .

Result: A total of 64 cases of syphilis or gonorrhoea were identified with a mean age of 26 years (± 4.1 years). Of those cases, 40 were syphilis seropositive and the remaining were gonorrhoea cases. Lower educational status (adjusted odds ratio = 2.4, 95% confidence interval: 1.1–4.9), age of first sex < 18 years (adjusted odds ratio = 2.8, 95% confidence interval: 1.3–5.9), history of abortion (adjusted odds ratio = 3.1, 95% confidence interval: 1.4–6.6), and having two or more sexual partners in the past year (adjusted odds ratio = 2.5, 95% confidence interval: 1.1–5.7) were significantly associated with gonorrhoea and syphilis infection.

Conclusion: Demographic, behavioral, and obstetric factors are associated with the occurrence of syphilis or gonorrhoea among pregnant women. Strengthening the existing antenatal care services, providing health education on risk factors, and prioritizing women with the risk characteristics and initiation of gonorrhoea and syphilis screening during antenatal care are mandatory.

Keywords

Ethiopia, gonorrhoea and syphilis infection, pregnant women, risk factor

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Introduction

Sexually transmitted infections (STIs) are a worldwide public health concern in determining pregnancy and perinatal outcomes. Gonorrhoea, chlamydia, syphilis, and trichomoniasis were responsible for 357 million new cases of STIs every year.^{1,2} According to World Health Organization (WHO) in 2012, the African region had the highest prevalence of gonorrhoea and syphilis at 4.3% and 7.4%, respectively. Females had a higher prevalence of gonorrhoea

(2.3%) and syphilis (1.2%).^{1,3} The study conducted in 2016 shows that the prevalence of gonorrhoea and syphilis

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infection were in the range of 1.7%–8.3% and 2%–5.2%, respectively, in low and middle-income countries.⁴ Data from sub-Saharan Africa have shown that up to 4% of pregnant women are infected with gonorrhoea and up to 15% are infected with syphilis in 2012.⁵

Studies of antenatal clinic attendees in Africa have shown that gonorrhoea and syphilis had a high burden among pregnant women. Syphilis affects 2.5%–17% and gonorrhoea affects 2.5% of pregnant women.^{6,7}

In Ethiopia, the burden of STIs shows it affects 1% of the total population⁸ and the majority (61%) were females.⁹ According to Ethiopian Antenatal Care (ANC) sentinel surveillance of 2012, the prevalence of syphilis among pregnant women was 1% at the national level and 2.3% at Gondar health center.^{10,11} According to a study done in Assella Teaching Hospital in central Ethiopia prevalence of gonorrhoea and syphilis among ANC attendees were 4.3% for gonorrhoea and 2.2% for syphilis in 2017.¹²

Gonorrhoea and syphilis in pregnant women are closely associated with maternal and neonatal mortality and morbidity by determining pregnancy and perinatal outcomes including stillbirth, spontaneous abortion, ectopic pregnancy, and prematurity.³ It also affects the productivity of the country as a result of inhibited growth, cognitive development, and chronic disease later in life.³

Identifying the risk factors for STIs among pregnant women is a prerequisite for taking an evidence-based intervention. However, this information is scarce in the study area. Therefore, the aim of this study was to assess factors associated with gonorrhoea and syphilis among pregnant women at the Dilla University referral hospital.

Methods

Study area

The study was conducted at the Dilla University Referral Hospital (DURH) ANC clinic. The DURH is found in Dilla town, the capital of Gedeo zone. The town is located 365 km southwest of Addis Ababa, capital of Ethiopia, and 88 km away from Hawassa, capital of Southern peoples. The hospital is one of the public referral hospitals in the Southern part of Ethiopia, which is providing the highest level of clinical care for nearly a million local patients. The hospital has more than 270 daily outpatient visits, including approximately 40 daily obstetrics/gynecologic visits. It has two ANC clinic and one laboratory investigation room which gives service for pregnant women. The town has a total of 89,045 projected populations in 2018 of which 42,692 (50.2%) were female. There was an estimated 3081 pregnant woman in the town in 2018.¹³

Study design and period

A hospital-based unmatched case-control study design was employed. The study was conducted from 29 January 2018 to 20 June 2018.

