American Journal of Health Research
2017; 5(5): 154-161
http://www.sciencepublishinggroup.com/j/ajhr
doi: 10.11648/j.ajhr.20170505.17
ISSN: 2330-8788 (Print); ISSN: 2330-8796 (Online)

Seroprevalence and Risk Factors of Sexually Transmitted Infections (HIV, HBV and Syphilis) Among Pregnant Women Provided Health Care Services, Addis Ababa, Ethiopia

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To cite this article:

Kinfe Fissehatsion, Ibrahim Ali, Ashebir Getachew. Seroprevalence and Risk Factors of Sexually Transmitted Infections (HIV, HBV and Syphilis) Among Pregnant Women Provided Health Care Services, Addis Ababa, Ethiopia. *American Journal of Health Research*. Vol. 5, No. 5, 2017, pp. 154-161. doi: 10.11648/j.ajhr.20170505.17

Received: August 30, 2017; **Accepted**: September 13, 2017; **Published**: October 13, 2017

Abstract: Globally the burden of HIV, HBV and Syphilis infections are common problem of pregnant women where its complication isn't only restricted to the pregnant women rather they are a serious issue for their newborn infants. Compared to developed country, developing countries including Ethiopia have been seriously influenced by such kinds of infections. Therefore this study have designed to determine the sero-prevalence and identify the possible risk factors of HIV, HBV and Syphilis infections in pregnant women providing health care services at Gandhi Memorial Hospital Addis Ababa, Ethiopia from January to April 2014. A Cross sectional study design has used and data on socio-demographic characteristics and possible risk factors have collected through pre-tested and structured questionnaire. After that blood have collected and screened for hepatitis B surface antigen using rapid cassette device and the final positive sample for HBsAg have confirmed by enzyme linked immunosorbent assay (ELISA). Antibodies to HIV-1/2 have tested based on the national testing algorism and *Trepollema pallidum* antibodies have tested by using Syphilis Rapid Test Strip (Quick Test™ Syphilis Serum/ Plasma/Whole Blood Strip). After the data have entered to Epi Info version 3.5.1 and exported to SPSS version 16 for validation and analysis, the overall prevalence of HIV-1/2 and HBsAg was 5.2%, 5% respectively while co-infection of HIV-HBV was 9.5% but no cases of Syphilis detected positive. In relation to the risk factors; history of sex with multiple sexual partners, pre-exposure to STI and low level of monthly income were significant risk factors for both HBV and HIV, while each infection found to have additional different risk factors; these includes: receiving of blood through donation, ear piercing and history of abortion for HBV infection while sharing different sharp materials and contact history with infected person for HIV infection alone. Therefore; intensified prevention activities in antenatal care targeting this population will have vital impact in halting the spread of the infections.

Keywords: HIV, HBsAg, Syphilis, Sero-prevalence, Risk Factors, Pregnant Women

1. Introduction

Currently sexually transmitted infections like HIV, HBV and syphilis have continued to be a public health problem in both developed and developing countries that causes acute illness, infertility, long-term disability and death, with severe medical and psychological consequences for millions of women and infants. There is tangible scientific evidence that a person with an untreated sexually transmitted infections (STIs), particularly involving ulcers or discharge, is at increased risk of passing on or acquiring either of this infections during sex due to the presence of broken skin or

membranes allowing the pathogens to enter the body [1].

HIV/AIDS has been spreading at an alarming rate worldwide. Globally, 35.3 million people were living with HIV in all adult aged 15-49. Out of this globally estimated infection, there were around 1.6 million deaths related to the acquired immune deficiency syndrome (AIDS) and 2.3 million new infections (6,300 new HIV infections per day). Women represent about half (52%) of all people living with HIV worldwide and the infection is leading cause of death among women of reproductive age. HIV prevalence among the adult population in the Sub-Saharan Africa and Caribbean sub region was estimated to be 4.7% and 1% respectively, while the global adult prevalence was estimated at 0.8% [2, 3]. Ethiopia is among the highly affected countries in the region with national adult prevalence rate of 1.3% and 1.8% in women [4]. Based on ANC sentinel surveillance data the urban adult HIV prevalence was 4.2% and rural was 0.6 [5].

