

PREVALENCE OF HYPERTENSION, ANEMIA, ASYMPTOMATIC URINARY TRACT INFECTION, SYPHILIS, HIV AND HEPATITIS B VIRUS INFECTION AMONG PREGNANT WOMEN ATTENDING AN ANTENATAL CLINIC AT A RURAL HOSPITAL IN SOUTHERN ETHIOPIA

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Abstract. Antenatal care (ANC) is provided to prevent, diagnose early and treat pregnant women for a variety of diseases. The objective of this study was to determine the seroprevalences of syphilis, human immunodeficiency virus (HIV) and hepatitis B virus (HVB) and asymptomatic urinary tract infections and the prevalence of hypertension and anemia among pregnant women attending the antenatal clinic at Gambo Rural Hospital in southern Ethiopia. The following tests were conducted among study subjects: hemoglobin (Hgb) level, rapid plasma reagin (RPR) for syphilis, anti-HIV antibodies, hepatitis B surface antigen (HBsAg) and urine analysis. A total of 574 pregnant women were included in this study. The mean age of the participants was 25.7 (SD: 4.8) years old; 88.2% were living in urban areas and 11.8% in rural areas. Sixty-seven point two percent of participants began their attended care during the second trimester of their pregnancy. Overall, anemia (Hgb < 11 mg/dl) was present in 8.9% (95% CI: 6.9-11.6): severe anemia (Hgb < 7 mg/dl), moderate anemia (Hgb 7-8.9 mg/dl) and mild anemia (Hgb 9-10.9 mg/dl) were found in 0.5% (95% CI: 0.2-1.5), 0.2% (95% CI: 0.03-0.9) and 8.2% (95% CI: 6.2-10.8). The overall prevalence of hypertension was 1.2% (95% CI: 0.06-2.6). This was significantly higher ($p=0.01$) in the third trimester (3.2%) than in the second (0.5%) and first (0%) trimesters. The prevalence of preeclampsia, defined by have hypertension and proteinuria, was 0.7% (95% CI: 0.3-1.8). Asymptomatic urinary tract infection (having ≥ 10 white blood cells /high power field in the urine) was present in 12.7% of participants (95% CI: 10.0-15.5). The RPR test was positive in two patients (0.3%; 95% CI: 0.1-1.3). The prevalences of positive test for HBsAg and HIV-1 were 2.3% (95% CI: 1.3-3.8) and 0.2% (95% CI: 0.03-0.9), respectively. No HIV-2 cases were detected. Our data show relatively low prevalences of anemia, hypertension, urinary tract infection, syphilis, HIV,

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and hepatitis B virus infections among study subjects at a rural antenatal clinic in southern Ethiopia.

Keywords: hypertension, preeclampsia, asymptomatic urinary tract infection, syphilis, hepatitis B infection, HIV infection, pregnant women, antenatal care, Ethiopia

INTRODUCTION

The government of Ethiopia is committed to achieving the millennial development goals of improving maternal health, with a target of reducing the maternal mortality rate by three-quarters between 1990 and 2015 (Ministry of Health, 2013; Chemir *et al*, 2014). Ethiopia has implemented a focused antenatal care (ANC) model (Ministry of Health, 2013). The goal is for each women to have at least 4 ANC visits during a pregnancy (Ministry of Health, 2011a, b). ANC aims to facilitate prophylaxis and treatment of anemia, malaria, sexually transmitted infections (STIs), urinary tract infection, and tetanus (Ministry of Health, 2011a, b). Each visit includes a physical examination, a blood pressure check, urine analysis, determination of the hemoglobin level, and screening for human immunodeficiency virus (HIV) and syphilis. Although hepatitis B infection is an important cause of morbidity in sub-Saharan Africa (Ramos *et al*, 2011) it is not included in ANC screening in Ethiopia.

ANC is provided to prevent, early diagnose and treat general medical and pregnancy-related problems (Tsegay *et al*, 2013; Zegeye *et al*, 2013; Hagos *et al*, 2014; Chemir *et al*, 2014). Knowing the prevalences of hypertension, anemia, and sexually transmitted infections (STIs) among pregnant women is important to guide ANC protocols.

