

Seroprevalence of Human Immunodeficiency Virus among Antenatal Women in a Tertiary Care Hospital, India

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ABSTRACT

Introduction: Human immunodeficiency virus (HIV) infection is rapidly increasing in world as well as in India since the detection of first acquired immune deficiency syndrome (AIDS) case in Chennai in 1986. Having seroprevalence rate of less than 1%, India is considered as low prevalence country but due to large population this low prevalence convert in a huge subset of HIV positive people. Unfortunately India shares one third of total HIV positive cases of the world. Estimating the HIV seroprevalence in a low risk population of pregnant women provides vital information for the successful implementation of AIDS control program and also for monitoring trend of HIV in general population. Therefore, screening of pregnant women in early pregnancy may help in prompt counselling and therapy, thereby bringing down the mother to child transmission of HIV infection.

Objective: To determine the rate and trends of seroprevalence of HIV among antenatal women.

Materials and Methods: It is a retrospective study conducted at PPTCT centre, Rajendra Institute of Medical Sciences (RIMS), Ranchi, a tertiary care referral hospital in Jharkhand state of India from January 2014 to December 2016. The tests were done as per NACO guidelines using COMBAIDS-RS Advantage-ST, HIV-1/2 TRISPOT and MERISCREEN HIV 1-2 WB tests.

Results: 19266 antenatal women were included in this study.

Out of this 57 women were detected to be positive for HIV, accounting for 0.32% prevalence rate. HIV seroprevalence amongst antenatal women is 0.32% which is in agreement with the national projection (0.29% as per NACO annual report 2014-2015). HIV seroprevalence rates showed a decreasing trend from 0.32% in 2014 to 0.16% in 2016.

Conclusion: Every antenatal woman should be screened for HIV. Appropriate antenatal screening, interventions and preventive strategies might bring down the mother to child transmission of HIV.

Keywords: HIV, Seroprevalence, Antenatal Women, PPTCT.

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INTRODUCTION

Human immunodeficiency virus (HIV) infection is rapidly increasing in world as well as in India since the detection of first acquired immune deficiency syndrome (AIDS) case in Chennai in 1986. Having seroprevalence rate of less than 1%, India is considered as low prevalence country but due to large population this low prevalence convert in a huge subset of HIV positive people. Unfortunately India shares one third of total HIV positive cases of the world.

According to National AIDS Control Organization (NACO), annual report (2015), 2.117 million people were suffering from HIV infection, out of which 6.54% was below 15 years of age whereas in adults (15-49 yr), prevalence was 0.26% (0.30% male, 0.22% female). Manipur has the highest prevalence followed by Mizoram, Nagaland, Andhra Pradesh & Telangana, Karnataka, Gujarat and Goa. Maharashtra, Chandigarh and Tamil Nadu had an adult

prevalence greater than national prevalence (0.26%) whereas, Bihar and Jharkhand were considered to be a low prevalence state.¹

According to HIV sentinel surveillance 2014-2015, the overall HIV prevalence among ANC clinic attendees, considered a proxy for prevalence among the general population, continues to be low at 0.29% with an overall declining trend at the national level. The commonest mode of spread of virus in India is heterosexual contact which accounted for 87% of new infections in 2015. Mother to child transmission is the largest source of HIV infection among children below the age of 15 years (according to UNAID-The Joint United Nations Programme on HIV/AIDS). The vertical transmission take place in about 25 to 35% of HIV positive women, which contributes in 4% of the total HIV infection load in India.²

The number of babies infected with HIV in the perinatal period is likely to increase if the infection become unnoticed during pregnancy as the HIV-positive women in India are rising in number due to this reason PPTCT (prevention of parent-to-child transmission) has been given due importance during National AIDS Control Programme (NACP) Phase III period(2007-2012). Estimating the HIV seroprevalence in a low risk population such as pregnant women provides vital information for an effective implementation of AIDS control program and also for monitoring trend of HIV in general population. Therefore, screening of pregnant women in early pregnancy may help in prompt counselling and therapy, thereby assist in prevention from mother to child transmission (PMTCT) of HIV infection. To the best of our knowledge, no study on HIV prevalence in antenatal women are available from Jharkhand India, hence we did this study to determine the rate and trends of seroprevalence of HIV among pregnant women attending antenatal clinics at tertiary Care hospital of Jharkhand, India.