Hepatitis B virus (HBV) is highly infectious and associated with long term morbidity and mortality due to complications like cirrhosis, portal hypertension and hepato-cellular carcinoma. It is estimated that, worldwide more than 2 billion people have been infected by HBV and 350 million people have chronic infection [6, 7]. The virus is 50 - 100 times more infectious than HIV and 10 times more infectious than hepatitis C virus (HCV). Additionally: the virus is relatively easy to be transmitting from one infected individual to another by blood-to blood contact, during birth, unprotected sex, sharing needles and has a relatively higher prevalence in the tropics [8].

Syphilis is systemic disease which caused by *Trepanoma pallidum* and can be spread by sexual contact, blood transfusion and via vertical transmission. Approximately 12 million new cases of syphilis detected each year and more than 2 million occur in pregnant women [2, 9]. The risk of contracting syphilis through sexual contact with a person that has primary or secondary syphilis is 30–50% [10, 11].

Co-infection with HBV and HIV is becoming common and a growing public health concern because both viruses share similar transmission routes. In HIV infected individuals, HBV infection prevalence is approximately ten times higher than in the general population. Individuals with HIV who contract acute hepatitis B are more likely to develop chronic hepatitis B than individuals who contract acute hepatitis B without HIV [12].

Syphilis and HIV co-infection is now increasingly common all over the world. One of the major concerns regarding the coexistence of HIV and syphilis is that syphilis, as other genital ulcer diseases, might facilitate HIV acquisition and transmission due to interfering with the natural mucosal and epithelial barriers and by causing local inflammation [13].

In general; HIV, HBV and Syphilis infections has been causing a serious pregnancy related problems with high morbidity and mortality effect. In addition; these common STIs share common mode of transmission that induce economical and psychological outcome, highly pathogenic effect that initiate immunological intolerance for pregnant women. Therefore; this study has designed on these common STIs to understand the burden of these infections in pregnant women which is an integral part to develop a strategy targeted on prevention and intervention.

2. Methods

2.1. Study Area and Period

The study has conducted in Gandhi Memorial Hospital Addis Ababa, Ethiopia, from January – April, 2014. The Hospital is a governmental health facility that provides services for referral cases and is the only maternity hospital in the city administration. The services provided in the hospital are anti-natal care, PMTCT, delivery, rape clinic, post-natal care, problems related to gynecology and any fetomaternal related services including anti-retro viral therapy (ART). In addition to this the hospital served as a center of excellence for students specialized in gynecology and obstetrics from Addis Ababa University.

2.2. Study Design

A cross sectional study design has selected to determine the sero-prevalence and identify the possible risk factors of HIV, HBV and Syphilis among pregnant women provided health care services in Gandhi Memorial Hospital Addis Ababa, Ethiopia.

2.3. Population

All pregnant women who came for receiving health care services during the study period have used as a source population and those women who are giving written or verbal consent were consider as a study population.

2.4. Sample Size Calculations and Data Collection

The sample size has calculated based on single sample size estimation [14]. Since similar prevalence rate were not done on these three infections on pregnant women, the prevalence rate (p) was taken 50%. From this, a sample size was calculated as 403 (including 5% non- response rate). Trained nurses were collect data using a pre-tested and well structured questionnaire for socio-demographic variables and potential risk factors. Three milliliters of whole blood samples from pregnant women have collected aseptically using serum separator tube (SS tubes) and sera were separate by centrifugation and kept at -20°C until processed.

