

SAINT PAUL'S HOSPITAL MILLENIUM MEDICAL
COLLEGE

DEPARTMENT OF PUBLIC HEALTH



SEROPREVALENCE OF SYPHILIS AND ASSOCIATED FACTORS
AMONG PREGNANT WOMEN ATTENDING ANTENATAL
CLINIC IN GAMBELLA HOSPITAL, GAMBELLA, ETHIOPIA, 2017

BY: LEZHIALEM ALMAW (BSc)

ADVISORS: Dr. ELIAS SENBETO (MPH, PhD)

Mrs. YEMISRACH ABEJIE (BSc, MPH)

A THESIS SUBMITTED TO THE DEPARTMENT OF PUBLIC HEALTH, IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF PUBLIC HEALTH IN FIELD EPIDEMIOLOGY

March, 2018

ADDIS ABABA, ETHIOPIA

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SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE (SPHMMC)

DEPARTMENT OF PUBLIC HEALTH

Approval sheet (by advisor and Programme coordinator)

Declaration form

Letter for Declaration (body of work with thesis)

I, the undersigned, declared that this is my bona fide original work, has never been presented in this or any other university, and that all the resources and materials used for the body of work with thesis have been fully acknowledged.

Student Name: _____

Signature _____

Date _____

Place _____

Date of Submission _____

This body of work with thesis has been submitted for examination with our approval as **candidate's advisors.**

_____ Name of Primary Advisor	_____ Signature	_____ Date
_____ Name of Co Advisor	_____ Signature	_____ Date
_____ Name of FETP coordinator	_____ Signature	_____ Date

DEPARTMENT OF PUBLIC HEALTH GRADUATE STUDIES

FINAL BODY OF WORK WITH THESIS APPROVAL FORM

As members of the Board of Examiners of the final body of work with thesis open defense, we certify that we have read and evaluated the body of work with thesis prepared by **LEZHIALEM ALMAW** under the thesis entitled “**Seroprevalence of syphilis and associated factors among pregnant women attending antenatal clinic in Gambella hospital, Gambella, Ethiopia, 2017**” and recommendation for the degree of Master of Public Health in Field Epidemiology.

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_____ Name External Examiner	_____ Signature	_____ Date

Final approval and acceptance of the body work with thesis is contingent upon the submission of the final both hard and soft copies of the body of work with thesis in the department of public health

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Acronyms

ANC.....	Antenatal Care
CI.....	Confidence Interval
GGH.....	Gambella General Hospital
RPR.....	Rapid Plasma Reagin
SOP.....	Standard Operating Procedure
SPHMMC.....	St.Paul's Hospital Millennium Medical College
SPSS.....	Statistical Packaging for Social Science
STD.....	Sexually Transmitted Disease
STI.....	Sexually Transmitted Infections
VDRL.....	Venereal Disease Research Laboratory
WHO.....	World Health Organizations

Table of Contents

Acknowledgement	I
Acronyms	IV
Table of Contents	V
List of Tables	VIII
List of Figures	IX
Abstract	X
1. Introduction	1
1.1. Background	1
1.2. Statement of the problem	1
1.3. Significance of the study	3
1.4. Conceptual frame work:	4
2. Literature review	5
2.1. Prevalence of syphilis	5
2.2. Determinant factors	8
3. Objective:	11
3.1. General Objective	11
3.2. Specific objectives:	11
4. Method and Materials	12
4.1. Study Design and Settings:	12
4.2. Study population with eligibility criteria:	13
4.3. Sample size determination:	13
4.4. Sampling Technique and Procedures:	14

4.5. Study Variables:.....	14
4.6. Data collection tools and procedures:	14
4.6.1. Laboratory method:.....	15
4.7. Operational definition:	15
4.8. Data Quality:	15
4.9. Data Analysis:	16
4.10. Ethical considerations:	16
4.11. Dissemination of Results	17
5. Result	18
5.1. Socio-demographic Characteristics of the Study Participants.	18
5.2. Knowledge status of the pregnant women	19
5.3. Seroprevalence of syphilis and associated risk factors	20
5.3.1. Socio-Demographic and knowledge related associated factors to Syphilis infection	21
5.4. Sexual behavior and risk factors for acquiring syphilis	23
5.5. Multivariate Analysis	25
6. Discussion	27
7. Limitation.....	30
8. Conclusion	31
9. Recommendation	32
7. Reference	33
Annex I: English version of participant information sheet, consent and questionnaire:	37
1.1. Participant information sheet	37
1.2. Informed consent:	38
1.3. Questionnaire	39
Annex II: Amharic version of participant information sheet, consent and questionnaire	44

2.1. የጥናቱ መረጃና መግለጫ ቅጽ	44
2.2. ስለ ስምምነቱ ማረጋገጫ ቅጽ	45
2.3. የጥናቱ መጠይቅ ቅጽ:	45
Annex IV: Syphilis Standard operating procedures (SOP).....	48

List of Tables

Table 1: Socio-demographic characteristics of pregnant women attending at Gambella General Hospital, September to November 2017, Gambella, Ethiopia.....	18
Table 2: Knowledge status of pregnant women attending ANC clinic at Gambella General Hospital, Gambella, Ethiopia, 2017	20
Table 3: Association of possible risk factors related to syphilis infection in pregnant women attending ANC at Gambella General Hospital, Gambella, Ethiopia, 2017.	21
Table 4: Association of sexual behavior and risk factors related to syphilis infection in pregnant women attending ANC at Gambella General Hospital, Gambella, Ethiopia, 2017.....	23
Table 5: Multivariate analysis of possible predictors of syphilis among pregnant women attending Gambella General Hospital ANC, Gambella, Ethiopia, 2017	25

List of Figures

Figure 1: Conceptual framework showing the factors associated with syphilis among pregnant women ANC attendant.....	4
Figure 2: Map showing study area, Gambella region.	12

Abstract

Background: Syphilis is one of the sexually transmitted infections caused by bacteria and it is transmitted through sexual contact, via blood transfusion, or transplacentally. In 2008 there were 1,360,485 pregnant women with active syphilis infections. In Ethiopia the prevalence of syphilis among antenatal care attenders has been quantified and survey every two year has been undertaken and showed that 9% prevalence of syphilis was highest in gambella hospital.

Objective: To assess seroprevalence and associated factors of syphilis infections among pregnant women attending antenatal care at Gambella General Hospital, Gambella , Ethiopia, 2017.

Methods: The study was conducted at Gambella General Hospital from November to December. Pregnant women attending antenatal clinics were study population. Cross sectional study design was employed. The sample size calculated was 385 pregnant women. Data was entered and analysed using Statical Packaging for Social Science (SPSS). Variables in multivariate analysis with p-value < 0.05 were considered statistically significant. Ethical clearance was obtained and confidentiality maintained.

Result: The overall sero prevalence of syphilis was 11.9%. About 45.6% of the sero positive mothers were found in 26-30 age categories. Six (8.5%) of respondents with genitourinary symptoms were reactive for VDRL test. The prevalence of syphilis was 24.0% for mothers who had abortion. Mother history of sexually transmitted disease; adjusted odds ratio (AOR) : 8.488; 95%CI: 3.289-21.906), Mother who had extra sexual partner (AOR: 7.510; (95%CI: 2.839-19.863), husband, who had extra sexual partner (AOR: 6.005; 95% CI: 2.487-14.495), history of abortion (AOR: 5.082; 95%CI: 2.043-12.646) and husband travel history (AOR: 3.191; (95%CI: 1.402-7.262) were significantly associated with syphilis infections.

Conclusion and Recommendation: Syphilis infection among pregnant women in Gambella hospital was high-intermediate. Mother history of abortion, mother extra sexual partner relationship, travel history of husband, multi sexual partnership of husband and mother history of sexual transmitted disease associated with syphilis infection. Health education needs to be provided to mothers and husband about possible risk factors.

Key words: Syphilis, Gambella, prevalence

1. Introduction

1.1. Background

Syphilis is one of the sexually transmitted infections (STI) caused by the bacteria known as *Treponema pallidum* that results in substantial morbidity and mortality which is a fragile spiral bacterium with 6-15 micrometer long by 0.25 micrometer in diameter; the bacteria can survive only briefly outside of the body (1). Syphilis is transmitted through sexual contact with infectious lesions of the mucous membranes or abraded skin, via blood transfusion, or in utero by transplacental passage of the *Treponema* from a pregnant woman to her fetus. The risk of transmission is related to the maternal *Treponema* load; hence early maternal infection carries a much greater risk of transmission than late infection. Congenital syphilis is due to hematogenous dissemination of *Treponema pallidum* from untreated or inadequately treated pregnant women to their fetus, via the placenta untreated, the disease lasts many years and is divided into stages (2,3).

Early syphilis consists of primary syphilis, secondary syphilis and early latent syphilis, while late syphilis consist of late latent syphilis and tertiary syphilis (3). Syphilis may go clinically unnoticed, especially in women, in whom even the primary stage may not have visible symptoms. It is paramount that pregnant women be examined many times during antenatal care (ANC) in order to detect any suggestive finding on physical examination; however, both the detection and diagnosis of syphilis are based chiefly on routine serological tests. Syphilis more than any other bacterial and curable sexually transmitted infection, has greater potential to cause adverse birth outcomes when the diagnosis is missed (4).

Syphilis is estimated to cause over 500,000 adverse pregnancy outcomes per year, like spontaneous abortion, stillbirth, prematurity, clinical manifestations of congenital syphilis, infant death, and late sequelae; seventeen percent of all adverse pregnancy outcomes in unscreened women were attributable to maternal syphilis(4).

1.2. Statement of the problem

Syphilis is still serious public health issue in the modern world both in developed and developing country. Approximately 12 million new cases of syphilis detected each year and more than 2

million occur in pregnant women (5). The risk of contracting syphilis through a sexual contact with a person that has primary or secondary syphilis is 30–50% (5).