Cases and controls

Case. Pregnant women who were registered for attending routine ANC follow up at the DURH and had at least one of the two syphilis, or gonorrhoea by laboratory tests during the study period.

Control, pregnant women who were registered to attend routine antenatal follow up at DURH and had no history of syphilis, or gonorrhoea as well had negative screening test result on syphilis, or gonorrhoea during the study period.

Study population

The study population include all pregnant women, regardless of gestational age who were registered for attending routine ANC at DURH during the study period.

Study subjects

Study subjects include pregnant women who were registered for attending routine ANC at DURH during the study period that fully filled the inclusion criteria and from whom the data were collected.

Inclusion and exclusion criteria

Eligible participants were pregnant women attending a routine antenatal clinic at DURH for prenatal care, which fulfills the definition of cases and controls. Pregnant women who have been treated with antibiotics in the preceding 3 weeks, visiting ANC more than once, during the study was omitted, who was at labor or delivery during data collection and critically sick and unable to answer the questionnaire, were also excluded. Pregnant women who have been diagnosed or treated for syphilis or gonorrhoea previously were also excluded from the controls,

Sample size determination

The sample size was determined by using the prevalence of syphilis among pregnant women exposed to partners infected by STI in Gondar town 13.8%, two-sided confidence level, 95%, power of the study, 80%, a ratio of controls to cases 2:1 and odds ratio of 3.62.¹⁴ By substituting the above values, the sample size was determined using a double population proportion formula by Epi Info version 7 software, the sample size became 138, and adding the potential none response rate of 30%, the total sample size was 180 (60 cases and 120 controls). But slightly more sample 192 (64 cases and 128 controls) were recruited in the study.

Sampling technique

Study subjects were selected randomly from the ANC registration book before laboratory testing. All cases found during the study period were included. Then we took two

controls for every single case by a simple random sampling technique using a random table number until proportionally allocated sample size gets its target.

Data collection method

All pregnant antenatal attendants were informed about the study and screening of all ANC attendants were done using a checklist of inclusion and exclusion criteria. Data on sociodemographic and predisposing factors were collected by face-to-face interview using a pretested structured questionnaire. The questionnaire was prepared in the English language, then translated to Amharic then to Gedeoffa and re-translated back to English to keep consistency. The translation was done by an individual who speaks fluently these three languages. The Amharic and Gedeoffa version were used to collect data through a face-to-face interview. Eight-degree holder health professionals: five midwifery nurses and two laboratory technologists were participated in the data collection process, whereas one health officer supervised the overall activities. All of them were selected from other health facilities in order to avoid bias. Moreover, a 2mL venous punctured blood sample was collected by trained laboratory technologist for syphilis serology using the rapid plasma reagin (RPR) test, and also one vaginal swab sample was collected by trained midwifery nurses for gram staining based on hospital's laboratory standard operating procedure from each participant. Study participants were taken as "case" if a serological test for syphilis indicated positive RPR and/or gram staining for gonorrhea identifies gram-negative diplococci. Study participants were taken as "controls" were negative for both tests.

Variables of the study

Dependent variable

Dependent variables are syphilis and gonorrhea.

Independent variables

Sociodemographic variables—age, marital status, occupation, educational status, residency, income.

Obstetric factors—gravidity, parity, history of abortion, history of stillbirth.

Behavioral risk factors—age of first sex, alcohol/drug use, multiple sexual partner, condom use, new sexual partner in the last 3 months.

Operational definition

Commercial sex worker. A woman who has her own means of income and engaged in a sexual practice by having sexual intercourse with others to get money, gift, or favor.

Risky sexual behavior. Sexually active woman who has sexual contact with a casual partner, or multiple sexual partners, or commercial sex worker or experience unprotected sex.

Unprotected sex. A sexual act with a casual partner or multiple sexual partners or commercial sex worker without or with occasional use of a condom.

