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Original Research Article

Incidence of HIV, its predictors and risk factors in children

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ABSTRACT

Background: Children mostly acquire HIV (Human immunodeficiency syndrome) infection from their parents. There is need to know the HIV status of their parents, associated risk factors and predictors so as to make effective strategies to prevent this disease and save the coming/future generation from this deadly disease. The objective of the study was to know incidence of HIV, its predictors and risk factors in children. Study Setting: This is a Hospital based observation study conducted in Department of Pediatrics, Govt. Medical College, Amritsar.
Methods: In this study, all patients admitted to Pediatrics department, irrespective of presenting complaints were evaluated for presence of any of risk factors/predictors as mentioned in Proforma and those children having any of risk factors/predictors were selected, consent was taken and undergone detailed clinical evaluation and investigations for HIV.
Results: Incidence of HIV in all patients admitted to children ward was 1.21% (27/2227) and children who had one or more risk factor or predictor was 6.58% (27/410). Weight loss, Failure to thrive (44.44%), Diarrhoea (37.03%), Fever (70.37%), Oral Candidiasis (22.2%), Pulmonary Tuberculosis (11.11%) and Generalized Lymphadenopathy (18.51%) were significant predictors in present study. High risk behaviour of parents (37.30%) and mother's HIV positivity (62.92%) were significant high risk factors, however needle prick (18.5%) was also equally significant in present study.
Conclusions: Children brought with various signs and symptoms of HIV or born to high risk behaviour practicing parents and/or HIV positive mother, physician must get their patients tested for HIV (as per NACO Guidelines) so that infected children diagnosed early and referred to a specialized centre for treatment and follow up.

Keywords: Human immunodeficiency syndrome, Predictors, Risk factors

INTRODUCTION

Worldwide HIV/AIDS continues to be a unique development challenge.[1] Some 33.2 million (30.6-36.1 M) people were living with HIV as of 2007; 2.1 million (1.9-2.4 million) of them were children under 15 years, and about 15.4 million (13.9-16.6 million) were women. AIDS is among the leading cause of death globally and remains the primary cause of death in Africa. Every day over 6800 persons become infected with HIV and over 5700 persons die from AIDS, mostly because of inadequate access to HIV prevention care and treatment services. Of the estimated 2.1 million (1.9-2.4 million) people who died of AIDS-related illness in 2007, 290000 (270000-320000) of them were children under 15 years old. Out of estimated 2.5 million (1.8-4.1 million) people who were newly infected in 2007, 420000 (350000-540000) were children under 15 years of age.[2] Across India today, AIDS/HIV is seen to be moving from high risk group to the more vulnerable segment among general

population. In India NACO estimates the 5.21 Million people were living with HIV at end of 2005, of which 39% were females. Total number cases reported in India were 124995 at end of august 31, 2006, 4.47% of cases under 14 years of age. India released new estimated in November 2007 revising the actual prevalence of HIV to be less than half of what was estimated till then. In 2006, India had 2.47 million (2.0-3.1 million) HIV infected people at a prevalence of 0.36% (0.27%-0.46%) against the reported 5.21 million (at a prevalence of 0.91 %) in the year 2005. Out of this, 39% are women and 3.8% are children. The data for the previous years have also been revised as per the new assumptions and a declining trend in the prevalence of HIV is noticeable since 2002, the year of peak HIV prevalence in India: The HIV prevalence amongst the high-risk groups continues to be nearly six to eight times greater than general population.[3-5] A study conducted on prevalence of pediatric HIV in New Delhi by Parthasarthy, Mittal and Sharma, revealed that out of one hundred and twelve children tested, who were born to a seropositive mother or suffering from chronic diarrhoea, failure to thrive or disseminated tuberculosis, ten were seropositive (8.9%).[6]