The aims of this study were to determine the prevalences of hypertension,

asymptomatic urinary tract infection, anemia, syphilis, HIV, and hepatitis B infections among women attending the ANC clinic of a rural hospital in southern Ethiopia to assist in guiding appropriate ANC in this population.

MATERIALS AND METHODS

The study population was pregnant women attending the ANC clinic at Gambo Rural Hospital (GRH). GRH is a 150-bed rural general hospital located in the West-Arsi zone of Ethiopia, 250 km south of Addis Ababa, the capital. It is a private mission hospital. Due to inadequate transportation, the catchment area of GRH includes approximately 100,000 inhabitants. Most of this population is rural and works in agriculture or farming.

Study design

We conducted a cross sectional study of pregnant women consecutively attending the ANC clinic at GRH from July 1, 2011 to February 28, 2012.

Data collection and definitions

The data recorded for each subject were: the date, age, location of residence, parity number, and gestational age. Subjects were examined for blood pressure, hemoglobin level, urine analysis, the rapid plasma reagin (RPR) for syphilis, ant-HIV antibody test, and hepatitis B surface antigen (HBsAg) test.

We defined anemia overall as a hemoglobin level < 11g/dl: mild anemia as a hemoglobin level of 9.0-10.9 g/dl, moder-

ate anemia as a hemoglobin level of 7-8.9 g/dl, and severe anemia as a hemoglobin level < 7 g/dl following operational definitions of Obse *et al* (2013). All study subject received iron supplementation for one month [ferrous sulfate, 325 mg (65 mg elemental iron)] daily.

Hypertension was defined as a systolic blood pressure ≥ 140 mmHg and/or a diastolic blood pressure ≥ 90 mmHg. Preeclampsia was defined as gestational hypertension and proteinuria (a protein level in the urine of $\geq 2+$).

Procedures and sample collection

Blood pressures were measured by auscultation and measured in an arm with a sphygmomanometer.

Hemoglobin levels were measured using a portable digital hemoglobin meter using a finger stick (Hemo Control, EKF-diagnostic, Barleben/Magdeburg, Germany).

Nitrite and protein levels in the urine were determined using a dipstick test (URS-10T, Zhejiang Orient Gene Biotech, Zhejiang, China). They were considered positive if the color indicated 2+ or more. Direct urine microscopy has used to determine the white blood cell (WBC) count per high power field (HPF). A WBC count > 10 cells/HPF was considered abnormal.

We used an immunochromatographic assay to detect antibodies against syphilis (Wondfo One Step Syphilis Whole Blood/Serum/plasma test; Guangzhou Wondfo Biotech, Guangzhou, China). We used an immunochromatographic method to detect antibodies against HIV-1 and HIV-2 (Colloidal Gold; KHB Shanghai, Kehua Bio-engineering, Shanghai, China). We use an immunochromatographic one-step assay to detect HBsAg in the blood (SD BIOLINE HBsAg Fast test; Gyeonggi-do, Korea).

Data analysis

Data were collected and entered into Excel software. The data were then cleaned and imported into SPSS, version 22 software (IBM, Armonk, NY) for analysis. The Student's *t*-test was used to evaluate continuous data, and the chi-square test was used to compare between two or among three or more categorical variables. We estimated prevalence with 95% confidence intervals (CI) using the Wilson procedure.

Ethical clearance

This study was conducted under anonymous conditions. Ethics approvals was obtained to conduct the study from the local Research and Publication Committee of GRH and the Health Unit and Ethical Review Committee of the Ethiopian Catholic Secretary. Each pregnant woman provided verbal informed consent after being told the purpose and procedures of the study.

RESULTS

A total of 574 pregnant women were included in this study. The mean age of the study population was 25.7 years [standard deviation (SD): 4.8]; 88.2% of subjects lived in rural areas and 11.8% lived in small urban areas. The mean gravidity was 4.0 ± 2.4 . Four point seven percent (26/548) of subjects presented for their ANC visit during their first trimester of their pregnancy, 67.2% (368/548) during their second trimester, and 28.1% (154/548) during their third trimester (Table 1).