MATERIALS AND METHODS

This retrospective study was conducted at PPTCT (prevention of parent to child transmission centre), Rajendra Institute of Medical Sciences (RIMS), Ranchi, a tertiary care referral hospital in Jharkhand state of India from January 2014 to December 2016. All pregnant women registered at antenatal clinic in this period were enrolled for the study. All pregnant women are routinely advised to undergo HIV screening test at antenatal clinic in this institute. After taking patient consent, the tests were done as per NACO guidelines using COMBAIDS-RS Advantage-ST, HIV-1/2 TRISPOT and MERISCREEN HIV 1-2 WB tests.

Specimen

Five ml venous blood sample was collected in a sterile plain container from all pregnant women who came for testing. Blood was allowed to clot for 30 minutes at room temperature (25–30°C). After that serum was separated by centrifugation at low speed. The serum samples were then stored at 4°C and were used within 48 hrs. In tests, where whole blood is needed, it should always be used freshly collected in EDTA/ Heparin/ citrate anticoagulant.

Serology

1) COMBAIDS: This is a HIV1+2 immunodot test assay for detection of antibody to HIV-1 and/or HIV-2 in whole blood, serum or plasma.

Principle- Dot immunoassay employs same principle as Enzyme Immuno Assay (EIA) where immobilised antigen-antibody complex is visualised by means of a chromogenic reaction. The coloured end point is developed by a colloidal gold-protein-A-signal reagent. Each tooth of the comb has three circular spots, one near the tip with an optimally standardised HIV-1 and HIV-2 recombinant antigens and /or synthetic peptides (test spot), and the third spot, a little above the first spot is with the control reagent (control spot). When incubated with a specimen containing HIV-1 and/or HIV-2 antibodies, these antibodies bind directly to the HIV antigens present in the test area on the tooth of the comb. The immune complex is directly visualised after incubation with the colloidal gold-protein A signal reagent.

The presence of pink coloured spot/dot in the test area is indicative of positive result. Built in control is visualised separately.

A pink coloured spot/dot will always appear at the control area during testing the sample detecting presence of human immunoglobulins (IgG), irrespective of the presence or absence of HIV specific antibodies in the sample.

Interpretation of results:

Reactive: Appearance of pink coloured spot/dot on both test area and control area, indicating positive reaction. The positive result shows either HIV-1 or HIV-2 or both together. The intensity of spot/dot shall be > 1.0 colour index when compared with reference colour index for SPIA (Solid Phase Immunosorbent Assay)

Non-reactive: Absence of pink spot/dot in test area indicates a negative result.

Indeterminate: The test is considered to be invalid if no pink coloured spot/dot is visible in control. The test should be repeated using a new device

2) Meriscreen HIV 1-2 WB: This is a qualitative, screening, in-vitro diagnostic immunochromatography assay for detection of HIV-1 and HIV-2 specific antibodies in human serum, plasma and whole blood.

Principle- It is a rapid test kit, with pre coated HIV-1 antigens (gp41 and gp120) and HIV-2 antigen (gp36) on test region 1 and 2 respectively. Recombinant antigen (gp41, gp120, and gp36) gold conjugate forms a coloured band in test region 1 and 2 in the test window. As the test sample flows through the membrane after addition of assay buffer, the antigen gold conjugate complexes with anti- HIV antibodies. This complex moves further on the membrane towards the test region, where HIV antigens are coated and leads to formation of reddish purple band at test region. Absence of test bands indicates a negative test result. The control band is always used. The test results to be interpreted at the end of 20 minutes and do not read the results after 30 minutes.

Interpretation of results:

NEGATIVE: If only the control band is developed, it indicates that no detectable HIV antibodies are present in the sample. The result is negative.

POSITIVE: If control, HIV-1 and HIV-2 bands developed, this indicates the presence of antibodies to HIV-1 and/or HIV-2 in the sample. The result is positive.

INVALID: If no control band is developed, the assay is invalid regardless of colour development of both bands. The assay is to be repeated with a new device.

3) HIV-1/2 trispot test (AIDSCAN): This is a immuno concentration based assay for the detection of HIV-1 and HIV-2 antibodies in human serum or plasma.

Principle- This is an immunoassay which employs r-proteins for the detection of HIV antibodies in human serum or plasma. These proteins are corresponding to highly antigenic segments of both the structural and non-structural proteins of the HIV constitute the solid phase antigenic absorbent. The r-proteins have multiple epitopes so, its usage offers advantage of high degree of specificity and sensitivity.

Interpretation of result-

NEGATIVE: If only one red spot (control) appears at the control region, it indicates that no antibodies either HIV-1 or HIV-2 are present in the specimen.