Condom use. Consistent or non-interrupted condom utilization during all episodes of penetrative sexual act with all forms of sexual partners.

Vaginal practices. Vaginal practices include different behavioral activities such as douching or cleaning the vagina, which may be done for hygienic or other purposes.

Early sexual practice. Sexual commencement practiced during early adolescence (before age of 18 years) or when physical maturity is not well obtained.

Data management and analysis

First data were checked for completeness and consistencies by checking each variable for missing. Fortunately, no missing data were observed. After that, the data were coded and entered into Epi Info version 7 software and then exported to the Statistical Package for Social Science (SPSS) IBM version 20 for analysis. Descriptive statistics (mean \pm standard deviation, frequencies, and proportions) were used to summarize the sociodemographic characteristics of the study participants. Hosmer & Lomeshow goodness of fit and Omnibus test were used to check the fitness for logistic regression. Bivariable and multivariable analyses were used to ascertain the association between dependent and independent variables. All variables with p -value < 0.25 in the bivariable analysis were taken to the multivariable model to control for the possible confounders. From multivariable analysis, variables with an odds ratio of p -value $< 0.05\%$ and 95% confidence interval (CI) were taken as risk factors for STIs. Finally, the results were displayed using tables.

Data quality control

The training was given for a total of eight health professions (five BSc midwifery nurses, two BSc laboratory technologists, and one BSc health officer) prior to the study period for 3 days about the study. A pretest was conducted on 10% of the sample of similar study subjects in a non-study public health facility to identify the potential problems faced during data collection and to ensure the quality of data. After a little modification on the questionnaire, interviews were conducted in the study subjects.

Data collectors and supervisors reviewed every questionnaire for completeness and consistency before and after data collection. Double data entry of the questionnaire was performed by two data clerks independently in order to assure the quality of the data.

Specimen collection, labeling, storage, and transportation to the laboratory were carried out in accordance with existing standard operating procedures. Quality controls of the laboratory procedures were done in randomly selected 10% of the samples taken for screening by the lab technician who was blinded for the test according to manufacturers' specifications. Data quality and safety were ensured at all stages of data collection, entry, and analysis.

Ethical consideration

Ethical approval and clearance to commence the study were obtained from the Hawassa University College of Medical and Health science institutional review board. The reference number is IRB/063/10, issued on the date of 15 November 2018. In addition, letters of support and permission were also obtained from the concerned bodies of the Gedeo zone health department and DURH prior to the data collection. The interview was carried out only with the full consent of study participants. Before each interview, a clear explanation was given about the purpose and significance of the study for the study subjects, and written consent was obtained from each study participant. The confidentiality was kept by coding patient information and specimen.

The pregnant women who found infected with STIs were contacted confidentially and treated free of charge according to the guideline. They were also advised to inform their sexual partner(s) about the infection, encouraged to seek screening and treatment at a health institution of their choice.

Results

A total of 192 pregnant women (64 cases and 128 controls) who were attending ANC service and gave informed consent were recruited to this study. Of those cases, 40 were syphilis seropositive and the remaining cases were positive for gonorrhoea infection.

Sociodemographic characteristics of cases and controls for STIs

The age of the pregnant women attending ANC recruited in the study ranged from 18 to 40 years where the mean age was 26 years with standard deviation (SD) of 4.1. Of those, the mean age for cases was 26 years with SD of 4.8 and 25 years with 3.7 SD for controls.

The sociodemographic characteristics showed that the majority of the study participants were married (83.9%),

Table 1. Sociodemographic characteristics of study participants DURH, 2018.