2.5. Laboratory Investigation

2.5.1. HIV Screening

Based on the national testing algorism of HIV in Ethiopia Sera were first tested for the qualitative detection of HIV-1/2 antibodies using a solid phase colloidal gold immunochromatographic technique KHB (Shanghai Kehua Bio-engineering Co., Ltd. China). Samples that are negative for HIV-1/2 antibody are reported as HIV negative where as samples having HIV-1/2 antibody are tested using a more

specific secondary Chembio HIV-1/2 STATPAK test kit (Chembio HIV- 1/2 STATPAK™ Assay, CHEMBIO DIAGNOSTIC SYSTEMS, INC., MEDFORD, NY, USA). Any discordant results have tested using Ti-breaker Uni-Gold which is more specific and sensitive (Uni-Gold HIV-1/2, Trinity Biotech PLC, Wicklow, Ireland). Finally samples that are positive for HIV-1/2 antibody reported as HIV-positive, while those that are negative for HIV antibody reported as negative.

2.5.2. Detection of HBsAg

Hepatitis B infection was determined using GENEDIA® HBsAg rapid device (manufactured by GREEN CROSS MEDICAL SCIENCE, KOREA) (Immunochromatographic 1-step test device) and positive sera were confirmed using ELISA according to the manufacturer's instructions. The reason why utilizing one step test device for screening of HBV was mainly to minimize cost and effect less of the method in result interpretation because of its sensitivity (100%) mean while the possibility of missing positive samples is minimum.

2.5.3. Detection of Syphilis Antibody

Syphilis Rapid Test Strip (Quick Test™ Syphilis Serum/ Plasma/Whole Blood Strip) was used to detect antibodies produced against *Trepollema palladium.*

2.6. Quality Control

To make sure and understand the feasibility of the questionnaire, it was pretested on 40 pregnant women at three health centers which are other than the actual study sites. The collected data has checked daily and followed strictly for consistency and accuracy. During blood collection standardized procedures were highly used. To monitor the storage condition and analytical process a calibrated refrigerator have used to store samples until processed. Finally Positive and negative controls were run alongside of the test.

2.7. Data Analysis

The data have entered in to Epi Info 5.3.1 soft ware and double checked before analysis and exported to SPSS version 16 for analysis. The descriptive statistics (means, percentages or frequency) have calculated and the bi-variant logistic regression analysis used. Variables that had a significant association have selected for further analysis using multiple logistic regression models with a p-value ≤ 0.05 considered as statistically significant. The strength of the association have measured using an odd ratio and interpreted using the 95% confidence interval.

2.8. Ethical Clearances

Ethical clearances obtained from the "Department of Research and Ethical Review Committee" of the Medical Laboratory Sciences, School of Allied Health Sciences, College of Health Sciences, Addis Ababa University and Addis Ababa City Administration Health Bureau Ethical Reviewing Committee. Additional permission was also obtained from the health facility. The purpose of the study explained and consent was obtain from each participant both verbally and written. Finally those with informed consent enrolled in the study. Test results have given to the clinicians for further clinical management and follow up.

3. Result

3.1. Prevalence of HIV, HBV and Syphilis Infection

Overall, 21 (5.2%) and 20 (5%) of the pregnant women were positive for HIV-1/2 and HBsAg, respectively but no case of syphilis have determined. 2 (9.5%) of pregnant women had both HBV/HIV co-infections. Of the 5.2% HIV-1/2 positive respondents 12 (3%) of them had aware of their previous status whereas; 9(2.2%) were newly infected.

3.2. Socio-demographic Characteristics

A total of 403 pregnant women took part in this study. Majority of them were between an age group of 20-29 (51.1%) followed by 30-39 (43.4%) with a mean age of 24.8 (SD±5.99). In case of marital status 348 (86.4%) were married and 21(5.2%) separated (divorced or widowed), moreover; 141(35%) attained secondary school and 47(11.7%) didn't have formal education. Concerning their occupational status 195(48.4%) weren't employee and 37(9.2%) were self -employed individuals. Moreover; majority of their average monthly income of the respondents were <1000 (52.6%) birr (Table 1).