Findings from Uganda by Gray et al. (2005) that suggest an increased risk of HIV acquisition during pregnancy. Among African women aged 15-49 years who were pregnant in the last 24 months an HIV incidence of 7.9% was found, the highest incidence rate of all analysed sub-populations in our survey. This is powerful information in developing prevention interventions specifically targeted at pregnant women visiting antenatal clinics. HIV from being an intravenous drugs user transmitted disease has now progressed to a sexually transmitted disease and in children- a vertically transmitted disease. Mother-to-infant transmission is the major cause of pediatric AIDS, of all three means peripartum is considered to be the most common mode in the United States.[7-9]

The clinical manifestations of HIV-infection in children are different from those in adults; vary widely among infants, children, and adolescents. The immune system of young children, who are infected perinatally, is immature and hence dissemination throughout the various organs may occur very early. Children tend to suffer from primary infection while adults are more likely to suffer from reactivation of infection as their immunity wanes in response to advanced HIV-infection. In most infants physical examination at birth is normal, initial symptoms may be subtle such as lymphadenopathy and hepatosplenomegaly, or nonspecific, such as failure to thrive, chronic or recurrent diarrhoea, oral thrush, parotitis, skin manifestations, hematological abnormalitis, respiratory manifestations (lymphoid interstitial pneumonitis (lip) and pulmonary lymphoid hyperplasis), tuberculosis, malignancy (most common one are non-hodgkin's lymphoma, leiomyomas and leiomyosarcomas and leukemia) and may be distinguished only by their persistence.[10,11] So, children are innocent victims of HIV infections. Mostly acquire this infection from their parents. There is need to know the HIV status of their parents, associated risk factors and predictors so as to make effective strategies to prevent this disease and save the coming/future generation from this deadly disease.

The objective of the study was to find the incidence of seropositivity of HIV-I and HIV-2 antibodies in admitted pediatrics patients who have predictors and risk factors. To evaluate the predictors and risk factors in HIV positive cases.

METHODS

The present study was undertaken on 2227 indoor patients who were admitted in department of Pediatrics, Government Medical College, Amritsar over a period from August 15, 2006 to December 31, 2007. This study was undertaken as follows:

In this study, all patients admitted to Pediatrics department, irrespective of presenting complaints were evaluated for presence of any of risk factors/predictors as mentioned in Proforma and those children having any of risk factors/predictors were selected, consent was taken and undergone detailed clinical evaluation and investigations for HIV as per proforma.

- Test for HIV (HIV Antibody-based tests): Pre-test counseling to the parents was given; informed consent was taken before the test. All the samples were tested by three E/R/S (ELISA/Rapid/simple) assay tests using different antigens and/or principles by the kits available at Integrated Counseling and Testing Centre (ICTC) in the Microbiology Department.
- RT-PCR: This test was done in children who were below 18 months of age. Two PCR tests were done to confirm HIV status of child.
- Other investigations as per requirements.

RESULTS

Out of 2227 children who were screened, 410 had one or more risk factor/ predictors. Incidence of HIV in all patients admitted to children ward was 1.21% (27/2227) and children who had one or more risk factor or predictor was 6.58% (27/410). Majority of children in the study were males (60%). Male to female ratio was 1.86:1. Three hundred children (73.90%) were below 5 years of age, while only 26.1% were above 5 years of age (Table 1).

Weight loss >10% was significantly related to sero-positivity of children. Failure to thrive was present in 44.44% sero-positive children and significantly related to HIV status. 37.03% sero-positive children had diarrhoea >1 month. It was good predictor of HIV in children. Fever >1 month was present in 70.37% sero-positive children. It had a highly significant correlation to sero-positivity of children. Thirty three percent sero-positive

children had cough >1 month and it was not significantly related to HIV status of children. Encephalitis was present in 3.7% sero-positive cases which were also not significantly related to HIV status of children. Meningitis was present in 18.51% sero-positive children in comparison to 9.51% sero-negative.