Variable	Case no. (%)	Control no. (%)	Total no. (%)
Current age (years)			
<25	10 (15.6)	55 (43)	65 (33.9)
25–29	39 (60.9)	48 (37.5)	87 (45.3)
More than 30	15 (23.4)	25 (19.5)	40 (20.8)
Religion			
Protestant	33 (51.6)	50 (39.1)	83 (43.2)
Orthodox	19 (29.7)	53 (41.4)	72 (37.5)
Muslim	12 (18.8)	25 (19.5)	37 (19.3)
Ethnicity			
Gedeo	29 (45.3)	46 (35.9)	75 (39.1)
Oromo	4 (6.3)	21 (16.4)	25 (13)
Amhara	16 (25)	32 (25)	48 (25)
Gurage	15 (23.4)	29 (22.7)	44 (22.9)
Education			
Primary and less	41 (66.1)	44 (34.4)	85 (44.3)
Secondary and above	23 (35.9)	84 (65.6)	107 (55.7)
Occupation			
Privately employed	16 (25)	35 (27.3)	51 (26.6)
Govern. worker	12 (18.8)	39 (30.5)	51 (26.6)
Student	4 (6.3)	5 (3.9)	9 (4.7)
Housewife	32 (50)	49 (38.3)	81 (42.2)
Residency			
Rural	23 (35.9)	58 (45.3)	81 (42.2)
Urban	41 (64.1)	70 (54.7)	111 (57.8)
Marital status			
Single	8 (12.5)	10 (7.8)	18 (9.4)
Married	49 (76.6)	112 (87.5)	161 (83.9)
Divorce	7 (10.9)	6 (4.7)	13 (6.8)

DURH: Dilla University Referral Hospital.

housewife (42.2%), and multigravid (67.2%). More than half were living in urban settings (57%) and have secondary and above educational status (55.7%), as shown in Table 1.

Obstetric and behavioral factors

The majority of the study participants, 67.2%, were multigravid and 63.5% had two or more sexual partners in the past year, 16.1% had a history of stillbirth, 18.8% had a history of neonatal death, 34.4% had a history of abortion, and only 4.7% reported condom use (Table 2).

Factors associated with the curable STIs

In bivariate logistic regression analysis, pregnant women who were multigravid, aged below 25 years, had the previous history of stillbirth, history of abortion, and below the secondary in educational status were variables that showed

Table 2. Obstetric and behavioral factors associated with gonorrhoea and syphilis among pregnant women attending ANC in DURH, Gedeo zone, Southern Ethiopia, 2018.

Variable	Cases	Controls	Total no. (%)
Gravidity			
Primigravid	11 (17.5)	52 (82.5)	63 (32.8)
Multigravid	53 (41)	76 (59)	129 (67.2)
History of stillbirth			
Yes	17 (54.8)	14 (44.2)	31 (16.1)
No	47 (29.2)	114 (70.8)	161 (83.9)
History of neonatal death			
Yes	19 (52.7)	17 (47.3)	29 (18.8)
No	45 (28.8)	111 (71.2)	163 (81.3)
History of abortion			
Yes	34 (51.5)	32 (48.5)	66 (34.4)
No	30 (23.8)	96 (76.2)	126 (65.6)
Number of sex partner past year			
1	14 (20)	56 (80)	70 (36.5)
≥ 2	50 (41)	72 (59)	122 (63.5)
A new sex partner in the last 3 months			
Yes	9 (50)	9 (50)	18 (9.4)
No	55 (32.5)	119 (67.5)	174 (90.9)
Condom use			
Yes	3 (33.3)	6 (66.7)	9 (4.7)
No	61 (33.3)	122 (66.7)	183 (95.3)
Use of alcohol/drug			
Yes	17 (43.6)	22 (56.4)	39 (20.3)
No	47 (30.7)	106 (69.3)	153 (79.7)
Partner use alcohol/drug			
Yes	38 (33.9)	64 (66.1)	102 (53.1)
No	26 (28.8)	64 (71.2)	90 (46.9)

ANC: Antenatal Care; DURH: Dilla University Referral Hospital.

association with that of STI. In addition, starting first sexual practice before the age of 18 years, sexual partners' history of STIs, and having two or more sexual partners in the past year were associated risk factors for STIs in pregnant women.

