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Full Length Research

Impact of HIV/AIDS on mother-to-child transmission and health outcomes in children under five years in Nsukka Local Government Area of Enugu State

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ABSTRACT: The impact of HIV on the health transmission of Paediatric is largely unknown in many countries in sub-Saharan Africa (SSA). This work aimed to determine the prevalence and the impact of HIV infection among children under 5 years old in Nsukka Local Government Area. Methods: A facility-based study among mothers/guardians with their under-5 years children exposed to HIV infection. Information on HIV status, socio-demographic and other family characteristics was collected using a structured questionnaire. Data analysis was performed using STATA version 13.0. Results showed that 876 children under five years old who were HIV-exposed were recruited, along with their mothers or guardians. The HIV prevalence among under-5-year-old children was 9.70% (95% CI: 7.1-12.1%). The burden of HIV infection was observed to be higher among females 10.3% than male 8.72%, within older children aged 24 to 36 months (AOR = 7.0, 95% CI 2.4 - 25.1) than in the younger children. There was a four-fold (AOR=3.9, 95% CI 1.7-9.1) risk of HIV infection among children born to mothers of unknown HIV status at conception than among children born to mothers with known HIV status. The odds of HIV infection were higher among children who were delivered from home (AOR = 2.6, 95% CI 1.0-6.5), received mixed feeding (AOR = 2.4, 95% CI 1.2-4.9), and those living far from a health facility (AOR = 3.0, 95% CI 1.4-6.5). In conclusion, the prevalence of HIV among children under 5 years old in Nsukka LGA is higher among older children. The high prevalence is associated with being born to mothers with unknown HIV status at conception, receiving mixed feeding, home delivery, and living far from the health facility. Campaigns that provide health educational messages addressing risk factors of HIV need to be emphasised to promote the control and prevention of HIV among children.

Keywords: Conception, HIV, paediatric, prevalence, questionnaire.

INTRODUCTION

The HIV/AIDS epidemic has had profound effects on global health, particularly among vulnerable populations such as children under five years old. Mother-to-child transmission remains a significant route of HIV infection among under-five year old, highlighting the importance of prenatal care and prevention programs. The increased vulnerability of infections in children under five years old born to HIV-positive mothers are at a higher risk of contracting HIV themselves, because they are more susceptible to other infections due to weakened immune systems, leading to higher mortality rates. In addition to that, HIV/AIDS often leads to malnutrition in children, either due to the virus itself or as a result of socio-economic factors. (Wagner *et al*., 2015; Bwana *et al*., 2016).

Globally, an estimated 1.3 million women and girls living with HIV become pregnant each year. In the absence of intervention, the rate of transmission of HIV from a mother living with HIV to her child during pregnancy, labour, delivery or breastfeeding ranges from 15% to 45%. As such, identification of HIV infection should be immediately followed by an offer of linkage to lifelong treatment and care, including support to remain in care and virally suppressed and an offer of partner services. In 2019, 85%

of women and girls globally had access to antiretroviral therapy (ART) to prevent mother-to-child transmission (MTCT). However, high ART coverage levels do not reflect the continued transmission that occurs after women are initially counted as receiving treatment. Achieving retention in care and prevention of incident HIV infections in uninfected populations remain high priority to reach global elimination targets. Since the global shift to, and accelerated rollout of, highly effective, simplified interventions based on lifelong ART for pregnant women living with HIV, virtual elimination of MTCT – also known as vertical transmission – has been shown to be feasible (WHO, 2022)

It has been reported that the risk is strongly associated with high maternal viral load and advanced stage of maternal HIV infection during labour and at delivery. High maternal viral load and low Cluster of Differentiation 4 (CD4) count are highly associated with an increased risk of HIV infection in children (Hill *et al*., 2018). Studies have shown that maternal CD4 cell count of less than 200 cells per mm3 near delivery, and those who have been diagnosed with the severe clinical disease are more likely to transmit the virus than those who are less severely affected by HIV infection (Coutsoudis *et al*., 2001). Studies have shown that breastfeeding duration, as well as maternal immune status, are the major determinants of increased risk of MTCT of HIV. The risk of HIV transmission increases drastically among mixed-fed children, especially if breastfeeding is mixed with solids during the first 2 months of life, and the risk is even more if breastfeeding duration is continued for more than 4 months (Fawzi *et al*., 2002). The use of Antiretroviral (ARV) drugs by HIV infected mothers and infant ARV prophylaxis has been shown to reduce the risk of postnatal HIV transmission through breastfeeding (Kilewo *et al*., 2009).