It was not significantly related to sero-positivity of children. 7.4% sero-positive children were present with pneumonia in comparison to 19.75 in sero-negative cases and had no statistically significant correlation to HIV status of children. 7.40% sero-positive children had URTI, in comparison to 9.92% sero-negative cases and not significantly related to HIV status of children. 22.2% children were present with oral candidiasis which had highly significant correlation with HIV.

Pulmonary tuberculosis was present in 11.11% sero-positive children and significantly related to sero-positivity of children. Generalized lymphadenopathy was present in 18.51% sero-positive cases. It was significantly related to HIV status of children (Table 2).

Table 1: Distribution of children according to their HIV status.

Age group	Reactive female	Reactive male	Non reactive female	Non reactive female	Total
0-18 months	1	4	56	136	197
18 months-5 years	1	7	34	64	106
5 years-10 years	0	7	23	29	59
>10 yrs	1	6	27	14	48
Total	**3**	**24**	**140**	**243**	**410**

Table 2: Association of predictors with HIV status of children.

Predictors	Non-reactive with predictor	Non-reactive without predictor	Reactive with predictor	Reactive without predictor	P value
Weight loss >10%	28	355	9	18	<0.001%
Failure of thrive	67	316	12	15	<0.001%
Diarrohea >1 month	70	313	10	17	<0.05%
Fever >1month	144	239	19	8	<0.001%
Cough >1months	70	313	09	18	<0.05%
Encephalitis	7	376	01	26	>0.05%
Pneumonia	81	302	02	25	>0.05%
Meningitis	75	308	05	22	>0.05%
Oral candidiasis	18	365	06	21	<0.001%
Pulmonary tuberculosis	06	377	03	24	<0.01%
Extra pulmonary tuberculosis	04	379	01	26	>0.05%
URTI	38	345	02	25	>0.05%
Generalized lymphadenopathy	10	373	05	22	<0.001%
Repeated admission to hospital	27	356	02	25	>0.05%

Table 3: Association of risk factors with HIV status of children.

Risk factors	Non-reactive with risk factor	Non-reactive without risk factor	Reactive with risk factor	Reactive without risk factor	P value
Parents high risk activity	02	381	10	17	<0.001%
Blood transfusion	18	365	01	26	>0.05%
Needle prick	07	376	05	22	<0.001%
Surgery	03	380	01	07	>0.05%
HIV status of mother	0	383	17	10	<0.001%

Parents of 37.03% sero-positive children had high risk behaviour and significantly related to sero-positivity of children. Needle prick was present in 18.51% sero-positive children in comparision to 1.82% in sero-negative cases. Needle prick had significant correlation to HIV status of children. Blood transfusion not significantly related to HIV status of children. 3.7% sero-positive underwent surgery and it is not significantly correlated with HIV status of children. Mothers of

62.96% sero-positive children were HIV positive so most common mode of transmission in present study was vertical transmission (Table 3).

DISCUSSION

In our study 2227 patients were screened. Out of which 410 (18.4%) were found to have risk factors and predictors. A similar study was conducted by Agrawal et al12 in Mumbai, which, 5.5% patients had either one or more risk factors and predictors. Our incidence is very high (18.4%) as compared to 5.5% of Agarwal et al, as in present study number of risk factors and predictors were e as compared to study of Agrawal et al.[12]

In the present study, incidence of HIV in persons admitted to Pediatric ward was 1.21 % and for those who had one or more risk factors or predictors was 6.56%. Agrawal et al observed this in 0.83% of all patients admitted to hospital and 15.1 % those having risk factors and predictors.[12] In their study, high incidence of HIV can be explained on the basis that their hospital was located near large commercial sex area, where nearly half of the workers were infected and this hospital was catering to this population. Adrien et al at Haiti found 11.8% seropositivity in children having one or more risk factors.[13] Since in their study 71 % of children were less than one year of age and PCR test was not done, so the presence of maternal antibodies could not be ruled out, and this reflected high incidence of HIV in their study.