Worldwide, a million pregnancies are adversely affected each year by syphilis because of maternal infection. About 270 000 babies are born with congenital syphilis, 460 000 pregnancies end with abortion or perinatal death. Furtherly, vertical transmission can occur at any time during pregnancy and at any stage of syphilis but it is more common in primary (50%) and secondary syphilis (50%), compared with early latent (40%), late latent (10%) and tertiary syphilis (10%) (6,7).

World Health Organization (WHO) estimates that in 2012 there were approximately 950 000 maternal syphilis infections; that resulted in 360 000 adverse outcomes, including 150 000 early fetal deaths or stillbirths, 110 000 infants with congenital infection, 60 000 neonatal deaths, and 50 000 preterm or low-birth-weight infants (8). In 2008 there were 1,360,485 pregnant women with active syphilis infections; the estimated number of infected pregnant women by region was (44.3%) in Asia, (39.3%) in Africa (7.8%) in the Americas, (4.0%) in the Pacific (3.0%) in the Mediterranean and (1.6%) in Europe (9).

In Brazil, more than 100,000 cases were reported during pregnancy between 2005 and 2014 (10). The burden of syphilis in pregnancy was greatest in Africa, representing 63.1% of global maternal infections and 64.0% of adverse outcomes and the lowest was in Europe, representing 2.0% of maternal infections and 1.2% of adverse outcomes (10).

In Africa, its prevalence among pregnant women has been found to vary from 1.2 % in Nigeria (11), to 9.3% in Zambia (12) and 22.1% in south Sudan (13). Ethiopia is a country where maternal syphilis is highly prevalent; The prevalence of syphilis among ANC attendants has been quantified and survey every two year has been undertaken since 1989 (14).

Syphilis infections have been causing a serious pregnancy related problems with high morbidity and mortality effect. As a result; Understanding the burden of these infections in pregnant women is an integral part to develop strategy for prevention and to emphasis on providing integrated service. Similarly a plenty of research has been done in different regions of Ethiopia especially on syphilis prevalence and few were done on its determinant factors; even though data was not available that was done in Gambella region to rollout those determinant factors for

syphilis disease among ANC attendants. In Ethiopia the prevalence of syphilis was high in the past three consecutive survey periods. National ANC survey conducted in Ethiopia showed that 9% prevalence of syphilis was highest in Gambella General hospital compared to other regions and even more than the national 1.2% prevalence(15). Hence, there was a recommendation placed that further research need to undertake in Gambella region aiming to determine the possible determinant factors for high syphilis prevalence in the region. Therefore; this study provided a data on the current burden and determinant factors of this infection at Gambella General Hospital.

1.3. Significance of the study

Syphilis infections are the major causes for the development of different complications during pregnancy worldwide. The result of this study will be used by Programme managers, health planners or policy makers and other concerned bodies to initiate the relevant intervention measures and screening packages in pregnant women.

Generally, this study used to:

- ❖ Find out the current burden of syphilis among pregnant women in the study area.
- ❖ Identify the possible determinant factors for acquisition of this infection among pregnant women in the area.
- ❖ Identify gaps that help to design a strategy for prevention of syphilis infection transmission among pregnant women in the area.
- ❖ Draw the attention of stake holders to focus on such life threatening but preventable infection.
- ❖ It may also serve as a baseline data for the coming researchers who are interested in related topics.

1.4. Conceptual frame work:

The study used this conceptual framework, which was developed after referring different literatures. The detail of conceptual framework displayed as follow and the arrows in the diagram show the relationship between dependent and independent variables.

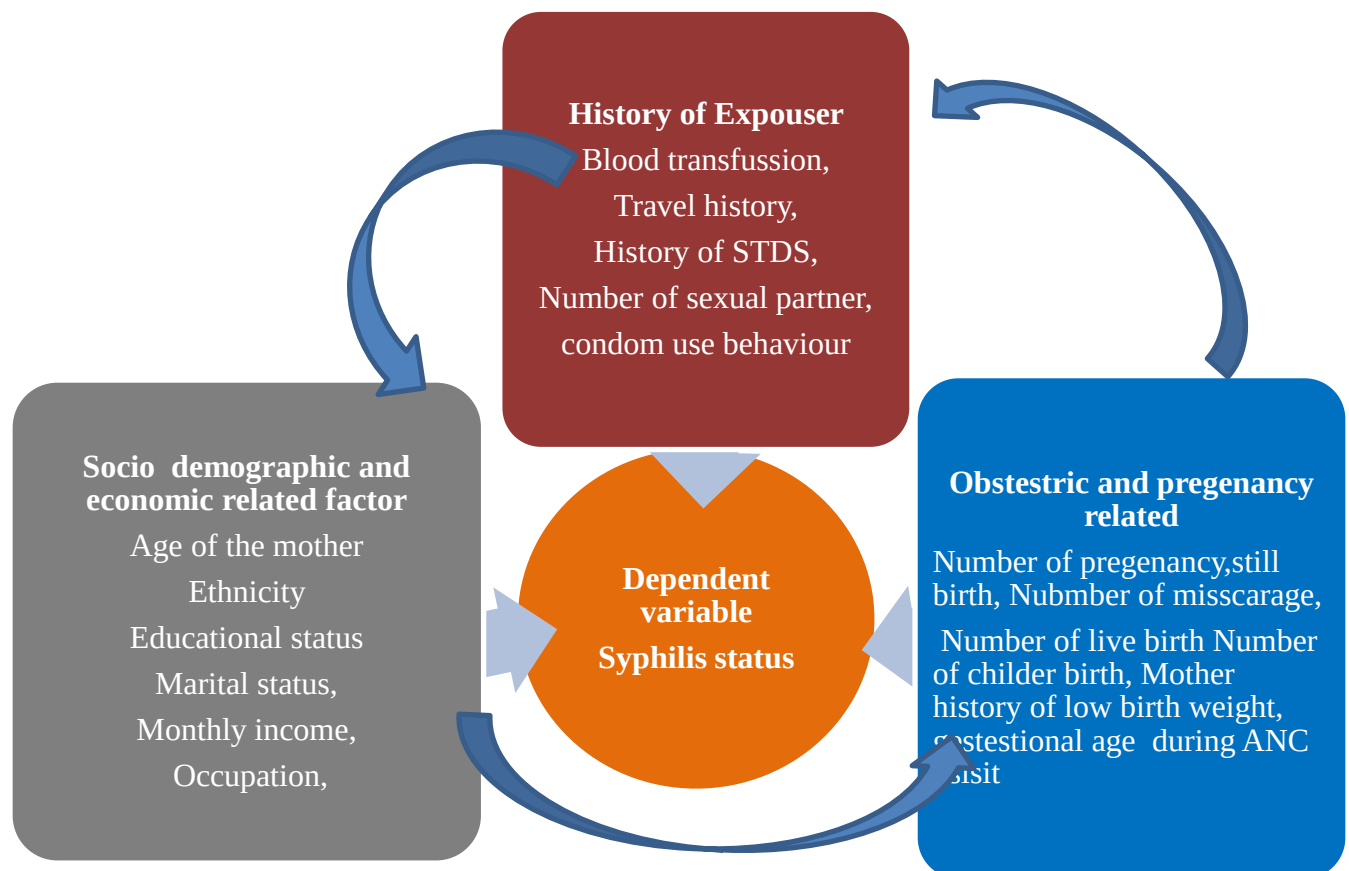


Figure 1: Conceptual framework showing the factors associated with syphilis among pregnant women ANC attendant.

2. Literature review

2.1. Prevalence of syphilis

A syphilis infection is well recognized worldwide but has been reported to be more common in developing countries especially in Africa and Asia. Perhaps it's wide spread all over the world; different epidemiological studies suggest that the prevalence of such common sexually transmitted infections has been shown to vary from one country to other among different groups k(5).

A study conducted by Gabriela T et al, from 2010 to 2013 on seroprevalence of syphilis among pregnant women in the Varna region (Bulgaria), the prevalence of syphilis was in range 0.43% in 2010 and 0.74% by 2013 (16).

A cross-sectional prevalence study done on women attending ANC in Karachi, Pakistan on 2007, with Prevalence of syphilis among antenatal clinic attendees, the prevalence of syphilis found to be less than 1 percent (0.9%) (17).

A study conducted on Sero prevalence of syphilis infection among patients attending antenatal Care & Sexually transmitted disease (STD) clinics among 17440 pregnant women in Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh, India by Nazish Fatima, et al, 2014 showed that 23 (0.15%) were found to be positive by Venereal Disease Research Laboratory (VDRL) (2).

Baseline report on global sexually transmitted infection surveillance 2012, indicated the prevalence of syphilis among ANC attendee: Argentina (1.1%), Brazil (1.2%), Chile (0.2%) Algeria (1.9%) and Togo (1.2%) (18).

Cross sectional study done in Tanzania in 2011, shown syphilis seroprevalence of 2.5% and (27) likewise study conducted by Jacob Sakala, et al., on 2015 in Zambia ,reveled the overall prevalence of syphilis was 9.3% (12).

Survey done in South Africa on the year 2010, national prevalence of syphilis shows a 0.4% decrement where the prevalence was 1.8% in 2009 to 1.5% in 2010 (28).

A study done in Nigeria in 2011, on *Treponema pallidum* Infection among a Cohort of Pregnant Women with 185 consenting women, with prevalence of syphilis 0.5% (6). Similarly a study conducted in Maiduguri, Nigeria on prevalence of syphilis among pregnant women of 108 serum samples syphilis prevalence was 1.9% (24).

Study in Tanzania done by Sia E Msuya, et al on 2009 to determine Prevalence of sexually transmitted infections among 2654 pregnant women, 0.9% of syphilis prevalence was found (19).

In a cross-sectional study conducted among 7069 pregnant women attending antenatal clinics in Cameroon to assess the Hepatitis B, HIV, and Syphilis Seroprevalence in Pregnant Women by Jodie Dionne-Odom et al, 2014 shows with an overall prevalence of 4% for syphilis (20).

On the other study to correlates syphilis sero-reactivity on pregnant women among a total of 2270 women with HIV-infected and 366 with HIV-uninfected in countries, Malawi, Tanzania, and Zambia antenatal syphilis prevalence rates were 2.7% ,7.2% and 8.2% respectively (21).