Since its inception in 2000, the Prevention from Mother to Child Transmission (PMTCT) program has made several advancements in most settings. In 2010, the WHO recommended the Option A regimen. This involved the use of Zidovudine (AZT) from 14 weeks of pregnancy until 7 days post-delivery and infant Nevirapine (NVP) from birth until one week after cessation of breastfeeding (WHO, 2020). Later, these guidelines were updated, and the Option B regimen was introduced, which involved triple ART during pregnancy from 14 weeks of pregnancy until the end of breastfeeding and infant NVP daily from birth up to age 4 to 6 weeks. This regimen was further modified to involve initiating triple ART for life during pregnancy and breastfeeding women irrespective of clinical stage of disease or CD4 count, and infant NVP up to the age of 4 to 6 weeks. The regimen was named PMTCT Option B+ and is the best recommended regimen that is currently in use in most settings (WHO, 2020). Identifying the key factors that contribute to vertical transmission is critical for informing the design of context-specific interventions to eliminate pediatric HIV infections. The study aims to assess the impact of HIV/AIDS on Mother-to-Child Transmission and Health Outcomes in Children Under five Years in Nsukka Local Government Area.

MATERIALS AND METHODS

Study area

The study was carried out in four hospitals, which include the State University of Medical and Applied Sciences Igbo-Eno Medical Centre, Faith Foundation Mission Hospital Nsukka, University of Nigeria, Nsukka Medical Centre, and Bishop Shanahan Hospital, which are located in the Nsukka Local Government Area of Enugu State. The local Government covers a latitude and longitude of 6°51′24′'N 7°23’45′E. Nsukka people speak central Igbo and the Nsukka dialect, a sub-dialect of the larger Igbo language. They have a rich cultural heritage, known for their traditional arts, music, and festivals. Nsukka people are predominantly farmers and are known for their craftsmanship in pottery, weaving, and other traditional trades. The hospitals play a significant role in providing healthcare services, Heart to Heart services and promoting well-being in the Nsukka area.

Sampling and sample size determination

The study was conducted between May 2024 and October 2025; the participants were selected by employing a multistage sampling approach. The initial step involved the selection of the district purposely. Four hospitals were selected because it is among the leading hospitals with maternity wards and heart-to-heart care where HIV/AIDS individuals are being cared for. The sample size (n) was calculated based on the formula that accounted for simple random sampling and the design effect, where $n = z^2 p (1-p)*DEFF/d^2$ (Gorstein, 2007).

The Design Effect (DEFF) was adjusted by a factor of 2, at a 95% Confidence Interval (CI) with a Z value of 1.96, and the desired level of absolute precision (d) was taken at 5%. The transmission rates of HIV from mother to child range between 20 and 45% (De Cock, 2000). The highest exposure of infection risk (p) was taken at 45%, and a response rate of 90%. Hence the estimated sample size $[(1.96)^2 *45(100- 45)*2/5^2]$ was 760 + 76 = 836 under-five year children. However, the minimum and maximum numbers of mother/guardian-child pairs in each cluster were set at 20 and 50, respectively. But the proportion to size was employed based on the estimated total number of HIV-exposed children at a particular health facility.

Inclusion and exclusion criteria

A list of HIV-exposed children under five-years old was obtained from the registers/database at each of the selected health facilities. The lists were numbered, and all

eligible children under five years old, each with their respective mother/guardian, were selected randomly using the lottery method and enrolled based on the inclusion criteria. Data of HIV-infected mothers with missing key variables, HIV-exposed infants not breastfeeding, those without confirmatory HIV testing after breastfeeding cessation, and those with indeterminate test results were not included.

Data collection

Socio-demographic factors of the mother/guardian-child pair (age, sex, residence, marital status, occupation, knowledge of HIV and distance from a health facility, which will be defined as the time taken in minutes to reach the health facility on foot) were collected using a structured questionnaire. Mother/guardian's knowledge on HIV was assessed based on 4 key questions that addressed general MTCT knowledge; prevention of MTCT; timing of post-exposure prophylaxis to HIV exposed infants, and factors affecting HIV transmission. Maternal information, which included CD4 cell count levels during pregnancy, HIV status before conception and history of taking CPT during pregnancy, was collected. The child's HIV status was extracted from the HIV database available at the hospital. In addition, during recruitment, more data on children and their biological mothers were extracted from registers, HIV database, hospital case files for children under five years or antenatal cards, and PMTCT records to supplement the collected primary data.

Data analysis

All variables from univariate analysis with p-values of ≤ 0.2 were fitted to the multivariable logistic model. Multiple logistic regression analyses were used to examine the associations between various socio-demographic factors of the mother/guardian-child pairs and the child's HIV infection status. A stepwise Logistic Regression was employed by removing variables that were statistically nonsignificant at a p-value of ≤0.05. The final model consisted of variables with Adjusted Odds Ratios (AOR) at 95% Confidence Interval (CI), which were taken as significant predictors for HIV infection in children under five years.