Among seropositive cases, 24 (88.8%) were males and 3 (11.2%) were females. Agrawal et al observed 62.1% males and 37.9% females in seropositive cases.[12] Lodha R observed 82% males and 18% females from seropositive cases.[14] Male predominance in our study may be due to gender bias, self-referral to hospital and females being neglected. Our study is quite similar to Lodha R, but in Agrawal et al study, female predominance is more. It could be attributed as their hospital located to red light area of Mumbai.[12,14] In seropositive cases 5 (18.5%) were below 18 months of age in my study. Agrawal et al observed 46.8% seropositive children in same age group.[12] This difference can be explained as number of cases in their study in this group was more and PCR test was not done. So, the presence of mother's antibodies could not be ruled out and this reflected high number of children in this group from seropositive cases.

In present study, from seropositive cases, 25.9% were adolescents. Sehgal et al at Delhi observed 24% adolescents from seropositive children, quite similar to our study.[15] Agrawal et al observed 8.8% children above 7 years from seropositive cases.[12] This difference can be explained as in their study 46.8% cases were less than 18 months and their HIV status not confirmed by PCR test. 33.33% seropositive children had weight loss >10% in the present study. Pol et al observed 56.3% seropositive children who had weight loss >10%.[16] Difference in weight loss can be explained as study by Pol et al conducted in children >18 months of age.[16] Shah et al observed weight loss >10% in 50% of seropositive cases.[17] This incidence of more weight loss as compared to our study can be explained as Shah et al conducted their study in children >1 month of age.[17] This shows high correlation of HIV incidence and weight loss >10%. In the current study, it was observed that there was statistically significant relationship between incidence of HIV and weight loss >10% ($p < 0.001$).

Failure to thrive was observed in 44.44% seropositive cases in the present study, whereas in study by Myhre et al at Chicago it was observed to be 38.14% in seropositive cases, which is comparable to our study.[18] In another study conducted by Parthasarathy et al at New Delhi, failure to thrive was observed to be 10% in seropositive cases, the disparity can be explained on the basis of small sample size in their study.[6] We observed by statistical analysis that the correlation between incidence of HIV and children who had failure to thrive was highly significant ($p < 0.001$).

In our study, 37.03% seropositive cases had diarrhea >1 month. Pol et al observed 30.99% seropositive children with diarrhea >1 month which is quite similar to our study.[16] In another study conducted by Lodha et al seropositive children with diarrhea >1 month was 50.5%, which is also comparable to our study.[14] In our study, we observed statistically significant correlation between incidence of HIV and diarrhea >1 month ($p < 0.05$).

Percentage of seropositive cases with fever >1 month was 70.37% in the present study. 70.42% seropositive children had fever >1 month in a study conducted by Pol et a1.[16] In another study, Lodha found 73.6% seropositive children with fever >1 month.[14] Observations of both studies were similar to our study. In our study their existed a statistically significant correlation of HIV and fever >1 month ($p < 0.001$).

Encephalitis was found in 1/27 (3.5%) seropositive children in our study. Less than 10% seropositive children had encephalitis in a study conducted by Nikrumah et a1.[19] Pol et al observed 5.63% encephalitis in seropositive cases.[16] Both studies are comparable to our study. However, Encephalitis was not found to be significantly correlated with HIV ($p > 0.05$).

In present study, cough more than 1 month was not significantly correlated to HIV status of children ($p > 0.05$). Spira et al also stated that cough was not related to HIV.[20] In the present study, 7.4% seropositive children had pneumonia. Pol et al observed 12.68% seropositive children with pneumonia, which is comparable with our study.[16] Pneumonia was also not significantly correlated with HIV in our study ($p > 0.05$). In our study, 18.51 % seropositive children were with meningitis. In a study conducted by Nikrumah et a1, 10% seropositive children had meningitis.[19] Meningitis was also not significantly

correlated with incidence of HIV (p >0.05). Oral candidiasis was found in 22.2% seropositive cases in our study. This finding was comparable to study by Pol et al who observed that 21.3% seropositive cases were suffering from oral candidiasis.[16] In a similar study conducted by Prazuck et al in France, it was observed that there exists a statistically significant relationship between Oral candidiasis and HIV, which was also observed in the present study (p <0.001).[21]