Table 1 shows the prevalences of screening of hypertension, asymptomatic urinary tract infection, anemia, syphilis, HIV and hepatitis B infections. Overall, anemia was present in 8.9% (51/570) (95% CI: 6.9-11.6). Severe anemia was found in 0.5% (3/570) (95% CI: 0.2-1.5), moderate anemia in 0.2% (1/570) (95% CI: 0.03-0.9) and mild anemia in 47 patients (preva-

Table 1
Prevalences of studied factors among the study population.

Variables	<i>n</i>	% (95% CI)
Epidemiological data		
Median age (<i>n</i> =574)	25.7 (SD: 4.8)	
Location of residence (<i>n</i> =574)		
Urban area	68	11.8% (9.5-14.7)
Rural area	506	88.2% (85.3-90.5)
Mean number of gravity (<i>n</i> =561)	4 (SD: 2.4)	
Period of pregnancy attended (<i>n</i> =548)		
First trimester	26	4.7% (3.2-6.9)
Second trimester	368	67.2% (63.1-70.9)
Third trimester	154	28.1% (24.5-32.0)
Screening		
Anemia (<i>n</i> =570)		
Hemoglobin < 11 g/dl	51	8.9% (6.9-11.6)
Hemoglobin < 7 g/dl	3	0.5% (0.2-1.5)
Hemoglobin 7-8.9 g/dl	1	0.2% (0.03-0.9)
Hemoglobin 9-10.9 g/dl	47	8.2% (6.2-10.8)
Hypertension (<i>n</i> =574)	7	1.2% (0.06-2.6)
Preeclampsia (<i>n</i> =574)	4	0.7% (0.3-1.8)
≥10 WBC/HPC in urine (<i>n</i> =574)	73	12.7% (10.0-15.5)
Rapid plasma reagin test positive (<i>n</i> =574)	2	0.3% (0.1-1.3)
Hepatitis B surface antigen test positive (<i>n</i> =574)	13	2.3% (1.3-3.8)
Ant-HIV antibody test positive (<i>n</i> =574)	1	0.2% (0.03-0.9)

CI, confidence interval; SD, standard deviation; WBC/HPC, white blood cell counts per high power field; HIV, human immunodeficiency virus.

lence: 8.2%; 95% CI: 6.2-10.8). Moreover, 24.4% of study subjects had a hemoglobin levels between 11 and 11.9 g/dl.

The overall prevalence of hypertension was 1.2% (95% CI: 0.06-2.6). Significantly more subjects developed hypertension during the third trimester (3.2%) than during the second (0.5%) and first trimesters (0%) ($p=0.01$). Preeclampsia was found in 0.7% (CI: 0.3-1.8%).

Asymptomatic urinary tract infection (≥ 10 WBC/HPC) was seen in 12.7% of subjects (95% CI: 10.0-15.5). However, only 1.2% (95% CI: 0.05-2.5) had nitrite in urine ($\geq 2+$).

The RPR was positive in two patients (0.3%; 95% CI: 0.1-1.3). Thirteen (2.3%; 95% CI: 1.3-3.8) had a positive for HBsAg test. One patient had a positive anti-HIV-1 test (0.2%; 95% CI: 0.03-0.9).

DISCUSSION

In this study we found moderate prevalences of anemia, asymptomatic urinary tract infection and hepatitis B virus (HBV) infection and low prevalence of hypertension, HIV infection and syphilis.

Anemia is a common problem in pregnant women (Getachew *et al*, 2012). The prevalence of anemia among preg-

nant women in Ethiopia has been reported to range from 16% (Melku *et al*, 2014) to 36% (Obse *et al*, 2013). In our study, the prevalence of anemia was lower than other Ethiopian studies among pregnant women (Haidar, 2010, Getachew *et al*, 2012; Obse *et al*, 2013; Melku *et al*, 2014). The low prevalence of malaria in our study area could have influenced our results (0.7% of attendance in outpatient department).