Ethical considerations

Ethical approval was obtained from the ethical committee of the four selected hospitals and medical centres involved. Written informed consent was obtained from each mother/guardian before the recruitment to the study. All participants were identified by numbers throughout the study. No names were used to identify participants during data collection, reporting, or publication of study findings

RESULTS

A total of 876 mothers/guardians, each with HIV-exposed children under five years of age, were enrolled into the study, of which 321 (36.6%) were males, and 555 (63.4%) were females. Out of 876 children enrolled, a Seroprevalence rate of 9.70%, with male 8.72% and female 10.3% (Table 1), was recorded. The 113 participants with an age range between 24 - < 36 had the highest prevalence, 17.7%, while the 96 participants with an age range of ≤ 12 had the lowest prevalence, 4.17%. Out of 876 children, 245 (7.34%) aged < 48 - < 60 months were seropositive. The age range between 36 - < 48 months had 9.18%, 12 - < 24 accounted for 12.5%, with 16 positive cases as shown in Table 2.

The demographic factors show that those delivered at health facility 217(71.1%) have less complications than those who deliver at home148(22.9%). With respect to the level of education, secondary school level 38.5%, while those with no formal education 5.47%. The carrier married women has rate of 65.0%, while single ladies 34.9%, although not all the participants filled out their marital status. The mode of feeding, breastfeeding had the highest 47.3%, and replacement feeding had the lowest 10.9%.

Weight loss/falter was the commonest presenting symptom in HIV infected children; other presenting symptoms were cough, diarrhoea, fever, and fast breathing (Table 2). All these features were significantly more common in HIV infected participants compared to HIV uninfected group. Less common features among the HIV infected children were seizures, loss of consciousness and jaundice. A significant proportion of the HIV infected children were treated in isolation, 64.2%, compared with those treated in a friendly manner, 35.8%. A less significant mother is unaware of PMTCT, 17.1% out of 876 participants, which may be uncollected with the loss of a baby, 4.34%. A total of 70.1% had blood transfusions after birth, 44.1% (386/876) needed easy access to antiretroviral, while 24.4% needed maternal health initiative, as shown in Table 3.

The occupation of the mother/guardian shows traders 386(44.1%), the housewife 112(12.7%), farmer 214 (24.4%) and civil servant 164 (18.7%). The married women 402 (65.0%) and single ladies 216 (34.9%), the husbands who are carriers 217(71.1%) and non-carriers 88 (28.8%). The risk of HIV infection was 58.6% times higher among those who lived far from a health facility, as compared to those living close to a health facility, 41.3% (Table 3).

The WHO revised Paediatric Clinical Staging of HIV/AIDS was used to classify the degree of immunosuppression (Table 4). Most patients presented in clinical stages 3 (31.7%) and 4 (29.4%), with advanced immunodeficiency in 9.41% and severe immunodeficiency in 56.5%. The viral load of the patients ranged from 800 to 4000 viral copies/µlitre of blood. Most of the children had a viral load of more than 2400 viral copies/µlitre of blood,

Table 1. Sex characteristics of the subjects (n = 876).

Sex	No. exam	%	no. + tive	% of + tive	- tive	% - tive
Male	321	36.6	28	8.72	293	91.2
Female	555	63.4	57	10.3	345	89.7

Table. 2. Age characteristics of the subjects (n = 876).

Age (months)	No. exam.	+	% +	- tive	% of - tive
≤ 12	96	4	4.17	92	96.8
12 - < 24	128	16	12.5	112	87.5
24 - < 36	113	20	17.7	93	82.3
36 - < 48	294	27	9.18	267	90.8
48 - < 60	245	18	7.34	227	92.6

Table 3. The demographic factors of the mother/guardian of the subject.

Criteria	No. exam	%	Non exam	% non exam	OR (95% CL)	*P values*
Educational status	n = 876					
Non formal education	48	5.47	828	94.5	2.21(1.21,3.10)	0.004
Primary	286	32.6	590	67.3	4.74(3.32,10.32)	0.001
Secondary	338	38.5	538	61.4	1.66(0.30,1.23)	0.242
Tertiary	204	23.3	672	76.7	3.21(3.17,10.13)	0.004
Occupational	n = 876					
Civil servant	164	18.7	712	81.3	51.13(8.20,58.65)	0.254
Trader	386	44.1	490	55.9	09.80(4.15,26.12)	0.070
Farmer	214	24.4	662	75.6	11.13(3.69,28.4)	0.108
House wife	112	12.7	764	87.2	0.12(0.03,0.52)	0.001
Marital Status	n = 618					
Single	216	34.9	402	65.0	1.20(0.14,2.10)	0.310
Married	402	65.0	216	34.9	2.13(1.42,2.065)	0.020
Husband carrier	n = 305					
Yes	217	71.1	88	28.8	09.51(5.15,11.23)	0.009
No	88	28.8	217	71.1	21.21(13. 13,19.52)	0.000
Place of delivery	n = 645					
Health facility	497	77.1	148	22.9	12.21(1.12,10.13)	0.109
Home	148	22.9	497	77.1	13.10 (3.18,13.2)	0.081
Distances to the health facility	n = 876					
≤ 2 miles	362	41.3	514	58.6	11.28 (10.12,34.16)	0.017
≥ 2 miles	514	58.6	362	41.3	10.13 (3.19,23.4)	0.080
Status of the baby after birth	n = 876					
Positive	85	9.70	791	90.3	0.12 (0.05,0.21)	0.022
Negative	791	90.3	85	9.70	09.13 (3.29,23.4)	0.000
Mode of feeding the baby	n = 876					
Breast feeding	414	47.3	462	52.7	11.12(2.60,509.25)	0.023
Exclusive	38	4.34	838	95.6	10.10(2.25,21.17)	0.011
Mixed feeding	328	37.4	548	62.5	1.30 (0.14,2.10)	0.142
Replacement feeding	96	10.9	780	89.0	11.16 (3.21,31.21)	0.024