In a multiple logistic regression analysis at $p < 0.05\%$ and 95% CI, all variables except age below 25 years and multigravidity revealed significant. Our study revealed that pregnant women with a previous history of abortion (AOR = 3.1, 95% CI: 1.4–6.6) were three times more likely to acquire STIs than pregnant without a history of abortion. Lower educational status (below secondary) increases the chance of STIs by 2.4 times as compared to pregnant with secondary or above secondary education (AOR = 2.4, 95% CI: 1.1–4.9). Having two or more sexual partners in the past year (AOR = 2.8, 95% CI: 1.3–5.9) had a higher likelihood of STIs as compared with one partner pregnant women. Another prominent factor associated with STIs was a sexual partners' history of STIs (AOR = 4.6, 95% CI: 1.8–11.5) in our findings (Table 3).

Discussion

Our finding indicated that lower educational status, age of first sex before the age of 18 years, history of abortion, having two or more sexual partners in the past years and sexual partner's history of STIs were significantly associated with gonorrhoea and syphilis infections. Identification of such factors may help for more efficient gonorrhoea and syphilis infections intervention which in turn reduces the vertical transmission of these diseases from mother to child.

Those pregnant women with lower educational status (include illiteracy, read and write, and primary school) had twice higher odds of gonorrhoea and syphilis than pregnant women with secondary and above educational status. This association has similarity with study reports from Ethiopia, Botswana, and Brazil.^{15–17} This might be explained as women with low educational levels might not have adequate knowledge about the transmission and prevention mechanisms of STIs and where to go for treatment. Therefore, they might be exposed to the diseases unintentionally.

Pregnant women who started sexual practice before the age of 18 years had higher odds of gonorrhoea and syphilis as compared with pregnant women started first sex after the age of 18 years in our study; the finding is similar to the studies done in Kenya and China.^{18,19} This might be due to the sociocultural status for early marriage of women or the earlier the onset of sexual life, the higher chance of having many sexual partners which increase vulnerability for gonorrhoea and syphilis infections. Anecdotal experience tells us women have no capability to drive to safe sex practice. And they are attracted by older promiscuous men who are more likely to transmit STIs than partners of the same age would be.

The odds of gonorrhoea and syphilis among pregnant women who had a previous history of abortion were higher than those who did not have. This finding is in line with studies finding from Tanzania, South Sudan, Juba, WHO.^{20–24} This might explain the fact that the adverse outcome occurred previously may be a result of undetected and untreated STIs, or that the infection was reacquired in the current pregnancy. Or it might be due to the use of contaminated equipment with STI patients during the abortion procedure.

In our findings, the odds of gonorrhoea and syphilis are twice higher among pregnant women who reported having two or more sexual partners in the past years than those who had only one partner. These findings were concordant with scientific studies from China and Brazil.^{15,25} This might be explained as having many sexual partners increase vulnerability for STIs due to unsafe sexual practices.

The study revealed that those pregnant women who had a sexual partner with a history of STIs were five times

Table 3. Factors associated with gonorrhoea and syphilis among pregnant women attending ANC in DURH, Gedeo zone, Southern Ethiopia, 2018.

Variable	Case no. (%)	Control no. (%)	COR	95% CI	AOR	95% CI	p-value
Current age (years)							
<25	10 (15.6)	55 (43)	3.3	1.3–8.4	2.9	0.9–8.7	0.058
25–29	39 (60.9)	48 (37.5)	0.7	0.34–1.6	0.64	0.3–1.6	0.342
More than 30	15 (23.4)	25 (19.5)	1		1		
Gravidity							
Primigravid	11 (17.2)	52 (40.6)	1		1		
Multigravid	53 (82.8)	76 (59.4)	3.29	1.57–6.9	1.1	0.3–3.9	0.847
Education							
Primary and below	41 (64.1)	44 (34.4)	3.4	1.8–6.4	2.4	1.1–4.9	0.024
Secondary and above	23 (35.9)	84 (65.9)	1		1	1	
History of abortion							
Yes	34 (56.1)	32 (25)	3.4	1.8–6.4	3.1	1.4–6.6	0.003
No	30 (46.9)	96 (75)	1		1		
History of stillbirth							
Yes	17 (26.6)	14 (10.9)	2.95	1.34–6.5	2.6	0.9–6.9	0.064
No	47 (73.4)	114 (89.1)	1		1		
Age of first sex (years)							
<18	45 (70.3)	54 (42.2)	3.24	1.7–6.2	2.8	1.3–5.9	0.01
≥18	19 (29.7)	74 (57.8)	1		1		
Number of sex partners							
1	14 (21.9)	56 (43.6)	1		1		
≥2	50 (78.1)	72 (56.3)	2.77	1.4–5.5	2.5	1.1–5.7	0.032