Hypertension in pregnancy may contribute to increased mortality and morbidity in the fetus and the mother (Wolde *et al*, 2011). Hypertensive disorders may complicate up to 10% of all pregnancies (Teklu and Gaym, 2006; Osungbade and Ige, 2011; Wolde *et al*, 2011). The highest proportion occurs among women who are pregnant for the first time and during the third trimester (Teklu and Gaym, 2006). In our study, the overall prevalence of hypertension was 1.2% and it was more common during the third trimester. Hypertension was not related to gravidity in our study. The prevalence of preeclampsia in our study (0.7%), was lower than previous studies conducted from northern Ethiopia (about 7%) (Gaym *et al*, 2011; Osungbade and Ige, 2011; Wolde *et al*, 2011).

It is estimated about one in three women of childbearing age contracts a urinary tract infection (Duarte *et al*, 2008). Asymptomatic bacteriuria reflects a significant quantity of bacteria. About 30% of women with untreated asymptomatic bacteriuria during pregnancy develop pyelonephritis (Duarte *et al*, 2008). In Ethiopia, studies have reported the prevalence of asymptomatic bacteriuria among pregnant women to range from 7% to 18.8% (Gabre-Selassie, 1998; Tadesse *et al*, 2007; Assefa *et al*, 2008; Demilie *et al*, 2012; Tadesse *et al*, 2014). In our study 12% of pregnant women had leukocyturia

(≥ 10 WBC/HPC) indicating asymptomatic urinary tract infection. However, urine cultures were not carried out in the study; therefore, we cannot confirm there was indeed an asymptomatic urinary tract. Only 1.2% of women in our study had nitrite in their urine, which is more specific for urinary tract infection than leukocyturia.

Sexually transmitted infections constitute a major public health problem in developing countries, including Ethiopia. In sub-Saharan Africa, syphilis, HIV and hepatitis B infections are important causes of morbidity (Alemayehu and Godana, 2015). The prevalence of syphilis among pregnant woman in different parts of Ethiopia has decreased over the past fifteen years; in a study from 1995, the prevalence of syphilis was reported to be 13.7% (Azeze *et al*, 1995); in 2000 it was reported to be 2.9% and in 2005 it was reported to be 1% (Kebede and Chamiso, 2000; Mulu *et al* 2007). In Ethiopia, during the past decade, the prevalence of syphilis has been reported to be 1-2% (Mulu *et al*, 2007; Tiruneh, 2008). In our study, the prevalence of syphilis (0.3%) was lower than previously reported, possibly because this study was conducted in a rural area.

The prevalence of HIV infection in our study was also lower than previous studies from Ethiopia such as the one from the rural Amhara region (11%) (Tiruneh, 2008). A recent study from Bahir Dar (Ethiopia) reported the prevalence of HIV to be 6% among pregnant women (Zenebe *et al*, 2014). A progressive decline in the prevalence of HIV-1 infections among young women attending antenatal care clinics in Ethiopia has been reported (Tsegaye *et al*, 2003, Wolday *et al*, 2007; Cherinet *et al*, 2013). In 2009, the Antenatal Care Sentinel HIV Surveillance Reported for Ethiopia, reported the prevalence of HIV in all age

groups declined remarkably from 2003 to 2009 (Federal Ministry of Health, 2011). The prevalence of HIV in our study (0.2%) was lower than that reported for a rural part of the Oromia region of Ethiopia (1.8%) (Federal Ministry of Health, 2011).

Hepatitis B infection can be severe and may be transmitted from mother to child at birth. In Ethiopia, the prevalence of hepatitis B infection among pregnant women has been reported by other studies range from 3.8% to 7.7% (Tiruneh, 2008; Zenebe *et al*, 2014). In our study, the prevalence was 2.3%, lower than a sentinel study performed at our clinic 5 years ago (6%) (Ramos *et al*, 2011).

A limitation of our study was that it was not conducted with a structured questionnaire using face-to-face interviews in order to determine socio-demographic data and their relationship to the diagnosed disease.

In conclusion, at our ANC clinic, we have found moderate prevalences of anemia, asymptomatic urinary tract infection and HBV infection and low prevalence of hypertension, HIV infection and syphilis. The prevalence of the study conditions was lower than the prevalences from other parts of Ethiopia.