Table 1. *Frequency of socio-demographic characteristics of pregnant women provided health care service at Gandhi Memorial Hospital Addis Ababa, Ethiopia, 2014.*

Demographic data	Frequency	Percentage
Age (in years)		
15-19	8	2%
20-24	59	14.6%
25-29	147	36.5%
30-34	121	30%
35-39	54	13.4%
>40	14	3.5%
Marital status		
Married	348	86.4%
Unmarried	34	8.4%
Separated	21	5.2%
Educational level		
No formal education	47	11.7%
Primary	115	28.5%
Secondary	141	35%
Tertiary	100	%
Occupational status		
Self-employed	37	9.2%
Government employed	69	17.1%
Private employed	102	25.3%
Not-employed	195	48.4%
Average monthly income (Birr)		
<1000	212	52.6%
1001-2000	79	19.6%
2001-3000	65	16.1%
>3000	47	11.7%

3.3. Associated Risk Factors for Hepatitis B Virus and HIV Infection

Table 2. *Association of socio-demographic characteristics and HIV infection of pregnant women provided health care service at Gandhi Memorial Hospital Addis Ababa, Ethiopia, 2014.*

Demographic characteristics	HIV Infection		p-value	AOR (95% CI)
	Positive	Negative		
Age in group				
<20 years	0(0%)	8(100%)		
20-29 years	13(6.3%)	193(93.7%)	0.533	0.485-0.582
30-39 years	8(4.6%)	164(95.4%)		
40-49 years	0(0%)	14(100%)		
Marital status				
Married	17(4.9%)	331(95.1%)	0.673	0.609-0.701
Unmarried	2(5.9%)	32(94.1%)		
Separated	2(9.5%)	19(90.5%)		
Educational level				
No formal education	2(4.3%)	45(95.7%)		
Primary	9(7.8%)	106(92.2%)	0.538	0.409-0.587
Secondary	6(4.3%)	135(95.7%)		
Tertiary	4(4%)	96(96%)		
Occupational status				
Self-employed	2(5.4%)	35(94.6%)		
Government employed	4(5.8%)	65(94.2%)	0.945	0.923-0.968
Private employed	4(3.9%)	98(96.1%)		
Not- employed	11(5.6%)	184(94.4%)		
Average monthly income (Birr)				
<1000	17(8.0%)	195(92.0%)		
1001-2000	3(3.8%)	76(96.2%)	0.045	1.023-1.062
2001-3000	1(1.5%)	64(98.5%)		
>3000	0(0.0%)	47(100%)		

*AOR-Adjusted odds ratio *CI-Confidence interval

Table 3. *Association of possible risk factors related to HIV infection of pregnant women provided health care service at Gandhi Memorial Hospital Addis Ababa, Ethiopia, 2014.*

Risk Factors		HIV Infection		p-value	AOR (95% CI)
		Positive N (%)	Negative N (%)		
Multiple sexual practices	Yes	8(10.7)	67(89.3)	0.039	5.13(1.154-7.255)
	No	13(4)	315(96)		
Use of sharp material	Yes	2(28.6)	5(71.4)	0.046	5.682(1.45-43.59)
	No	19(4.8)	377(95.2)		
Ear piercing	Yes	19(5.8)	310(94.2)	0.392	0.103-1.99
	No	2(2.7)	72(97.3)		
Tattooing	Yes	4(5.1)	74(94.9)	1.000	0.334-3.124
	No	17(5.2)	308(94.8)		
Contact history with infected person	Yes	7(20)	28(80)	0.000	13.45(2.36-16.94)
	No	14(3.8)	354(96.2)		
Blood transfusion	Yes	4(12.9)	27(87.1)	0.068	0.102-1.028
	No	17(4.6)	355(95.4)		
Hospital admission	Yes	5(5.4)	88(94.6)	1.000	0.341-2.688
	No	16(5.2)	294(94.8)		
Tooth extraction	Yes	10(5.6)	170(94.4)	0.957	0.366-2.126
	No	11(4.9)	212(95.1)		
Surgery	Yes	8(8.2)	90(91.8)	0.211	0.201-1.247
	No	13(4.3)	292(95.7)		
Catheterization	Yes	3(7.7)	36(92.3)	0.443	0.175-2.222
	No	18(4.9)	346(95.1)		
History of STI	Yes	12(50%)	12(50%)	0.000	49.24(14.56-116.08)
	No	9(2.4%)	370(97.6%)		