Pulmonary tuberculosis was present in 11.11 % seropositive children in our study. Parthasarath observed that 10% seropositive children had pulmonary tuberculosis, which was quite similar to our study.[6] In study conducted by Pol et al pulmonary tuberculosis was observed in 36.3% seropositive cases.[16] In another study, Shah et al observed that 38% seropositive children had pulmonary tuberculosis.[17] The high incidence in the studies conducted by Pol et al and Shah et al can be explained as these studies were conducted in children more than 18 months of age.[16,17] In our study, we found statistically significant correlation between incidence of HIV and Pulmonary tuberculosis (p <0.05).

URTI was present in 7.4% seropositive children in present study. In a similar study by Kouakoussui et a1, URTI was observed to be 9.29% in seropositive cases.[22] Bhattacharyya at Kolkata concluded no significant correlation between incidence of HIV and URTI.[23] In present study, we did not found any significant correlation between HIV and URTI (p >0.05). Generalized Lymphadenopathy was present in 18.51% seropositive cases in our study. In a similar study conducted by Shah et al, generalized Lymphadenopathy was observed in 24% seropositive children.[17]

Grant HW observed that 22% seropositive children had generalized Lymphadenopathy.[24] Both studies were quite similar to the present study. In another study, Prazuck et al at France, a significant relationship was observed in Lymphadenopathy and HIV, which was also observed in our study (p <0.001).[21]

In our study parents of 37.03% seropositive cases had one or more high risk behaviour. In a study conducted by Folio et al, 58.9% parents of seropositive children had high risk activity.[25] Parent's high risk activity was significantly correlated to incidence HIV (p <0.001). In present study, 3.7% seropositive cases had previous blood transfusion. In a study conducted by Adejuyigbe at Nigeria, it was observed that 1.5% seropositive cases had previous blood transfusion, which was quite similar to our observations.[26] Zhuang K et al at China concluded that 8.1 % seropositive cases had previous blood transfusion.[27] In our study, out of 19 cases who had blood transfusion, 1 was seropositive, whereas study by Agrawal et al observed that out of 6 cases who had blood transfusion, 5 were seropositive, as blood transfusion in their study were given before 1998, when the blood screening became mandatory.[12]

So, blood transfusion is not significantly correlated to incidence of HIV in this era where blood screening is essential (p >0.05).

Needle prick as a risk factor was present in 18.5% cases in our study. Prazuck et al at France observed 10% seropositive cases had needle prick, which was quite similar to our study.[21] Infected needle prick has significant relationship to HIV (p <0.001).

From seropositive children, 62.9% mothers of seropositive children were HIV reactive in present study. Sehgal et al observed 51 % mothers to be HIV positive in seropositive children.[15] 62% mothers were observed to be HIV positive by Martinez-Aguilar, Kordy, observed 63.5% HIV positive mothers of seropositive children.[28,29] AII studies are very well comparable to our study. So most common mode of HIV transmission in children is vertical transmission from mothers to children (p <0.001).

CONCLUSION

Incidence of HIV in children was more in comparison to general population. So, it is matter of concern. High risk behaviour of parents and mother's HIV positivity were significant high risk factors, however needle prick was also equally significant in present study. Weight loss, Failure to thrive, Diarrhoea, Fever, Oral Candidiasis, Pulmonary Tuberculosis and Generalized Lymphadenopathy were significant predictors in present study. These predictors can be used as an indicator for AIDS (AIDS defining illness).

So, in the peripheries where CD4 count facility is not available, ART should be started in children who are HIV positive and having one or more predictor.

Children brought with various signs and symptoms of HIV or born to high risk behaviour practicing parents and/or HIV positive mother, physician must get their patients tested for HIV (as per NACO Guidelines) so that infected children diagnosed early and referred to a specialized centre for treatment and follow up.

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