AOR: adjusted odds ratio; COR: crude odds ratios; CI: confidence interval; ANC: Antenatal Care; DURH: Dilla University Referral Hospital. Bold values signifies p value < 0.05.

more likely to be infected with gonorrhoea and syphilis. This finding is in agreement with the study done in China.²⁵ This might be a result of the nature of the disease is asymptomatic in most of the cases and the partners might not seek treatment for the infections. Therefore, if there is unprotected sex, the chance of acquiring the diseases is higher.

Overall, this study is very helpful to fill the scarce information regarding determinants of gonorrhoea and syphilis among pregnant women. However, the study has some limitations. Of which, this study is a hospital-based study and includes only pregnant women who attend ANC, which might not represent the general population of pregnant women. Another limitation is the use of only serological tests for the diagnosis of syphilis and gram stain for gonorrhoea, which may lead to misclassification bias. Furthermore, since sexual-related issues are culturally and socially sensitive, risk behaviors and STI histories may have a potential social desirability bias.

Conclusion

Sociodemographic, obstetric, and behavioral factors were found to be associated with STIs among pregnant women in the study area. Lower educational status, starting first sexual practice before the age of 18 years, previous history of abortion, and having two or more sexual partners in the

past year were significantly associated with STIs among pregnant women in the study area.

Strengthening the existing screening and treatment of pregnant women in the first antenatal visit for syphilis. There is a need for initiation of screening and treatment for gonorrhoea and other STIs by prioritizing pregnant women with the risk characteristics identified in the study. Strengthen partner testing and treating for STIs to avoid re-infection and to decrease mother-to-child transmission of both infections. There is a need for regular health education for pregnant women at antenatal clinic to inform them about their health, avoidance of risky behaviors, and the risk of STIs on their pregnancy. Further population-based research needs to be done.

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Authors' contributions

K.H. initiated the study, collected the data, analyzed, and prepared. A.G. conceived the study analyzed, revised, and finalized the MS. Both authors read and approved the final version of the manuscript.

Availability of data and materials

The datasets generated and/or analyzed during the current study available from the corresponding author on reasonable request.