Similar cross-sectional study conducted in Ikot Ekpene, Nigeria by Etim Inyang E et al, in 2011 to determine prevalence of sexually transmitted diseases among pregnant women in a total of 562 pregnant shows with overall seroprevalence syphilis was found to be 1.2%. In this study 1.9% highest prevalence syphilis was seen among 73/108 those women who visited on first trimester (1-13Weeks) most of them were civil servant and 1.4% were married by marital status women (11).

In Kenya, a study done among 13,478 pregnant women attending care of age ranging 15-49 ,the prevalence of syphilis was 0.2% (22).

In Namibia, the 2014 national syphilis sentinel surveillance done among ANC attendant showed as the over prevalence of syphilis be 1.9% (23).

In south Sudan, a cross-sectional study conducted to determine prevalence and associated factors for syphilis in pregnant women attending selected antenatal clinics showed with syphilis prevalence of 22.1% within the study (13). Similarly ANC survey done on assessing the magnitude of HIV and Syphilis at 35 sentinel surveillance site among ANC attendee, South Sudan for the year 2012 shows with a seroprevalence 8.3% (25).

In Sudan, a study done on seroprevalence of syphilis among pregnant women in Khartoum, Sudan on 100 pregnant ANC attendant women by Abdel-bagi et al., 2008 maternal syphilis prevalence found to be 9% (26).

Study done by Elizabeth D, et al, on prevalence and significance of sexually transmitted diseases, among 342 pregnant women attending ANC in Addis Ababa two teaching hospitals shown seroprevalence of syphilis be 28% (29).

In a cross sectional study conducted by E. Kebede and B.Chamiso in Addis Ababa, on 1997 with prevalence of syphilis in pregnant women were carried out among 410 antenatal attendants, with the study 2.9% prevalence of syphilis was found (30).

Prospective cross sectional study done in 2005, by Andargachew M. et al, on Seroprevalence of syphilis and HIV-1 during pregnancy in a teaching hospital in northwest Ethiopia among 480 pregnant women, the syphilis prevalence was 1% and (31).

Similarly, a study done by Mengistu E et al, 2011 in Gondar teaching Hospital, Northwest Ethiopia, the overall prevalence of syphilis among pregnant women was 2.9%. (32).

In north east Ethiopia, a study done by Mulugeta M.et al in 2012, on magnitude of HIV and syphilis seroprevalence among 300 ANC attendant pregnant women was 3.7% (33).

Similarly, national ANC sentinel survey of Ethiopia, in 2014, among 53,431 pregnant women the overall national syphilis prevalence was 1.2% and syphilis prevalence was 0.7% in urban and 1.3% in rural sites respectively; likewise the syphilis prevalence in 2012 round were 0.7% in urban and 1% in rural sites, but the syphilis prevalence was 0.7% in urban and 1.3% in rural sites in 2014 round. (15).

In national ANC sentinel survey of Ethiopia in 2009, the highest and lowest syphilis prevalence was reported from Gambella (4.7%) and Dire Dawa (0.1%); moreover 4.7% and 6.7% syphilis prevalence was reported from urban and rural setting of Ethiopia respectively (34).

According to, report on the 2014 round antenatal care based sentinel HIV surveillance in Ethiopia the prevalence of syphilis in Gambella region with 390 pregnant mothers was 5.0 %; the

high syphilis figure were reported from Gambella General Hospital with a magnitude of 9% syphilis prevalence (15).

2.2. Determinant factors

A study conducted by Gabriela T et al, from 2010 to 2013 on seroprevalence of syphilis among pregnant women in the Varna region (Bulgaria), mother's place of residence has association with syphilis (16).

A cross-sectional prevalence study done on women attending ANC in Karachi, Pakistan on 2007, with prevalence of syphilis among antenatal clinic attendees; on this study women married to men with a lower educational background ,history of still birth and abortion was associated with contracting syphilis (17).

A study done in Nigeria in 2011, on *Treponema pallidum* infection among a cohort of pregnant women with 185 consenting women age group 31-40 were the risk factor for syphilis (6).

On the other study to correlates syphilis sero-reactivity on pregnant women among a total of 2270 women with HIV-infected and 366 with HIV-uninfected in countries, Malawi, Tanzania, and Zambia thus HIV infection (OR = 3.3), maternal age 20 to 24 years (OR = 2.5, being divorced/widowed/ separated (OR = 2.9, having had treatment for genital ulcers in the last year (OR = 2.9), history of stillbirth (OR = 2.8 for one stillbirth; OR = 4.3 for 2–5 stillbirths), or having had a preterm delivery (OR = 2.7 for one preterm delivery) were identified risk factors for the prevalence of syphilis (21).

In Kenya, a study done among 13,478 pregnant women attending antenatal care of age ranging 15-49 within this study age 35-49 and living in rural area were identified as a determinant factors (22).

A study conducted in Maiduguri, Nigeria on prevalence of syphilis among pregnant women of 108 serum sampled women with in this social demographic variable such as age, gravidity, trimester and history of blood transfusion were not statically significant with contracting syphilis (24).

In south Sudan, a cross-sectional study conducted to determine prevalence and associated factors for syphilis in pregnant women attending selected antenatal clinics being a housewife, history of

abortion, attending ANC for previous pregnancy and history of partner travel were determinant factors associated with syphilis (13).

Similarly ANC survey done on assessing the magnitude of HIV and Syphilis at 35 sentinel surveillance site among ANC attendee, South Sudan for the year 2012 shows Pregnant women with no formal education, age group of 30 – 34 years, women with a history of two pregnancies, widowed women, and married women in polygamous relationships, married women in monogamous relationships were risk factor for syphilis (25).

In Sudan, a study done on seroprevalence of syphilis among pregnant women in Khartoum, Sudan on 100 pregnant ANC attendant women by Abdel-bagi et al., 2008 here the past history of genital ulcers was found to be significant with positive cases of syphilis (26).

Study done in Tanzania in 2011, among ANC attendant women having more than three previous pregnancies and attending semi-urban and rural ANC clinics were significant to syphilis(27).

A study conducted by Jacob Sakala, et al., on 2015 in Zambia revealed; abortion history, still birth, multiple sexual partners, previous maternal syphilis infection, partner history of sexually transmitted infection and maternal co-morbid conditions of HIV and genital ulcer disease were significantly associated to maternal syphilis (12).

In a cross-sectional study conducted by E. Kebede and B.Chamiso in Addis Ababa, on 1997 with prevalence of syphilis in pregnant women were carried out among 410 antenatal attendants, Meanwhile monthly income less than 600 birr/month was identified as the risk factor for syphilis (30).

Prospective cross-sectional study done in 2005, by Andargachew M. et al, on Seroprevalence of syphilis and HIV-1 during pregnancy in a teaching hospital in northwest Ethiopia among 480 pregnant women, on this study age had no association with syphilis seroprevalence (31).

Similarly, a study done by Mengistu E et al, 2011 in Gondar teaching Hospital, Northwest Ethiopia, in this study, women with a history of miscarriage and stillbirth had statistically significant association with syphilis sero-positivity (32).

In North East Ethiopia, a study done by Mulugeta M.et al in 2012, on magnitude of HIV and syphilis seroprevalence among 300 ANC attendant pregnant women on this study husband illiteracy was a determinant factor for syphilis (33).

3. Objective:

3.1. General Objective

To assess seroprevalence and associated factors of syphilis infections among pregnant women attending antenatal care at Gambella General Hospital, Gambella , Ethiopia, 2017.

3.2. Specific objectives:

-  To determine seroprevalence of syphilis infection among pregnant women.
-  To find out socio-demographic factors associated with syphilis
-  To assess sexual behavior and obstetric related factors associated with syphilis.

4. Method and Materials

4.1. Study Design and Settings:

Institution based, analytical cross-sectional study design was employed at the Gambella General Hospital (GGH), from November –December 2017.

The study was conducted at Gambella General Hospital located in Gambella Town administration, Gambella Regional State, which is about 777 km from the capital city of Ethiopia, Addis Ababa. Based on the 2007 Census conducted in Ethiopia, CSA total population projection documents that the total population of Gambella was 435,999 (consisting of 227,000 men and 208,999 women). Of those female populations 100,280 and 13,079 are child bearing female population and pregnant mothers respectively (35)(36).

It serves as a referral for more than 250 thousand people coming from various districts of the region. It has 95 beds for inpatient and outpatient health care services including ANC for pregnant women. Many pregnant women visit the ANC clinic in a year for routine pregnancy check-up services that include the assessment of pre-existing health conditions (screening for anemia, syphilis, HIV), vaccination, nutrition counseling, micronutrient supplementation and early detection of pregnancy related complications. The ANC clinic serves pregnant women five days in a week and mostly they are attended by midwives and nurses and the clinic serves on average 20 pregnant women visit the hospital for ANC utilization each day from Monday to Friday.

The laboratory department in the hospital provides routine screening services for pregnant women with trained laboratory professionals; a quality syphilis diagnosis is done in the hospital laboratory using non Treponema specific testing kits. The study was conducted between November 01, 2017 and last week of December, 2017.

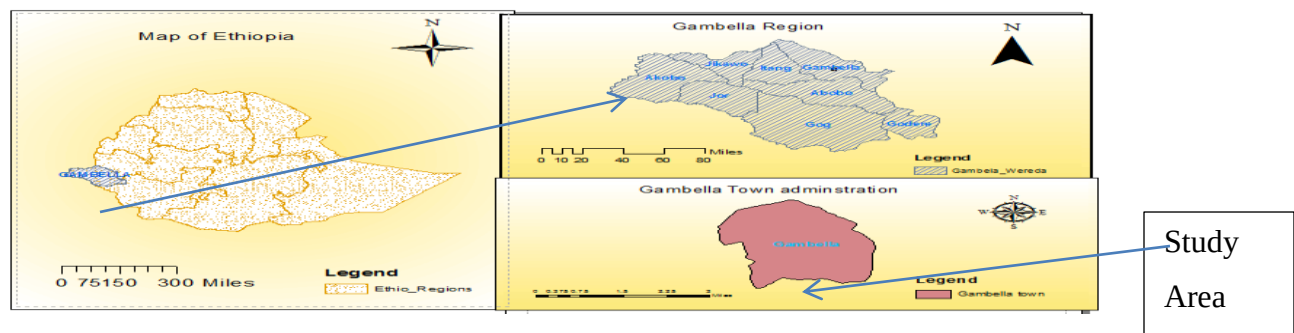


Figure 2: Map showing study area, Gambella region.