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REFERENCES

- Alemayehu A, Godana W. Knowledge and practice of clinicians regarding syndromic management of sexually transmitted infections in public health facilities of Gamo Gofa Zone, South Ethiopia. *J Sex Transm Dis* 2015; 2015: 310409.
- Assefa A, Asrat D, Woldeamanuel Y, G/Hiwot Y, Abdella A, Melesse T. Bacterial profile and drug susceptibility pattern of urinary tract infection in pregnant women at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. *Ethiop Med J* 2008; 46: 227-35.
- Azeze B, Fantahun M, Kidan KG, Haile T. Seroprevalence of syphilis amongst pregnant women attending antenatal clinics in a rural hospital in north west Ethiopia. *Genitourin Med* 1995; 71: 347-50.
- Chemir F, Alemseged F, Workneh D. Satisfaction with focused antenatal care service and associated factors among pregnant women attending focused antenatal care at health centers in Jimma town, Jimma zone, South West Ethiopia; a facility based cross-sectional study triangulated with qualitative study. *BMC Res Notes* 2014; 7: 164.
- Cherinet Y, Berihu A, Bekele A, Biadgilign S, Taye B, Tsegaye A. Trend of HIV prevalence among pregnant women attending Antenatal Care Unit of Bishoftu Hospital, Ethiopia. *Ethiop Med J* 2013; 51: 169-76.
- Demilie T, Beyene G, Melaku S, Tsegaye W. Urinary bacterial profile and antibiotic susceptibility pattern among pregnant women in North West Ethiopia. *Ethiop J Health Sci* 2012; 22: 121-8.
- Duarte G, Marcolin AC, Quintana SM, Cavalli RC. Urinary tract infection in pregnancy. *Rev Bras Ginecol Obstet* 2008; 30: 93-100.
- Federal Ministry of Health/ Ethiopian Health and Nutrition Research Institute. Report on the 2009 Round Antenatal Care Sentinel HIV Surveillance in Ethiopia. Addis Ababa: Ethiopian Health and Nutrition Research Institute (EHNRI), 2011. [Cited 2015 Jul 1]. Available from: URL: <http://www.ephi.gov.et/images/downloads/2009finalreport.pdf>
- Gabre-Selassie S. Asymptomatic bacteriuria in pregnancy; epidemiological clinical and microbiological approach. *Ethiop Med J* 1998; 36 :185-92.
- Gaym A, Bailey P, Pearson L, Admasu K, Ge-