*AOR-Adjusted odds ratio *CI-Confidence interval

Multivariate logistic regression analysis was conducted to assess independent risk factors for HBV and/or HIV infections. History of Multiple sexual practices (AOR=5.13, 95% CI, 1.154-7.255, P=0.039), Use of sharp material (AOR=5.682, 95% CI, 1.45-43.59, P=0.046) and Contact history with infected person (AOR=13.45, 95% CI, 2.36-16.94, P=0.000) had significant risk factors for HIV-1/2 infection (Table 3). On the other hand; History of Multiple

sexual practices (AOR =14.79, 95% CI, 2.426-15.301, P=0.000), Ear piercing (AOR=1.056, 95% CI, 1.036-1.094, P=0.033) and history of blood transfusion (AOR=21.6, 95% CI, 3.881-28.05, P=0.000) were statistically significant risk factors for HBV infections (Table 5).

4. Discussion

4.1. HIV Infection

In this study, the overall prevalence of HIV infection (5.2%) was higher than the adult (1.3%), women (1.8%) national HIV prevalence [4] and rural hospitals of southern Ethiopia (1.8%) [15]. In contrast to this; it was lower than previous studies in Kazanchis Health Center, Addis Ababa (7.68%) [16], Gonder Teaching Hospital (9.6%) [17] and Gonder Health Center (11.9%) [18]. But it was in line with Addis Ababa, Ethiopia, HIV prevalence (5.2%) [5]. Compared to studies in different part of the world; higher prevalence have observed in Brazil 8% [19], South Africa 14% [20], Northern Tanzania 7.6% [21] and lower were in Cameroon 4.2% [22] and Niger Delta Nigeria 4.1% [23]. The majority of HIV positive participants in this study were among the age group 20 to 29 which was 13(6.3%). Similarly, 13% of HIV prevalence was reported in the same age group (20–29 years) in Gondar, Ethiopia [18] and Nigeria 10.9% [24]. The reason may be due to vulnerability of this age group for HIV infection.

Among the socio demographic data of pregnant women the status of average monthly income were statistically associated with HIV infection (AOR=1.023-1.062, 95%CI, p=0.045).

Habit of multiple sexual practices, use of sharp material and contact history with infected person has significant risk factors for HIV infection. This report have supported by study conducted in Bangladesh [25] and Bahir Dar, Ethiopia [26].

4.2. HBV Infection

According to the WHO classification, the prevalence of HBV among pregnant women in this study was intermediate (2-7%) [27]. The finding of this study was in agreement with a study in Cameron 5.4% [28], Nigeria 5% [23] and Debre Tabor Hospital, Ethiopia 5.3% [29]. Studies with lower prevalence compared to this finding includes; in Brazil with 1.1% [30], Spain 0.4% [31], India 2.4% [32] and in Jimma southwest Ethiopia 3.7% [33]. On the other hand; higher prevalence was reported among a similar study population in Bangladesh 7.6% [25], Gonder Health Center Ethiopia 7.3% [18] and rural Hospitals of Southern Ethiopia 6.1% [34]. The variations observed compared to this study could be due to the methods used, socio-cultural variations, sample size and the study design.