4.2. Study population with eligibility criteria:

The study populations were all pregnant women who were attending Antenatal care (ANC) clinic for check-up services at Gambella General Hospital during the study period.

Study subjects were pregnant women attending antenatal care clinics in Gambella general Hospital and provide consent and referred for serological test to the laboratory between November-December, 2017.

Inclusion Criteria: Any pregnant woman attending antenatal care clinics in Gambella General Hospital between November-December, 2017 was recruited for the study

Exclusion criteria: pregnant woman who was mentally sick and unable to respond by her own self was excluded from the study.

Pregnant mothers who attended the clinic for more than one visit were excluded.

4.3. Sample size determination:

Sample size was statistically calculated based on single population proportion formula by taking 9.0% prevalence of syphilis infection from previous study (15), desired precision of 3%, a 95% confidence level and 10% non- response rate was considered. In addition sample size was also calculated for the predictors'; then sample size was calculated by considering its prevalence and determinant factors. Finally, the calculated sample size indicated below:

$$n = \frac{(Z_{\alpha/2})^2 * p(1-p)}{d^2}, \quad n = \frac{(1.96)^2 * 0.09(1-0.09)}{(0.03)^2} = 350; 350 * 10/100 = 385$$

Where: n= sample size

$Z_{\alpha/2}$ = Z value at 95% CI [1.96]

p = prevalence of syphilis is = 9%

d = precision or degree of error (d = 0.03)

With the above inputs the sample size required including 10% non-response was 385.

Variables	CI (%)	Power (%)	Ratio (Exposed: Unexposed)	% of outcome in unexposed	AOR	% of outcome in exposed	Sample size	Reference #
Husband Educational status (Illiterate)	95	80	2	1.3	7.2	8.4	285	32
Occupation (house wife)	95	80	4.2	1.5	7.19	9.6	312	32

After computing the sample size using syphilis prevalence and based on its predictors the highest sample size was 385. It was considered in for the final study sample size

4.4. Sampling Technique and Procedures:

As a routine service delivery procedure of the ANC clinic, pregnant women were triaged and assigned to the ANC clinic. According to the sequence of their registration, they were allowed to enter into the ANC room for routine follow-up care one by one. Meanwhile, after the purpose of the study was explained to the subjects, they were asked to participate voluntarily in the study. All pregnant women with confirmed pregnancy and willing to involve were enrolled in this study. Pregnant mothers who attended the clinic for more than one visit during the study period were excluded. To avoid this, a unique mark was putted on cards of all enrolled mothers. Accordingly, pregnant women who attended the ANC clinic were on consecutive random enrolled until the desired sample size was attained. Information on socio-demographic and other pertinent data was collected by trained data collectors using a pre-tested structured questionnaire.

4.5. Study Variables:

Dependent variable: Seroprevalence of syphilis among pregnant women (VDRL test result status; Positive or Negative)

Independent variables: Age, educational status, history of blood transfusion, history of sexually transmitted diseases, number of pregnancy, number of child, miscarriage/abortion.

4.6. Data collection tools and procedures:

Data collectors were recruited from the same facility in which actual data was collected. One BSc Nurse, one BSc midwifery and two laboratory technologist were used. Before starting data collection for the actual study; the questionnaire was pre tested on 10% of the study population at

Gambella town health center. Finally, they were trained on the purpose of the study, the methodology, socio-cultural norms and questionnaire administering techniques. Information regarding socio-demographic, exposure history and obstetric characteristics of the study participants were collected using pretested questionnaires by face to face interview. The data collection tools were prepared in English and translated to Amharic language. After the collection of the information questionnaire was translated back to English to ascertain for its consistence. In the questionnaire, data like marital status, residence, self-reported history of prior still birth and/or miscarriage, occupation and education levels was included.

4.6.1. Laboratory method:

Five ml of venous blood was obtained in vacutainer tubes from each study participants as part of a routine ANC and used for sera preparation. Syphilis sero reactivity was tested using the Venereal Disease Research Laboratory (VDRL) as per the manufacturer's instructions and recommendations; the left over serum sample was used for performing the test.

4.7. Operational definition:

High Income: Those mothers who get greater than or equal 3,000 ETB per month.

Low income: Those mothers who get less than 3,000 ETB per month.

Syphilis positive: pregnant woman who tested positive by VDRL test kit.

Syphilis Negative: pregnant woman who tested negative by VDRL test kit.

Husband extra marital relationship: husband/sexual partner who had more than one wife and/or had sexual contact other than his wife.

Travel history of the mother: Mother who had traveled from her residence area/village irrespective to the frequency of journey

Travel history of the husband: Husband/pregnant mother's sexual partner who had traveled from his residence area/village irrespective to the frequency of journey.

4.8. Data Quality:

Before the start of the actual research data collection work, a two days training was given for all data collectors on overall objective, data collection tools and method of data collection, similarly

pilot study was done in adjacent health facility on 10% of the sample size in order to evaluate for the data collection tools of the questionnaire.

Likewise, to maintain the quality of laboratory results, standard operating procedures (SOPs) of the test kit's manufacturer was followed strictly. Positive and negative controls were run along with each batch of VDRL test kit

4.9. Data Analysis:

Data processing was made by checking in the field to ensure that all the information have been properly collected and recorded. Here before and during data processing, however, the information was checked again for completeness and consistency. The data collected by the questionnaire were checked and inspected for any unfilled variables and were managed accordingly.

Data was entered and analysed using SPSS version 21. The data was sorted, checked, categorized, coded and summarized. A descriptive statistical test such as proportion, frequency and median was carried out to compute the socio demographic, behavioral and the outcome variable of the study population. Binary logistic regression analysis was used to determine the association between predictor (explanatory) variables and the outcome variable with odds ratio at 95% confidence interval (CI). All explanatory variables with $P\text{-value} \leq 0.2$ in the bivariate analysis were included in multivariate logistic regression model. $P\text{-value} < 0.05$ in multivariate analysis was considered as statistically significance.

4.10. Ethical considerations:

The study obtained ethical clearance from Institutional Review Board (IRB) of the St. Paul's Hospital Millennium Medical College, Department of Public Health. Letter to perform the study was obtained from the department of public health to Gambella regional health bureau. Regional health bureau in turn wrote supportive letter to Gambella General Hospital; then the hospital administrator wrote permission letter to the ANC clinics as to start the study. All study participants were informed about the study and assured about the confidentiality, protection and anonymity of data. Written consent was obtained from each study participant prior to data collection and they participated voluntarily in the study. Laboratory results of Syphilis were reported to the ANC clinic with the consent of the mother for further management of infected

pregnant women and they were also advised not to have sexual contact unless their sexual partner gets tested of syphilis and treated.

4.11. Dissemination of Results

The results of the study is going to delivered to Gambella regional health bureau, Gambella General hospital and St.Paul's Hospital Millennium Medical College both in hard and soft copies just at the end of the research period.

5. Result

A total of 385 pregnant women were enrolled in the study. All women approached for participation were consented, interviewed and provided clinical samples (participation rate=100%)

5.1. Socio-demographic Characteristics of the Study Participants.

Regarding to the age group distribution of the respondents; median age of the study population was 26 years (IQR of 5). One hundred sixty eight women (43.6%) were in the age group of 26-30 years. Of all the study participants, 326 (84.7%) were living in urban settings. Within the ethnicity category; 96(24.9%) of them were Anywaa, followed by Nuer 75(19.5%), Oromo 49(15.3%) other ethnic group holds the rest of the percent. With respect to the marital status of the mothers majority 371(96.4%) of the pregnant mothers were married and the other (single, divorced and widowed) holds less than five percent of the respondents (See table 1).

Table 1: Socio-demographic characteristics of pregnant women attending at Gambella General Hospital, September to November 2017, Gambella, Ethiopia

Variables	Frequency	Percentage (%)
Age		
≤20	38	9.9
21-25	121	31.4
25-30	168	43.6
31-35	43	11.2
≥36	15	3.9
Residence of the mother		
Urban	59	15.3
Rural	326	84.7
Mother educational level		
Uneducated	72	18.7
Read and write	77	20.0
1-8	57	14.8
9-12	94	24.4
Higher Institution	85	22.1
Mother occupation		
Employed	113	29.4
House wife	157	40.8
Daily laborer	43	11.2
Merchant	57	14.8
Commercial sex worker	3	8.0

Others	12	3.1
Ethnicity		
Anywaa	96	24.9
Nuer	75	19.5
Majang	5	1.3
Kembata	53	13.8
Amhara	49	12.7
Oromo	59	15.3
Tigre	32	8.3
Wolayita	9	2.3
Others	7	1.8
Marital status		
Single	7	1.8
Married	371	96.4
Divorced	5	1.3
Widowed	2	0.5
Husband educational level		
Uneducated	84	21.8
Read and write	60	15.6
1-8	59	15.3
9-12	40	10.4
Higher Institution	142	36.9
Mother monthly income		
≤2000	277	72.0
2001-4000	79	20.5
≥4001	29	7.5

5.2. Knowledge status of the pregnant women

Of the total pregnant mothers who participated in the study less than half 170(44.2%) of the respondents didn't hear about syphilis; but 14(3.6%) of them don't know any clue about the syphilis. Similarly 153(76.1 of them don't know as the disease can transmit to unborn child through the placenta (table 2).