POSITIVE: a) If two red spots (control spot and HIV-1 or HIV-2 spot) appear at the control region & test region HIV-1 and/or HIV-2 indicates that the specimen is reactive for HIV-1 and/or HIV-2.

b) If three spots (control, HIV-1 and HIV-2 spot) appear at the control and test region HIV-1 and HIV-2, indicates the specimen to be reactive for antibodies to HIV-1 and HIV-2.

INVALID: If no spot appears after completion of test either with clear background or with complete reddish background, indicates error. The specimen should be retested on a fresh device.

A person said to be HIV positive only when the above three tests were found to be positive.

When COMBAIDS-RS Advantage-ST and MERISCREEN HIV 1-2 WB test results were positive for HIV antibodies, then HIV-1/2 TRISPOT test was performed to verify the result. Only when all the three tests were positive, the person was said to be positive for HIV antibodies.

Statistical Analysis

Statistical analysis was done by descriptive statistics using simple ratio and percentages. Microsoft office 2007 was used to generate Tables. Associations were tested with the help of Chi-square test, p value < 0.05 was considered significant.

Table 1: Socio-demographic factors of HIV positive pregnant women.

VARIABLES		NUMBER OF SEROPOSITIVES	PERCENTAGE (%)
AGE (years)	<20	12	21.05
	21-30	37	64.91
	31-40	8	14.03
MARITAL STATUS	Married	57	100
	Unmarried	0	0
PARITY	Primigravida	19	33.33
	Multigravida	38	66.66
RELIGION	Hindu	41	71.92
	Muslim	6	10.52
	Others	10	17.54
RESIDENCE	Rural	22	38.59
	Urban	35	61.40
OCCUPATION	Housewife	47	82.45
	Labourer	08	14.03
	Service	02	3.5
EDUCATION	Illiterate	11	19.29
	Primary school	26	45.61
	Secondary school	13	22.80
	College & above	7	12.28
HUSBAND OCCUPATION	Migrant	38	66.66
	Driver	13	22.8
	Others (service, business etc)	06	10.52
EDUCATION OF HUSBAND	Illiterate	3	5.26
	Primary school	29	50.87
	Secondary school	17	29.82
	College & above	08	14.03
CD 4 COUNT OF ANC	<200	5	8.77
	>200	52	91.22
OUTCOME OF PREGNANCY	Live birth	40	70.17
	Still birth	7	12.28
	Abortion	2	3.5
	MTP	8	14.03
POSITIVITY	New	18	31.57
	Known	29	50.87
	Direct in labour	10	17.54

Table 2: Year wise HIV Prevalence in pregnant women

YEAR	% POSITIVITY
2014	0.318
2015	0.475
2016	0.161

Table 3: Year-wise prevalence rates of HIV in pregnant women at a tertiary care center

YEAR	TOTAL TESTED	HIV POSITIVE
2014	5959	19 (0.318%)
2015	5263	25 (0.475%)
2016	8044	13 (0.161%)
Total	19266	57

Chi-square = 10.681 (df = 2, p = 0.0048)

RESULTS

Total 19266 consenting antenatal women were participated in this study. Out of these 57 women were detected to be positive for HIV, accounting for 0.32% prevalence rate. Socio-demographic factors of HIV positive pregnant women are shown in table 1. HIV seroprevalence rates showed a decreasing trend from 0.32% in 2014 to 0.16% in 2016 (Table 2) ($p = 0.0048$). Among 57 seroreactive pregnant women, 29 were known HIV positive cases. The mean age was 26.38 years, the minimum age was 18 years whereas the maximum age was 36 years. Majority of the seroreactive pregnant women (64.91%) were in the age group of 21 to 30 years followed by younger population less than 20 yrs (21.05%) and 31 to 40 years (14.03%) age group. All HIV positive cases were married. Majority of HIV positive cases were multigravida, hindu and housewife. Educational status of majority of HIV positive women and her husband were primary class. The incidence of live birth, still birth, abortion and MTP were 70.17%, 12.28%, 3.5% and 14.03% respectively.