Table 4. *Association of socio-demographic characteristics and HBV infection of pregnant women provided health care service at Gandhi Memorial Hospital Addis Ababa, Ethiopia, 2014.*

Demographic characteristics	HBV Infection		p-value	AOR (95% CI)
	Positive	Negative		
Age in group				
<20 years	1(12.5%)	7(87.5%)		
20-29 years	11(5.3%)	195(94.7%)	0.583	0.535-0.631
30-39 years	8(4.6%)	167(95.4%)		
40-49 years	0(0%)	14(100%)		
Marital status				
Married	18(5.2%)	330(94.8%)	0.806	0.768-0.845
Unmarried	2(5.9%)	32(94.1%)		
Separated	0(0.0%)	21(100%)		
Educational level				
No formal education	2(4.3%)	45(95.7%)		
Primary	4(3.5%)	111(96.5)	0.744	0.702-0.787
Secondary	7(5%)	134(95%)		
Tertiary	7(7%)	93(93%)		
Occupational status				
Self-employed	2(5.4%)	35(94.6%)		
Government employed	4(5.8%)	65(94.2%)	0.342	0.296-0.389
Private employed	8(7.8%)	94(92.2%)		
Not- employed	6(3.1%)	189(96.9%)		
Average monthly income (Birr)				
<1000	6(2.8%)	206(97.2%)		
1001-2000	7(8.9%)	72(91.1%)	0.000	1.002-1.007
2001-3000	7(10.8%)	58(89.2%)		
>3000	0(0.0%)	47(100%)		

*AOR-Adjusted odds ratio *CI-Confidence interval

In relation to the sero-positivity rate of HBV infection and socio-demographic data; average monthly income level of respondents were statistically associated (AOR=1.002-1.007, 95%CI, P=0.000). This was supported by a research conducted in Jimma, Southwest Ethiopia [33].

Table 5. *Association of risk factors related to HBV infection of pregnant women provided health care service at Gandhi Memorial Hospital Addis Ababa, Ethiopia, 2014.*

Risk factors		HBV infection		p-value	AOR (95% CI)
		Positive N (%)	Negative N (%)		
Multiple sexual practices	Yes	11(14.7)	64(85.3)	0.000	14.79(2.426-15.301)
	No	9(2.7)	319(97.3)		
Use of sharp material	Yes	2(28.6)	5(71.4)	0.062	0.022-0.656
	No	18(4.5)	378(95.5)		
Ear piercing	Yes	20(6.1)	309(93.9)	0.033	1.056(1.036-1.094)
	No	0	74(100)		
Tattooing	Yes	4(5.1)	74(94.9)	1.000	0.311-2.95
	No	16(4.9)	309(95.1)		
Contact history with infected person	Yes	1(2.9)	34(97.1)	0.713	0.24-14.256
	No	19(5.2)	349(94.8)		
Blood transfusion	Yes	8(25.8)	23(74.2)	0.000	21.6(3.881-28.05)
	No	12(3.2)	360(96.8)		
Hospital admission	Yes	4(4.3)	89(95.7)	1.000	0.395-3.715
	No	16(5.2)	294(94.8)		
Tooth extraction	Yes	13(7.2)	167(92.8)	1.00	0.162-1.067
	No	7(3.1)	216(96.9)		
Surgery	Yes	7(7.1)	91(92.9)	0.382	0.224-1.494
	No	13(4.3)	292(95.7)		
Catheterization	Yes	1(2.6)	3897.4)	0.708	0.273-16.072
	No	19(5.2)	245(94.8)		
Pregnancy related problems	Abortion	13(18.3%)	58(81.7%)	0.011	6.45(1.39-12.905)
	others	3(5.4%)	53(94.6%)		

*Others-include ectopic pregnancy, Stillbirth, Obstructed labor *AOR-Adjusted odds ratio *CI-Confidence interval

The positivity of HBV infection had significantly associated with habit of multiple sexual practices, Ear piercing, history of abortion and history of receiving blood through transfusion from other people. Similar finding have observed in Brazil [30], Bahir Dar city, Northwest Ethiopia [26] and Jimma, Southwest Ethiopia while, pregnant women who have experienced in abortion had higher prevalence of HBsAg (7.3%) [33].