Table 2: Knowledge status of pregnant women attending ANC clinic at Gambella General Hospital, Gambella, Ethiopia, 2017

Variables		Frequency	percentage
Heard about Syphilis	Yes	201	52.2
	No	170	44.2
	I don't know	14	3.6
Knows ways of disease transmission	Yes	106	52.3
	No	95	47.7
Knows mother-child transmission	Yes	48	23.9
	No	153	76.1
Attending ANC reduce the risk to unborn child	Yes	82	40.7
	No	119	59.3

5.3. Seroprevalence of syphilis and associated risk factors

The overall seroprevalence of syphilis was 46/385(11.9%). About 45.6% of the sero-positive mothers were found in 26-30 age categories. The prevalence of syphilis was 18.6% and 10.7% in rural and urban respectively. Similarly of total reactive for VDRL test, more than three fourth (76%) of syphilis sero-positive were from urban setup. The prevalence of syphilis was 28.6% among single and 11.6% among married women. With regard to the educational level of the mothers the prevalence of syphilis was higher among those women who able to read and write 13 (28.2%) and those have attended higher education 12(26%).

From the total syphilis sero positive pregnant mothers, 15(32.6%) were Nuer and 9(19.5%) of them were Anywaa by ethnicity. Of the total syphilis sero-reactive pregnant mothers 43(93.45%) of them were married. High proportion, 65% of reactive pregnant mothers had monthly income of less than or equal to 2000 Ethiopian birr (ETB). Among 201 respondents who ever heard about syphilis 28(13.9%) of them were positive for syphilis

Only 5(15%) of the pregnant women were reactive for syphilis among those who had had blood transfusion previously. One hundred fifty two (39.4%) of ANC attendants had previous history of sexual transmitted disease; of them 30(20%) were infected with syphilis. Among those mothers who had previous history of genitourinary symptoms 6(8.5%) of them were reactive for VDRL test. Whereas, 83(21.5%) of husbands had had history of genitourinary symptoms of which 8(9.6%) of their sexual partner (Wives) were reactive for syphilis.

Fifty (12.9%) pregnant women and 121(31.4%) husband had extra sexual partner. Similarly prevalence of syphilis was slightly higher among those women who had more than one extra sexual partners 36% and 25.6% mothers were reactive among those whose partners have extra sexual partner relationship. The prevalence of syphilis was 19.5% among women who get pregnant for the fourth times and more followed by 19.3% for women on their third pregnancy number.

Nearly three fourth (73.3%) of the pregnant women were multigravida; 14% of them were positive for syphilis. likewise 127(48.4%) of the respondents had only single delivery. Of the 385 respondents, 104(27%) had had previous history of abortion; hereby the prevalence of syphilis was 24.0% among those who had abortion before.

5.3.1. Socio-Demographic and knowledge related associated factors to Syphilis infection

From socio demographic variables those were significant in bivariate analysis here each predictor tested with the dependent variables: Living in rural setup (OR: 1.905; 95% CI: 0.906-4.006; p= 0.089), Mothers who don't know how syphilis transmits (OR:0.465; 95% CI: 0.193-1.119; p=0.087), Mothers who don't know as syphilis transmit to newborn child (OR:0.465; 95% CI: 0.193-1.119; P=0.087) (see table 3).

Table 3: Association of possible risk factors related to syphilis infection in pregnant women attending ANC at Gambella General Hospital, Gambella, Ethiopia, 2017.

Variables	Categories	Non-Reactive N (%)	Reactive N (%)	COR at 95%CI	P-value
Mother educational level	No formal education	114(87.4%)	15(11.6%)	0.8(0.355-1.806)	0.592
	Primary	87(92.5%)	6(6.5%)	0.42(0.150-1.173)	0.098
	secondary	65(82.3%)	13(16.7%)	1.217(0.519-2.855)	0.652
	Higher education	73(86%)	12(14%)	1	
Residency	Urban	291(89.3%)	35(10.7%)	1	
	Rural	48(81.4%)	11(18.6%)	1.905(0.903-4.006)	0.089
Husband educational level	No formal education	127(88.2%)	17(11.8%)	0.867(0.430-1.745)	0.688
	Primary	54(91.5%)	5(8.5%)	0.599(0.213-1.689)	0.333
	Secondary	35(87.5%)	5(12.5%)	0.925(0.322-2.65)	0.884
	Higher institution	123(86.6%)	19(13.4%)	1	

5.4. Sexual behavior and Obstetric risk factors for acquiring syphilis

Sexual behavior related risk factor those were significant in bivariate analysis: mothers having previous history of STD (OR: 3.335; 95% CI: 1.748-6.363; P= 0.000), Husband who had travel history (OR:2.633; 95% CI: 1.383-5.014; P=0.003), Mother who had extra sexual partner before (OR:5.117; (95% CI: 2.522-10.382; P=0.000) were more likely to be positive for syphilis infection (Table 4).

Table 4: Association of sexual behavior and risk factors related to syphilis infection in pregnant women attending ANC at Gambella General Hospital, Gambella, Ethiopia, 2017.

Variables	Categories	Non-Reactive N (%)	Reactive N (%)	COR at 95%CI	P-value
Mother history of STD	Yes	122(80.3)	30(19.7)	3.335(1.748-6.363	0.000
	No	217(93.1)	16(6.9)	1	
Types of STDs mother infected	Syphilis	61(80.3%)	15(19.7)		
	Other than syphilis	47(81.1)	11(18.9)		
	Undetermined	14(77.8)	4(22.2)		
Mother travel history	Yes	113(88.3)	15(11.7)	0.968(0.502-1.860	0.922
	No	226(88)	31(12)	1	
Husband travel history	Yes	141(87.5)	20(12.5)	2.633(1.383-5.014)	0.003
	No	198(88.4)	26(11.6)	1	
Mother extra sexual partner relationship	Yes	32(64)	18(36)	5.117(2.522-10.382)	0.000
	No	307(91.6)	28(8.4)	1	
Husband extra sexual relationship	Yes	90(74)	31(26)	6.167 (3.078-12.359)	0.000
	No	249(94.3)	15(5.7)	1	
Number of pregnancy	≤ 2 pregnancies	218(92.8)	17(7.2)	1	
	>2pregnancies	121(79.7)	29(19.3% 0	3.073(1.60-5.80)	0.001
Number of delivery	One	114(89.7)	13(10.3)	1.54(0.700-3.424)	0.281
	Two	85(82.5)	18(17.5)	2.192(0.800-6.005)	0.127
	≥ Three	28(80)	7(20)	0.861(0.370-2.003)	0.729
	No delivery	112(90.)	11(10)	1	

History of abortion	Yes	79(75.9)	25(24.1)	3.918(2.08-7.375)	0.000
	No	260(92.1)	21(7.9)	1	
Transfusion	Yes	28(84.8)	5(15.2)	1.355(0.495-3.703)	0.554
	No	311(88.4)	41(11.6)	1	
Partner history of STD	Yes	101(82.3 %)	21(17.2%)	1.979(1.059-3.698)	0.032
	No	238(90.5 %)	25(9.5%)	1	
Mother Genitourinary Symptoms	Present	64(91.4)	6(8.5)	0.645(0.262-1.586)	0.339
	Absent	275(87.3)	40(12.7)	1	
Parent Genitourinary Symptoms	Yes	75(90.4)	8(9.6)	0.74(0.322-1.66)	0.465
	No	264(87.4)	38(12.6)	1	
Mother condom use	Yes	121(90.3 %)	13(9.7%)	1	
	No	218(87%)	33(13%)	1.409(0.714-2.779)	0.322
Mother past history of low birth weight	Yes	80(85.1%)	14(14.9%)	1.416(0.720-2.785)	0.313
	No	259(89%)	32(11%)	1	
Gestational age	First trimester	166(92.3 %)	12(6.7%)	1	
	Second trimester	15381.4%	22(12.6%)	1.899(0.952-4.156)	0.067
	Third trimester	20(61.5%)	12(37.5%)	8.300(3.292-20.93)	0.000
Age at first sexual contact	<18 years	143(82.2 %)	31(17.8%)	1	
	>=18 years	148(89.8 %)	15(9.2%)	2.139(1.108-4.130)	0.024

5.5. Multivariate Analysis

Results of multivariate logistic regression analysis indicated that few predictor variables showed statistically significant association with syphilis infection. Pregnant women who had history of abortion (AOR: 5.082; 95% CI: 2.043-12.646; P=0.000) , Pregnant women who had history of STD previously (AOR: 8.488; 95% CI: 3.289-21.906; P=0.000), Mother who had extra sexual partner (AOR: 7.510; (95% CI: 2.839-19.863; P=0.000), Husband or sexual partners who had extra sexual partner (AOR:6.005; 95% CI: 2.487-14.495; P=0.000), Husband/sexual partner who had traveled away from his residency area (AOR: 3.191; (95% CI: 1.402-7.262; p=0.006) (table 5).