Table 4: Various study results of HIV seroprevalence in pregnant women in India

STUDY	LOCATION	YEAR	SEROPREVALENCE
Parmeshwari et al ¹⁷	Namakkal Dist., Tamil Nadu	2002	0.70%
Ukey et al ⁸	Tertiary care hospital, India	2002 -2004	1.38%
Mehrotra et al ⁴	Allahabad, Uttar Pradesh	2003-2004	0.4%
Nagdeo et al ¹⁶	Hingna, Nagpur, Maharashtra	2003-2006	0.72%
Gupta et al ¹⁰	North India	2003-2006	0.88%
Chaudhury et al ¹⁵	Kolkata, West Bengal	2004- 2007	0.17%
Mandel et al ¹⁸	West Bengal	2004-2008	0.56%
Patil et al ⁷	Maharashtra	2004-2013	0.44%
Sinha et al ³⁰	19 medical colleges of India	2005-2006	0.41%
Joshi et al ³¹	Gujarat	2005-2008	0.35%
Hussain et al ²⁹	Agra, Uttar Pradesh	2005-2011	5.77 %
Dash et al ⁶	South Odisha	2005-2012	0.66%
Garg et al ¹¹	Agra, Uttar Pradesh	2005-2015	0.58%
Dwivedi S et al ³	Kanpur, Uttar Pradesh	2005- 2016	0.32%
Aljabri F et al ²¹	South India	2007-2012	0.27%
Giri et al ¹⁹	Loni, Maharashtra	2008-2011	0.41%
Sarkate et al ²³	Maharashtra	2008-2012	0.88%
Poonam C et al ²⁷	Akola, Maharastra	2010-2015	0.44%
Malik et al ⁹	Aligarh	2011-2013	0.41%
Devi et al ²⁰	Renga Reddy Dist, Andhra Pradesh	2011	0.45%
Khokar et al ²⁴	Gujurat	2011	0.39%
Kulkarni et al ²²	Nanded, Maharashtra	2013	0.76%
Preetkanwal S et al ²⁵	Punjab	2013-2014	1.03%
Nayak AK et al ²⁶	Cuttack, Odisha	2014	0.50%
Bala S ²⁸	tertiary care hospital Kota	2016 -2017	0.00055%
PRESENT STUDY	Ranchi ,Jharkhand	2014-2016	0.32%

DISCUSSION

The overall HIV seroprevalence among antenatal women was 0.32% in the present retrospective study. This seroprevalence is slightly more than the HIV prevalence (0.29%) among antenatal women in India as said by HIV sentinel surveillance (2014-15). The different surveillance system used by NACO could be the reason for this difference.

Various study done in different part of India, revealed a wide range of HIV seroprevalence as shown in table 4.

In a recent study which include study population from 2005-2016 done by Dwivedi S et al in Kanpur observed similar seroprevalence of 0.30%.³ In our study all HIV positive cases were married. Majority of them were multigravida (66.66%), hindu by

religion (71.92 %) and housewife by occupation (82.45%). In study done by Dwivedi S et al³ all seropositive women were married (100%), majority of them were Hindu by religion (88.2%) and housewife by occupation (89.2%). Likewise in study done by Mehrotra et al⁴. majority of seropositive women were Hindu (75%). The result of these studies are comparable to our study. Whereas Perry et al⁵ state that there is no significant difference between seropositive and seronegative women regardless of religion. Multigravida was found to be majority of seroprevalence in study by Dwivedi S et al³, whereas primigravida was majority in study done by Dash et al and Patil et al.^{6,7} In our study education of majority of HIV positive women was primary or secondary school which is similar to study by Dwivedi S et al³. Whereas maximum of HIV positive women were either illiterate or studied up to primary level as reported by Dash et al and Patil et al in their study.^{6,7}

Dwivedi S et al³ showed a higher predisposition of infection in young age group being high in age group of 26-30 (34.3%) followed 21-25 years (25.4%). Dash et al⁶ found that HIV infection was highest in the age group of 25- 29 years (43.8%), followed by 20-24 years (33.34%). Many literatures concluded that the, seroprevalence of HIV infection was highest in age group less than 24 years.⁸⁻¹¹ In our study majority of the seroreactive pregnant women (64.91%) were in the age group of 21-30 years followed by the < 20 yrs (21.05%) and 31-40 years (14.03%) age group. It may be because of the fact that 20 to 30 years is the most sexually active age group.

High prevalence in this group can be an alarming sign as there is more chance of spread of infection and loss of youth may cause both social and financial burden for the nation.

Additionally, these women have a higher reproductive history with increased rates of exposure to risk factors like surgical interventions during successive pregnancies and greater possibility of sexually transmitted infections. There has also been an additive effect of various factors such as lower educational status, low access to health care facilities and higher rates of inclination towards licentious activities of their husbands before the aggressive awareness programmes were launched. The women are less likely to make a visit to public antenatal clinic if they are older, have high parity, are illiterate, or are from low socio-economic background.^{10,12,13}

CONCLUSION

Every antenatal woman should be screened for HIV. Appropriate antenatal screening, interventions and preventive strategies might bring down the mother to child transmission of HIV.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from the National AIDS Control Organisation (NACO) and Jharkhand State AIDS Control Society (JSACS). The confidentiality of all the patients was maintained.

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