4.3. Syphilis Infection

The prevalence of Syphilis in this study was very low; different studies suggest that syphilis prevalence varies widely depending on the type of population being studied and associated risk factors. But the reason behind why the prevalence was low in this study may be as a result of delivering integrated services for pregnant women through early screening of syphilis and effective treatment of symptomatic individuals in antenatal care.

The finding of syphilis in this study was in line with study conducted in India [32], Spain [31] and in rural hospital of Southern Ethiopia [34]. In contrast, it was lower than the study documented in Brazil (3%) [30], Bangladesh (2.9%) [25], Annaba (Algeria) (0.26%) [35], Ethiopia at Gonder University Teaching Hospital (1%) [36] and Gonder Health center (2.3%) [18].

4.4. HBV and HIV Co-Infection

HIV and HBV infections are two major viral infections worldwide, though information on the actual role of HBV in HIV infection is not well established. Co-infection with HBV and HIV is becoming common and a growing public health concern due to their similar transmission routes. In HIV infected individuals, HBV infection prevalence is approximately ten times higher than in the general population. In addition individuals infected with HIV who contract acute hepatitis B are more likely to develop chronic hepatitis B than individuals who contract acute hepatitis B without HIV [37].

The frequency of HBV and HIV co-infection (9.5%) in this study was higher than the study done in Nigeria 0.5% [24], rural hospital of Southern Ethiopia 0.6% [34] but lower than Bahir Dar city, North West, Ethiopia 19% [26]. This is because most of the co-morbidity of HBV and HIV infection is common among risk groups and share common mode of transmission.

5. Conclusion

The chance of exposure to HIV infection were higher in pregnant women with age group 20-29 years of age, those having married, attained primary school and not employed even though the statistical analysis didn't suggest an association. The reason may be due to problems associated to unsafe practice, screening problems before marriage that assures the status of sexual partners and knowledge gap on transmission mode of the infection and the virus pathogenic effect. That's why still new HIV infection in pregnant women have been a serious problem. In relation to the possible risk factors; history of sex with multiple sexual partners, pre-exposure to STI and low level of monthly income were found as significant risk factors of HIV.

The finding of HBV infection was intermediate according to WHO classification even though history of sex with multiple sexual partners, pre-exposure to STI and low level

of monthly income were found to be significant risk factors of HBV infection. On the other hand; pregnant women employed in private sectors and having followed formal education in secondary and tertiary level have more exposed to HBV infections. This more exposure rate may be due to unsafe practice, awareness problem in the mode of transmission and pothogenesity of the virus and unknown status of sexual partners. HBV-HIV co-infection was low but Syphilis is not-existing.

Therefore; mass mobilizations that address awareness on risk factors and transmission mode of HIV and HBV for the targeted populations have recommended and the status of sexual partner is better to know before marriage. More over; screening of sexual partner for both HIV and HBV in ANC is better to incorporate. On the other hand; even though the study area provides a services that have coming from different corner of the city and represents majority of the existing population; further studies on syphilis that includes different study sites are recommended to conduct in order to visualize the exact figure.

Abbreviation

ANC: Anti natal care; STI: Sexual Transmitted infections; ELISA: Enzyme linked immuno sorbent assay; HIV: Human Immunodeficiency Virus; AIDS Acquired Human Immunodeficiency syndrome; HBsAg: Hepatitis B surface Antigen; HBV: Hepatitis B virus; HCC: Hepatocellular carcinoma; HCV: Hepatitis C virus; SOPs: Standard operating procedures; SPSS: Statistical package for the social sciences; WHO: World Health Organization.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

Kinfe Fissehatsion contributed to the design of the study starting from initiating questions, designing, analysis and development of manuscript. Finally all the authors (KF, IA and AG) critically revised the draft manuscript and approved the final manuscript.

Acknowledgements

We would like to acknowledge to Addis Ababa University for granting such opportunity and the study participants for their participation in this study.

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