Table 5: Multivariate analysis of possible predictors of syphilis among pregnant women attending Gambella General Hospital ANC, Gambella, Ethiopia, 2017

Variables	Category	Non-Reactive N (%)	Reactive N(%)	COR(CI)	AOR	p-value
Number of Pregnancy	≤ 2 pregnancies	218(92.8%)	17(7.2%0	1	1	
	>2 pregnancies	121(79.7%)	29(19.3%0	3.073(1.60-5.80)	1.199(0.450-3.193)	0.717
Gestational Age	First trimester	166(92.3%)	12(6.7%)	1	1	
	Second trimester	15381.4%	22(12.6%)	1.899(0.952-4.156)	0.894(0.368-2.172)	0.804
	Third trimester	20(61.5%)	12(37.5%)	8.300(3.292-20.93)	3.664(1.130-11.875)	0.300
Mother history of STD	Yes	122(80.3)	30(19.7)	3.335(1.748-6.363)	8.488(3.289-21.906)	0.000**
	No	217(93.1)	16(6.9)	1	1	
Travel history of Husband	Yes	141(87.5)	20(12.5)	2.633(1.383-5.014)	3.19(1.402-7.262)	0.006**
	No	198(88.4)	26(11.6)	1	1	
Mother extra sexual partner relationship	Yes	32(64)	18(36)	5.117(2.522-10.382)	7.51(2.839-19.863)	0.000**
	No	307(91.6)	28(8.4)	1	1	
Husband extra sexual partner	Yes	90(74)	31(26)	5.72(2.95-11.08)	6.005(2.487-14.495)	0.000**
	No	249(94.3)	15(5.7)	1	1	
History of abortion	Yes	79	25	3.918(2.08-7.375)	5.082(2.043-12.646)	0.000**
	No	260	21	1	1	

Parent history of STD	Yes	101(82.3%)	21(17.2%)	1.979(1.059-3.698)	1.15(0.97-1.97)	0.360
	No	238(90.5%)	25(9.5%)	1	1	
Age at first sexual contact	<18 years	143(82.2%)	31(17.8%)	2.139(1.108-4.130)	1.645(1.707-3.826)	0.248
	>=18 years	148(89.8%)	15(9.2%)	1	1	
Residency	Urban	291(89.3%)	35(10.7%)	1	1	
	Rural	48(81.4%)	11(18.6%)	1.905(0.903-4.006)	0.383(0.357-1.257)	0.212

** indicate variables significantly associated with syphilis infection.

6. Discussion

This study sought the seroprevalence of syphilis infections and identifying the possible associated factors among pregnant women attending at Gambella General Hospital and we found that the prevalence of syphilis among study participants was 11.9%. This finding is similar with a prevalence of 8.3% reported in south Sudan (25), 9% in Sudan (26), 9.3% in Zambia(12).But, relatively it is higher than 4.7%, 2.9%, and 0.1 % of prevalence which were reported from Gambella(34), Gondar (32) and Diredawa (34) respectively. Here our finding less than by two fold from the study reported 22.1% from south Sudan (13) and 28% from Addis Ababa (29). Likewise the finding still greater than the study reported from Malawi, Tanzania and Zambia with 2.7% 7.2% and 8.2% respectively (21). As far as the prevalence of syphilis concerned much smaller prevalence was reported from 1.1% Argentina, 1.2% brazil and 0.2% from Chile (18).This variation might be due to differences geographical variation, differences in cultural practices, sexual behavior and practices, and differences in the test methods employed to detect syphilis infection. This also attributed to the decreased in efficient syphilis screening at the ANC and effective treatment with antibiotics in the last few years.

In the present study, the prevalence of syphilis higher among the pregnant women whose age category lies from 26-30 years this finding was consistent with finding in Gondar(32) and India(2). The possible explanation for this finding could be that women in these age groups are more sexually active and they may have higher chance of multiple sexual partners. Syphilis prevalence was higher among age 30-35 thus as the age increase the prevalence of the disease increases. This goes in line with 2014 ANC survey done in Ethiopia(37). That was more likely because most of the women in this age category has gave more birth and they were multigravida.

The prevalence of syphilis among married women was 11.6%. This much figures of syphilis prevalence was quite higher as weigh with 1.4% of prevalence in Nigeria (11). It could be the higher number of the respondent in the study was married that showed the highest prevalence it might be as a fact of numerical advantage among married women (high proportion of married women in the study). Moreover they are less likely to use protective methods like condom and mostly uncommon among married couples.

The prevalence of syphilis was 6.7% and 37.5% for pregnant women who visited the hospital ANC on their first and third trimester gestational age respectively. In contrary with this finding,

syphilis prevalence was high among pregnant women who visited ANC on first trimester(11). That might be less habit of the pregnant women to visit ANC in their earlier pregnancy periods and late detection of the disease; hence mothers who visit ANC lately could have high syphilis prevalence. With the same speaking, it could also highlight low awareness of the pregnant mothers about the importance of visiting ANC in earlier pregnancy period.

The prevalence of syphilis was 18.6% and 10.7% in rural and urban respectively, where a bit higher in urban. This was much higher as compared with the national ANC sentinel report 0.7% in urban and 1.3% in rural sites in Ethiopia(37). It could be low educational level and poor knowledge on adequate prevention of sexually transmitted diseases in rural communities. Rural resident's differ from urban residents in terms of cultural and social behavior: rural communities are generally closed communities with limited access to medical information. Since syphilis is a treatable and curable disease and urban residents might have better health seeking behavior to get tested and treated earlier which could alter the status of syphilis.

In fact our study demonstrated that history of abortion; mother history of STDs, travel history of husband or sexual partners, history extra sexual partner of the mother and history of husband multiple sexual partners were significant predictors of syphilis infection. Pregnant women with history of abortion had five times (AOR: 5.082; 95% CI: 2.043-12.646) to develop syphilis infection compared to their counterpart. Similar results were reported from Gondar(32). Similarly study from other countries, they have shown similar findings in Pakistan(17), south Sudan(13) and Zambia(12). This high incidence of infection could be attributed to poor practices of infection prevention and control during abortion and related activities. It could be also less habit of the pregnant mothers to visit health facilities as soon as they get conceived.

Pregnant women who had history of STD previously (AOR: 8.488; 95%CI: 3.289-21.906; P=0.000) were eight times more likely of being infected by syphilis than those pregnant women who had no history of STD. Here our study, was compatible with study done in Zambia(12); where pregnant women having previous history of STDs were found to be at increased risk for syphilis. That could be as a result of the causative agent (bacteria) might remain for many years and failed to attain adequate diagnosis and treatment.

Husband or sexual partners who had multiple sexual relationship (AOR: 6.005; 95%CI: 2.487-14.495) were six times more likely to be infected with the disease compared with those with single partner. Similar finding was reported from Zambia with those husbands with multiple sexual partner were much at risk to be infected(12). This finding may be explained as, since syphilis is one sexually transmitted disease, sexual contact exposes to the bacteria hence semen and other body fluids are common source of infection that sexual contacts serve as a mode of transmission. Moreover, as a result of cultural influence (permit) husband tends to have more than one wife.

Pregnant women, whose husband had travel history (AOR: 3.191; 95% CI: 1.402-7.262; $p=0.006$) were three times more likely to be infected with syphilis than those mothers whose husbands didn't had traveled away from their living area. This displayed agreement with study done in south Sudan where husband or partners travel history had association with syphilis (13). It was attributed as a result of husband travel away from their area for different jobs and commitments and they would have sexual contact with other than their wife, though husband sexual practice to use protective method like condom might be very negligible.

The other significant predictor showed association with syphilis contracting was mother extra sexual relationship or pregnant women with multiple sexual relationship (AOR: 7.510; 95% CI: 2.839-19.863); pregnant women who had multiple sexual partner were more than seven times more likely to be infected with syphilis than those mothers who didn't had multiple sexual partners. Thus, sexually active women have a higher chance of getting the infection especially those who have the history of multiple sexual partners. Moreover, pregnant women with multiple sexual relations, the vulnerability to acquire syphilis increase as the time in relation elapsed and they tend to neglect to care solely even forget the disease risk without proving syphilis status as a result of adaptation and staying for long time together.

7. Limitation

- ❖ The study was conducted in hospital, so this study includes only those clients who have get access to the hospital during the data collection period. It doesn't include those who didn't have come to the hospital during the study period that may affect findings (estimation).
- ❖ The syphilis status of pregnant mothers' husband/ sexual partners was not detected.
- ❖ As the study design was cross-sectional; it is difficult to verify whether syphilis preceded the predisposing factors or the vice versa in this study.

8. Conclusion

The overall prevalence of syphilis infection among pregnant women in Gambella general hospital was high-intermediate (11.9%). Prevalence of syphilis increased as the age of the mother increase. Similarly as number of pregnancy increase prevalence of syphilis increase indeed mothers who visited ANC lately could have high syphilis prevalence. Syphilis more strikes those mothers who get married. Factors such as mother history of abortion, mother history of extra sexual partner relationship, travel history of husband, husbands' history of multi sexual partnership and mother history of sexual transmitted disease associated with syphilis infection.

9. Recommendation

Thus, to decrease the prevalence of this bacterial infection, we recommend that health education programs on the mode of syphilis transmission, pregnant mothers to visit ANC during their earlier pregnancy period, high-risk behaviors and methods of preventions should be instituted at antenatal care clinics to raise the awareness of mothers. Behavioral changes on both husbands and pregnant mothers to keep calm from having sexual contact with multi partners. Treat pregnant women who were reactive for VDRL test. Moreover further studies on syphilis that includes different study sites are recommended and all condition needs to be suited to address all those husbands/sexual partners to get tested for syphilis and know their status.

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Annex I: English version of participant information sheet, consent and questionnaire:

1.1. Participant information sheet

St. Paul's Hospital Millennium Medical College, Department of Public Health, Addis Ababa, Ethiopia

Title: Sero prevalence of syphilis and associated factors amongst pregnant women attending antenatal clinics in Gambella hospital, Gambella, Ethiopia.

First of all, I would like to say thanks in advance to your cooperation and consent in participating in this study. More over; I were request you politely to read or listen attentively in order to provide relevant information about the study and if there is any confusable information or question which isn't clear regarding the study please don't hesitate to ask freely.

Objective: The aim of the study will be to determine the sero-prevalence of syphilis and Associated factors amongst pregnant women attending antenatal clinics in Gambella hospital, Gambella, Ethiopia.

Benefits for participants

Study participants will not having any financial incentives or other inducements being participated in this study. However, those positives for syphilis will contact with the physician in the hospital for treatment and follow up. Furthermore, this study will provide a base line information or data for nationwide to develop health programmes for health policy and pave a strategic means of prevention for such sexually transmitted infection.

Risks and complication: Other than minor bleeding from the site of venipuncture when they give sample, there will no considerable risks to the study subjects being they are participated in the study. Venipuncture is a routine clinical practice for blood sample collection and can stop by pressing cotton on the site of puncture within a short period of time. Additionally the amounts of blood collected will be too little which is 5 ml (1 to 2 tea spoon) blood only.