Declaration of conflicting interests

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References

1. Kimberly AW and Gail AB. *Sexually transmitted diseases treatment guidelines* (64(RR3); 1-137). Atlanta, GA: CDC, 2015.
2. WHO. *Global prevalence and incidence of selected curable sexually transmitted diseases, overview and estimates*. Geneva: WHO, 2016.
3. WHO. *Global prevalence and incidence of selected curable sexually transmitted diseases, overview and estimates*. Geneva: WHO, 2012.
4. Joseph Davey DL, Shull HI, Billings JD, et al. Prevalence of curable sexually transmitted infections in pregnant women in low- and middle-income countries from 2010 to 2015: a systematic review. *Sex Transm Dis* 2016; 43(7): 450–458.
5. Chico RM, Mayaud P, Ariti C, et al. Prevalence of malaria and sexually transmitted and reproductive tract infections in pregnancy in sub-Saharan Africa: a systematic review. *JAMA* 2012; 307(19): 2079–2086.
6. Watson-Jones D, Changalucha J, Gumodoka B, et al. Syphilis in pregnancy in Tanzania: impact of maternal syphilis on outcome of pregnancy. *The Journal of Infectious Diseases* 2002; 186(7): 940–947.
7. Adachi K, Nielsen-Saines K and Klausner JD. Chlamydia trachomatis infection in pregnancy: the global challenge of preventing adverse pregnancy and infant outcomes in sub-Saharan Africa and Asia. *Biomed Res Int* 2016; 2016: 9315757.
8. Central Statistical Agency [Ethiopia] and ICF International. *Ethiopia Demographic and Health Survey 2011*. Addis Ababa, Ethiopia; Calverton, MD: Central Statistical Agency [Ethiopia] and ICF International, 2012.
9. Federal Democratic Republic of Ethiopia Ministry of Health (FMOH). *National guidelines for the management of sexually transmitted infections using syndromic approach*. Addis Ababa, Ethiopia: FMOH, 2015.
10. Ethiopian Public Health Institute (EPHI). *Report on the 2014 round antenatal care based sentinel HIV surveillance in Ethiopia*. Addis Ababa, Ethiopia: EPHI, 2015.
11. Tiruneh M. Seroprevalence of multiple sexually transmitted infections among antenatal clinic attendees in Gondar Health Center, Northwest Ethiopia. *Ethiop Med J* 2008; 46(4): 359–366.
12. Schönfeld A, Feldt T, Tufa TB, et al. Prevalence and impact of sexually transmitted infections in pregnant women in central Ethiopia. *Int J STD AIDS* 2017; 29(3): 251–258.
13. Gedeo Zone Health Department. *Demography of Gedeo Zone*. Dilla, Ethiopia: Gedeo Zone Health Department, 2017.
14. Melku M, Kebede A and Addis Z. Magnitude of HIV and syphilis seroprevalence among pregnant women in Gondar, Northwest Ethiopia: a cross-sectional study. *HIV AIDS* 2015; 7: 175–182.
15. Macedo VC, Lira PIC, Frias PG, et al. Risk factors for syphilis in women: case-control study. *Rev Saude Publ* 2017; 51: 78.
16. Endris M, Deressa T, Belyhun Y, et al. Seroprevalence of syphilis and human immunodeficiency virus infections among pregnant women who attend the University of Gondar Teaching Hospital, Northwest Ethiopia: a cross sectional study. *BMC Infect Dis* 2015; 15(1): 111.
17. Romoren M, Sundby J, Velauthapillai M, et al. Chlamydia and gonorrhea in pregnant Botswana women: time to discard the syndromic approach? *BMC Infect Dis* 2007; 7(1): 27.
18. Masha SC, Wahome E, Vaneechoutte M, et al. High prevalence of curable sexually transmitted infections among pregnant women in a rural county hospital in Kilifi, Kenya. *PLoS ONE* 2017; 12(3): e0175166.
19. Ma Q, Ono-Kihara M, Cong L, et al. Early initiation of sexual activity: a risk factor for sexually transmitted diseases, HIV infection, and unwanted pregnancy among university students in China. *BMC Public Health* 2009; 9: 111.
20. Yahya-Malima K, Evjen-Olsen B, Matee M, et al. HIV-1, HSV-2 and syphilis among pregnant women in a rural area of Tanzania: prevalence and risk factors. *BMC Infect Dis* 2008; 8(1): 75.
21. Newman L, Kamb M, Hawkes S, et al. Global estimates of syphilis in pregnancy and associated adverse outcomes: analysis of multinational antenatal surveillance data. *Plos Med* 2013; 10(2): e1001396.
22. Gomez GB, Kamb ML, Newman LM, et al. Untreated maternal syphilis and adverse outcomes of pregnancy: a systematic review and meta-analysis. *Bull World Health Org* 2013; 91(3): 217–226.
23. Hollier LM and Workowski K. Treatment of sexually transmitted infections in pregnancy. *Clin Perinatol* 2005; 32(3): 629–656.
24. Emmanuel SK, Lado M, Amwayi S, et al. Syphilis among pregnant women in Juba, Southern Sudan. *East Afr Med J* 2010; 87(5): 192–198.
25. Zhou H, Chen XS, Hong FC, et al. Risk factors for syphilis infection among pregnant women: results of a case-control study in Shenzhen, China. *Sex Transm Infect* 2007; 83(6): 476–480.