- brehiwot Y. Ethiopian National EmONC Assessment Team. Disease burden due to pre-eclampsia/eclampsia and the Ethiopian health system's response. *Int J Gynaecol Obstet* 2011; 115: 112-6.
- Getachew M, Yewhalaw D, Tafess K, Getachew Y, Zeynudin A. Anaemia and associated risk factors among pregnant women in Gilgel Gibe dam area, Southwest Ethiopia. *Parasit Vectors* 2012; 5: 296.
- Hagos S, Shaweno D, Assegid M, Mekonnen A, Afework MF, Ahmed S. Utilization of institutional delivery service at Wukro and Butajera districts in the Northern and South Central Ethiopia. *BMC Pregn Childbirth* 2014; 14: 178.
- Haidar J. Prevalence of anaemia, deficiencies of iron and folic acid and their determinants in Ethiopian women. *J Health Popul Nutr.* 2010; 28: 359-68.
- Kebede E, Chamiso B. Prevalence of syphilis in pregnancy in Addis Ababa. *East Afr Med J* 2000; 77: 212-6.
- Melku M, Addis Z, Alem M, Enawgaw B. Prevalence and predictors of maternal anemia during pregnancy in Gondar, Northwest Ethiopia: an institutional based cross-sectional study. *Anemia* 2014; 2014: 108593.
- Ministry of Health, Federal Democratic Republic of Ethiopia. Maternal Death Surveillance and Response (MDSR) Technical Guideline. Addis Ababa Ministry of Health, 2013. [Cited 2015 Jul 1]. Available from: <http://mdsr-action.net/wp-content/uploads/2015/01/14.05.05-Ethiopia-MDSR-revised-guidelines.pdf>
- Ministry of Health, Federal Democratic Republic of Ethiopia. Antenatal Care, Part 1, Blended Learning Module for the Health Extension Programme. Health Education and Training in Africa. Addis Ababa: Ministry of Health, 2011a. [Cited 2015 Jul 1]. Available from: http://www.open.edu/openlearnworks/pluginfile.php/71935/mod_resource/content/1/HEAT_ANC_pt1_FINAL_OUTPUT_Cropped.pdf
- Ministry of Health. Federal Democratic Republic of Ethiopia. Antenatal Care, Part 2, Blended Learning Module for the Health Extension Programme. Health Education and Training in Africa. Addis Ababa: Ministry of Health, 2011b. [Cited 2015 Jul 1]. Available from: http://www.open.edu/openlearnworks/pluginfile.php/71935/mod_resource/content/1/HEAT_ANC_pt2_FINAL_OUTPUT_Cropped.pdf
- Mulu A, Kassu A, Tessema B, et al. Seroprevalence of syphilis and HIV-1 during pregnancy in a teaching hospital in northwest Ethiopia. *Jpn J Infect Dis* 2007; 60: 193-5.
- Obse N, Mossie A, Gobena T. Magnitude of anemia and associated risk factors among pregnant women attending antenatal care in Shalla Woreda, West Arsi Zone, Oromia Region, Ethiopia. *Ethiop J Health Sci* 2013; 23: 165-73.
- Osungbade KO, Ige OK. Public health perspectives of preeclampsia in developing countries: implication for health system strengthening. *J Pregnancy* 2011; 2011: 481095.
- Ramos JM, Toro C, Reyes F, Amor A, Gutiérrez F. Seroprevalence of HIV-1, HBV, HTLV-1 and *Treponema pallidum* among pregnant women in a rural hospital in Southern Ethiopia. *J Clin Virol* 2011; 51: 83-5.
- Tadesse A, Negash M, Ketema LS. Asymptomatic bacteriuria in pregnancy: assessment of prevalence, microbial agents and their antimicrobial sensitivity pattern in Gondar Teaching Hospital, North West Ethiopia. *Ethiop Med J* 2007; 45: 143-9.
- Tadesse E, Teshome M, Merid Y, Kibret B, Shimelis T. Asymptomatic urinary tract infection among pregnant women attending the antenatal clinic of Hawassa Referral Hospital, Southern Ethiopia. *BMC Res Notes* 2014; 7: 155.
- Teklu S, Gaym A. Prevalence and clinical correlates of the hypertensive disorders of pregnancy at Tikur Anbessa Hospital, Addis Ababa, Ethiopia. *Ethiop Med J* 2006; 44: 17-26.
- Tiruneh M. Seroprevalence of multiple sexually transmitted infections among antenatal

- clinic attendees in Gondar Health Center, northwest Ethiopia. *Ethiop Med J* 2008; 46: 359-66.
- Tsegay Y, Gebrehiwot T, Goicolea I, Edin K, Lemma H, Sebastian MS. Determinants of antenatal and delivery care utilization in Tigray region, Ethiopia: a cross-sectional study. *Int J Equity Health* 2013; 12: 30.
- Tsegaye A, Rinke de Wit TF, Mekonnen Y, *et al*. Decline in prevalence of HIV-1 infection and syphilis among young women attending antenatal care clinics in Addis Ababa, Ethiopia: results from sentinel surveillance, 1995-2001. *Ethiop Med J* 2003; 41 (suppl 1): 31-4.
- Wolde Z, Segni H, Woldie M. Hypertensive disorders of pregnancy in Jimma University specialized hospital. *Ethiop J Health Sci* 2011; 21: 147.
- Wolday D, Meles H, Hailu E, *et al*. Temporal trends in the incidence of HIV infection in antenatal clinic attendees in Addis Ababa, Ethiopia, 1995-2003. *J Intern Med* 2007; 261: 132-7.
- Zegeye AM, Bitew BD, Koye DN. Prevalence and determinants of early antenatal care visit among pregnant women attending antenatal care in Debre Berhan Health Institutions, Central Ethiopia. *Afr J Reprod Health* 2013; 17: 130-6.
- Zenebe Y, Mulu W, Yimer M, Abera B. Sero-prevalence and risk factors of hepatitis B virus and human immunodeficiency virus infection among pregnant women in Bahir Dar city, Northwest Ethiopia: a cross sectional study. *BMC Infect Dis* 2014; 14: 118.