Confidentiality: In order to maintain the confidentiality of participants' information, their name will not be given and the samples will be coded. Participants will not prohibit stopping or

withdrawing at any time from the study. Only interested participants can retrieve their own laboratory results using their code number and the information can only be accessed through the physician/clinical nurse. The physician/ clinical nurse will be responsible for the interpretation of the results and providing treatment. No personnel information will have disclosed to third party or will not appear in any report from this study.

Assurance of Principal Investigator

I will put my signature below to confirm you that I take over the responsibility for the scientific ethical and technical conduct of the research project and for provision of progress reports for all stakeholders of the research project.

Lezhialem Almaw (PI)

Signature: _____ Date: _____

Note: If you have any questions about this study, you should feel free to ask now or at any time throughout the study by contacting:

PI Address: Lezhialem Almaw, St. Paul's Hospital Millennium Medical College, School of Public Health, Addis Ababa, Ethiopia.

Email:Lezhailem10@gmail.com, **Tel:** +251913349861

1.2. Informed consent:

I, (Full Name)

Here by voluntarily authorize the researcher to interview me and consent to him in order to obtain information that is relevant to his research topic on “sero-prevalence of syphilis and associated factors amongst pregnant women attending antenatal clinics in Gambella hospital, Gambella, Ethiopia, 2017”. I understand that as a participant, my privacy was maintained and the information obtained in this research was used in a manner that protects with guaranteed confidentiality, respect and personal rights.

I am aware that participating in this study is voluntary and I haven't obligated to answer every question asked for me and that I may withdraw my consent at any time without disadvantage to

myself or others. I am informed that information collected in this study was strictly confidential and for this study only.

Signature of Participant Date.....

Signature of data collector..... Date.....

1.3. Questionnaire

“Determine sero prevalence of syphilis and associated factors amongst pregnant women attending antenatal clinics in Gambella hospital, Gambella, Ethiopia, 2017”

PART I: Socio-demographic characteristics Direction: fill the answer by encircling the corresponding choice

S · N O	Questions	Response of categories	
1	Address:	Region_____ Zone_____	
		Woreda_____	
		Kebele_____	
2	Age (in years)	_____	
3	Where are you living?	1. Urban 2. Rural	
4	What is your educational status?	1. Illiterate 2.read and write 3. 1-8 4. 9-12 5. Diploma 6. Higher institution	
5	What is your occupation status?	1. Employed 2. House wife 3. Daily laborer 4. Merchant 5. Commercial sex worker 6. Other [specify] _____	

6	Ethnicity	1. Anywaa 2.Nuer 3.Majange 4. Kembata 5. Oromo 6. Tigre 7. Amhara 8.Wolayita 9. other [specify]	
7	Marital Status	1. Single 2.Married 3. Divorced 4. Widowed	
8	If mother is married, husbands education status	1. Illiterate 2. Read and write 3. 1-8 4. 9-12 5. Diploma 6. Higher institution	
9	Mothers monthly income in birr?	_____	
Part II. Knowledge			
10	Have you heard about syphilis?	1. Yes 2. No 3. I don't know	
11	Do you know how these diseases can be transmitted?	1. Yes 2. No	
12	Do you know that these diseases can be transmitted to unborn child?	1. Yes 2.No	
13	Do you think by attending ANC that reduces the chances of risk to your unborn child?	1.Yes 2.No	

Part III: Sexual behavior and risk factors for acquiring syphilis in the study subjects

14	Do you have any history of blood transfusion?	1. Yes 2. No	
15	Did you have history of sexually transmitted diseases (STD)?	1. Yes 2.No	If “NO” go to Q # 17
16	If “Yes” to Q # 15, what types of STD?	1. Syphilis 2. other than syphilis 3. Undetermined	
17	Did your sexual partner have a history of STD?	1. Yes 2. No 3. Unknown	If “NO” go to Q # 19
18	If “Yes” to Q # 17, what types of STD?	1. Syphilis 2. Other than syphilis 3. Unknown	
19	Did you have genitourinary symptoms?	1. Present 2. Absent	
20	Did your sexual partner have a history of genitourinary symptoms?	1. Yes 2. No 3. Unknown	
21	Travel history of the mother the past one year?	1. Yes 2. No	
22	Husband's job involves travel? (if the woman is married)	1. Yes 2. No	
23	Did you have used condom in the	1. Yes 2. No	

	past year?		
24	Had you have more than one sexual partner?	1. Yes 2. No	If “No” go to Q # 26
25	If “Yes” to Q # 24, number of casual partners in the past year?	1. Two 2. three 3. More than/equal to four	
26	History of husband's extramarital relations (if mother is married)	1. Yes 2. No	
27	Number of pregnancy	1. First pregnancy 2. Second pregnancy 3. Third pregnancy 4. Above Four pregnancy	
28	Number of delivery?	1. One 2. Two 3 Greater than /equal to 3	
29	How many children do you have?	1. One 2. Two- four 3. Five and above	
30	History of miscarriage or abortion of the mother?	1. Yes 2. No	If “No” go to Q # 34
31	If “Yes” to Q # 32, how many?	1. One 2. Above 1	
32	Number of stillbirths?	1.Zero 2. Greater or equal to 1	
33	Mother’s past history of low birth weight?	1. Yes 2. No	

34	Gestational age at the first ANC visit and screening?	1. First trimester (1-13 wks) 2. Second trimester (14-28wks) 3. Third trimester (29-40wks)	
35	How old were you when you first had sex?	_____	
37	Syphilis status of the mother?	1. Reactive 2. Non-Reactive	

Annex II: Amharic version of participant information sheet, consent and questionnaire

2.1. የጥናቱ መረጃና መግለጫ ቅጽ

የጥናቱ አላማ

የዚህ ጥናት አላማ መሰረት ያደረገው ቁጥኝ ተብሎ የሚጠራውን የአባላዘር በሽታ አምጪ ባክተሪያ ከሱ ጋር የተያያዙ ተጋላጪ መንስኤዎችን በነፍሱ-ጡር እናቶች ላይ ለማጥናት ነው። የእርሶ በዚህ ጥናት ውስጥ መሳተፍ ነፍሱ-ጡር እናቶች በቁጥኝ በሽታ እንዳይጠቁ ለመከላከል ይረዳል።

በጥናቱ ስለመሳተፍ

በዚህ ጥናት መሳተፍ በሙሉ ፈቃደኝነት ላይ የተመሠረተ ነው። ስለሆነም በመጀመሪያ በጥናቱ እንዲሳተፉ ፈቃደኝነትዎን በትህትና እንጠይቃለን። በዚህ ጥናት ለመሳተፍ ከፈቀዱ ለግማሽ ሰዓት ያህል ለጥያቄዎች ምላሽ ይሰጡናል።

በጥናቱ በመሳተፍ የሚገኝ ጥቅም

የደመዎ ናሙና በላብራቶሪ ሲመረመር የቁጥኝ በሽታ አምጪ ባክተሪያ ቴሪፖንማ ፓሊድም ከተገኘ የሀኪም ክትትልና አስፈላጊውን ምክር ይሰጠዎታል። ደሙም ነፃ ከሆነ ደግሞ ለወደፊቱ ማድረግ ስለሚገባዎት ጥንቃቄ በሀኪም በኩል ምክር ይሰጠዎታል።

ምስጢርን ስለመጠበቅ

በጥናቱ ውስጥ የተሰበሰቡ ማናቸውም ግላዊ መረጃዎች ሚስጥራዊነታቸው የተጠበቀ ይሆናል። ከማንነትዎ ጋር በቀጥታ ተያያዥነት ያላቸው መረጃዎች በሙሉ በዋና ተመራማሪው ሚስጥራዊ በሆነ የመረጃ ጥንቅር ዘዴ ከተቀየሩ በኋላ ብቻ ለምርምር ሂደቱ የሚውል ይሆናል።

ከጥናቱ ስለመውጣትና ስለማቋረጥ

ይህ ጥናት በፈቃደኝነት ላይ የተመሰረተ እንደመሆኑ መጠን በማናቸውም ወቅት በፈቃደዎ ከጥናቱ መውጣት ይችላሉ። ከጥናቱ ቢወጡም እንኳ በስራዎት ላይ ምንም ዓይነት ችግር አያመጣም። ከጥናቱ ጋር በተያያዘ ማናቸውም ጥያቄ ቢኖርዎ በሚከተለው አድራሻ ጥያቄዎን ማቅረብ ይችላሉ።

ዋና ተመራማሪ፡- ለዚህዓለም አልማው እውነቱ

አድራሻ፡ ቅዱስ ጳውሎስ ሆስፒታል ሚልንዩም ህክምና ኮሌጅ ህብረተሰብ ጤና ትምህርት ክፍል

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አዲስ አበባ ኢትዮጵያ

2.2. ስለ ስምምነቱ ማረጋገጫ ቅፅ

እኔ ስሜ ከታች የተገለፀው የጥናቱ ተሳታፊ ለመሆን ስወስን የጥናቱን አላማዎች አሰራሮችና ቅድመ ሁኔታዎች በግልጽ በመረዳትና ከጥናቱ ተሳታፊነት ፈቃደኝነቴን በማንኛውም ደረጃ የማንሳት መብቴን በማረጋገጥ ነው፡፡

እኔ----- በጥናቱ ተሳታፊ መሆኔን በፊርማዬ እያረጋገጥሁ ይህንን ስወስን በጥናቱ ሳቢያ ሊከሰቱ የሚችሉ አደጋዎች በሚገባ የተረዳሁና ከጥናቱ በማንኛውም ደረጃ እራሴን ለመሰረዝ ብወስን ቅጣት እንደሌለው ወይም ተገቢ የሆነ ጥቅም እንደማይነፈገኝ በማመን መሆኔን በፊርማዬ አረጋግጣለሁ፡፡

የተሳታፊው መለያ ቁጥር ----- ፊርማ-----

የተመራማሪው ሙሉ ስም፣ አቶ ለዚህዓለም አልማው እውነቱ ፊርማ -----

የምስክር ሙሉ ስም አቶ/ወ/ሮ/ወ/ረት/ሲ/ር-----ፊርማ-----

አሁን ጥያቄዎችን መጠየቅ እችላለሁ?

አዎ----- ወደ ጥያቄ አይቻልም -----ያበቃል

የጠያቂ ስም _____

መጠይቁ የተጀመረበት ሰአት ____ ደቂቃ ____

የጠያቂው ቃል :-ይህንን መጠየቂያ በላዩ ላይ በተጻፈው መመሪያና ጥያቄ እንድሁም በተሰጠኝ ስልጠና መሰረት ሞልቻለሁ፡፡

በላዩም ላይ የሰፈረው ሀሳብ ትክክለኛ መሆኑን እቀበላለሁ፡፡

ፊርማ _____ ቀን _____

2.3. የጥናቱ መጠይቅ ቅፅ:

ተ.ቁ	ጥያቄዎች	ምላሾች	ምርምራ
1.	እድራሻ	ክልል----- ዞን ----- ወርዳ ---- ----- ቀበሌ -----	
2.	ዕድሜ	-----	
3.	የመኖሪያ ስፍራዎ የት ነው	1. ከተማ 2. ገጠር	
4.	የትምህርት ደረጃዎ	1. ያልተማርሮ 2. ማንበብ እና መፃፍ 3. 1-8ኛ ክፍል 4. 9-12ኛ ክፍል 5. ዲፕሎማ 6. የመጀመሪያ	

		ድግሪ እና ከዚያ በላይ	
5.	ስራዎ	1. የመንግስት ሰራተኛ 2. የቤት እመቤት 3. የቀን ሰራተኛ 4. ነጋዴ 5. ሴተኛ አዳሪ 6. ሌላ.....	
6.	ብሔርዎ	1. አኝዋክ 2. ጃወር 3. መዥንግር 4. ከምባታ 5. አሮሞ 6. አማራ 7. ትግሬ 8. ወላይታ 9 ሌላ.....	
7.	የጋብቻ ሁኔታ	1. ያላገባች 2. ያገባች 3. አግብታ የፈታች 4. ባሏ የሞተባት	
8.	የትዳር አጋርዎ የትምህርት ሁኔታ (ያገባች ከሆነ)	1. ያልተማር 2. ማንበብ እና መፃፍ 3. 1-8ኛ ክፍል 4. 9-12ኛ ክፍል 5. ዲፕሎማ 6. የመጀመሪያ ድግሪ እና ከዚያ በላይ	
9.	ወርሃዊ ገቢ በብር		
ስለ ቂጢኝ ያላቸው ግንዛቤ የተመለከቱ ጥያቄዎች			
10.	ስለ ቂጢኝ ስምተው ያውቃሉ	1. አዎ 2. አልሰማሁም 3. ምንም አላውቅም	
11.	የቂጢኝ በሽታ እንዴት እንደሚተላለፍ ያውቃሉ	1. አዎ 2. አልሰማሁም	
12.	የቂጢኝ በሽታ በማህፀንዎ ወዳለው ህፃን እንደሚተላለፍ ያውቃሉ	1. አዎ 2. አልሰማሁም	
13.	የእርግዝና ክትትል በማድረግ ህፃንዎን ከበሽታው መከላከል እንደሚቻል ያውቃሉ	1. አዎ 2. አልሰማሁም	
ክፍል 3 ለቂጢኝ አጋልጭ የሆኑ ምክንያቶች			
14.	ከሌላ ሰው ደም ተለግሰው ያውቃሉ	1. አዎ 2. አይደለም	
15.	የአባላዘር በሽታ ይዞት ያውቃሉ	1. አዎ 2. አይደለም	መልሱ "አይደለም" ከሆነ ወደ ጥያቄ 17 ሂዱ
16.	ለጥያቄ ተ.ቁ 15 መልስዎ አዎ ከሆነ፤ ምን አይነት	1. ቂጢኝ 2. ሌላ አይነት አባላዘር በሽታ 3. አልታወቀም	
17.	የትዳር አጋርዎ በአባላዘር በሽታ ከዚህ ቀደም ታመው ያውቃሉ (ያገባች ከሆነ)	1. አዎ 2. አይደለም 3. አልታወቀም	መልሱ "አይደለም" ከሆነ ወደ ጥያቄ 19 ሂዱ
18.	ለጥያቄ ተ.ቁ 17 መልስዎ አዎ ከሆነ፤ ምን አይነት	1. ቂጢኝ 2. ሌላ አይነት አባላዘር በሽታ 3. አልታወቀም	
19.	አሁን በብልትዎ አከባቢ ህመም	1. አዎ 2. የለም	

	ስሜት አለበዎት		
20	የትዳር አጋርዎ በብልታቸው አከባቢ ህመም ስሜት አለባቸው	1. አዎ 2. የለም 3 አልታወቀም	
21	እናት ላለፉት አንድ ዓመት ወደ ሌላ ቦታ ጉዞ ተጉዘው ያውቃሉ	1. አዎ 2. የለም	
22	ባለቤትዎ ስራቸውን ለመስራት ወደ ሌላ ቦታ ይሄዳሉ እንዴ	1. አዎ 2. የለም	
23	ላለፉት አንድ ዓመት ግብር ስጋ ግንኙነት ወቅት ኮንዶም ተጠቅመዋል	1. አዎ 2. የለም	
24	እርስዎ ከአንድ ሰው በላይ ጋር የግብርስጋ ግንኙነት አድርገው ያውቃሉ	1. አዎ 2. የለም	መልሱ "አይደለም" ከሆነ ወደ ጥያቄ 26 ሂዱ
25	ለጥያቄ ተ.ቁ 24 መልስዎ አዎ ከሆነ፤ ከሰንት ሰዎች ጋር	1.ሁለት 2. ሦስት 3. አራት እና ከዚያ በላይ	
26	ባለቤትዎ ከእርስዎ ውጭ ከሌላ ሴት ጋር ግንኙነት አድርገው ያውቃሉ	1. አዎ 2. የለም	
27	የአሁኑ ስንተኛ እርግዝናዎ ነው	1. የመጀመሪያ እርግዝና 2. ሁለተኛ እርግዝና 3. ሶስተኛ እርግዝና 4. አራተኛ እና ከዚያ በላይ እርግዝና	
29	ስንት ጊዜ እርግዝዋል	1. አንድ 2. ሁለት 3. ሶስት እና ከዚያ በላይ	
30	ስንት ልጅ አለዎት	1. አንድ 2. ከሁለት- አራት 3. አምስት እና ከዚያ በላይ	
31	ከዚህ ቀደም ነፍሰጡር ሳሉ አስወርድዎት ያውቃል	1. አዎ 2.የለም	መልሱ "አይደለም" ከሆነ ወደ ጥያቄ 34 ሂዱ
32	ለጥያቄ ተ.ቁ 31 መልስዎ አዎ ከሆነ፤ ስንት ጊዜ	1. አንድ 2. ሁለት	
33	ትክክለኛ የመወለጃ ጊዜአቸው ሳይደርስ የተወለዱ ልጆች ብዛት	1. ዜሮ 2. አንድ እና ከዚያ በላይ	
34	ከዚህ ቀደም ዝቅተኛ ክብደት ያለው ልጅ ወልደው ያውቃሉ	1. አዎ 2. አልወለደኩም	
35	የእርግዝና ክትትል ሲጀምሩ የሰንት ሳምንት ነፍሰጡር ነበሩ	1. 1-13 ሳምንት 2. 14-27 ሳምንት	

		3. 28-39 ሳምንት	
36	ለመጀመሪያ ጊዜ የግብር ስጋ ግንኙነት ሲያደርጉ ዕድሜዎ ስንት ዓመት ይሆኖት ነበር	-----	
37	የእናትዬ የቂጥኝ በሽታ ሁኔታ	1. በሽታው አለ (ፖዘቲቭ) 2. በሽታው የለም (ኔገቲቭ)	

Annex III: Syphilis Standard operating procedures (SOP)

Procedures (standard operating procedure) and principles for syphilis

Test Principle

The Syphilis Rapid Test Strip (Quick Test™ Syphilis Serum/ Plasma/Whole Blood Strip) will be used to determine the presence of syphilis antibodies. This is a qualitative membrane strip based immunoassay for the detection of *Treponema pallidum* antibodies (IgG and IgM) in whole blood serum or plasma. In this test procedure, recombinant syphilis antigen was immobilized in the test line region of the strip. After a specimen (serum) was added to the specimen pad; it reacted with syphilis antigen coated particles that had been applied to the specimen pad. The mixture migrated chromatographically along the length of the test strip and interacted with the immobilized syphilis antigen. This double antigen test format can detect both IgG and IgM in the specimens. For specimens containing antibodies to *Treponema pallidum* a red line appeared in the test line region indicating a positive result; those without *Treponema pallidum* did not have a red line appearing in this region indicating a negative result. To serve as a procedural control, a colored band at control region always appears in the test area.

Procedure

- 1) Bring all reagents and specimen to room temperature
- 2) Remove the test strip from the foil pouch and place on a clean dry surface
- 3) Identify the test strip for each specimen or control

- 4) Apply 60ul of specimen on the sample pad
- 5) Interpret test result at 15 minutes
- 6) Do not interpret test result after 20 minute

Result Interpretation

Negative: One pink line appears in control line but no line in the test region

Positive: when there is pink color in the control line and testing region.

Invalid: when there is a total absence of color in both regions, in such case the test should be repeated using a new strip.

Annex V: Bibliography of principal investor (resident)

I am Lezhialem Almaw Ewunete, was born on June 1987 GC in Godere woreda Gambella region. I have attended my primary education and high school at Tiliku Metti Elementary School and Tinishu Metti Secondary and preparatory school respectively. Then I joined Arba Minch University and graduated with BSc in Medical Laboratory Science in 2010 GC.

Soon after graduation, I have been working as junior laboratory technologist in Gambella region, Gambella general hospital since January 2011 to the time I join St.Paul's Hospital Millennium Medical College for post-graduation study in Field Epidemiology and laboratory training program on October 2015.