Table 3. Cond.

Criteria	No. exam	%	Non exam	% non exam	OR (95% CL)	*P values*
Knowledge of PMTCT	n = 876					
Yes	726	82.8	150	17.1	09.21 (3.23,25.4)	0.019
No	150	17.1	726	82.8	21.11(13.33,149.52)	0.612
Lost of a baby before	n = 876					
Yes	38	4.34	838	95.6	0.26(0.39,1.18)	0.840
No	838	95.6	38	4.34	10.12 (3.69,28.4)	0.038
Blood transfusion after birth	n = 876					
Yes	614	70.1	262	29.9	2.12 (1.22,6.05)	0.000
No	262	29.9	614	70.1	24.31(13.23,131.92)	0.009
Other Symptom	n = 416					
Fever	114	27.4	302	72.6	2.31(3.04,4.12)	0.024
Cough	96	23.1	320	76.9	2.11(1.21,4.10)	0.008
Fast breathing	18	4.33	398	95.7	10.20(2.25,26.17)	0.000
Diarrhoea	63	15.1	353	84.8	10.12 (2.35,19.53)	0.056
Weight loss/falter	125	30.0	291	69.9	11.18 (10.12,14.36)	0.241
Baby treatment in public	n = 876					
Friendly	314	35.8	62	64.2	2.31(3.04,5.22)	0.201
Isolation	562	64.2	314	35.8	10.23 (1.35,17.33)	0.001
Most needed items	n = 876					
Antiretroviral	386	44.1	490	55.9	1.31 (1.32,6.05)	0.005
Nutritional support	182	20.7	694	79.2	2.11(1.11,4.10)	0.008
E C D	94	10.7	782	89.3	11.20(4.25,23.14)	0.041
Maternal health initiative	214	24.4	662	75.6	0.16(0.32,1.80)	0.849

ECD = Early Childhood Development.

Table 4. Clinical Staging, immunological category and viral load pattern of HIV positive children.

Parameters	No(%)
Clinical stage	
Stage1 -Asymptomatic	12(14.1)
Stage 2 - Mild	21(24.7)
Stage 3 - Advanced	27(31.7)
Stage 4 - Severe	25(29.4)
Total	85(100.0)
Immunologic category	
No significant Immunodeficiency	16(18.8)
Mild Immunodeficiency	13(15.3)
Advanced Immunodeficiency	8(9.41)
Severe Immunodeficiency	48(56.5)
Total	85(100.0)
Viral Load (copies/µlitre of blood)	
<800	12(15.2)
800 - < 2400	26(32.9)
2400 - < 3200	29(36.7)
> 4000	11(13.9)
Total	79(100)

with 36.7% having a viral load of 2400 - 3200 viral copies/µlitre of blood. The participant with > 4000 has the lowest percentage of viral load, 13.9%

DISCUSSION

The controversy as to whether gender is a risk factor for MTCT of HIV continues, as reported by Taha *et al*. (2005) and Jones *et al*. (1992). In this study, as observed by Adejuyigbe *et al*. (2003) and Oniyangi *et al*. (2006), there was a slight female preponderance, which contrasts with other reports from other parts of the world (Karande *et al*., 2002; Ugochukwu, 2016; and Bakaki *et al*., 2001). The prevalence rate of males in this study is 8.72% and female 10.3%, lower than earlier reports from other African countries (Bakaki *et al*., 2001; Lucas *et al*., 1996) and other parts of Nigeria (Adejuyigbe *et al*., 2003). Other studies that reported lower prevalence rates (Oniyangi *et al*., 2016; Angyo *et al*., 1998; Akpede *et al*., 2022) were mostly retrospective and among hospitalised children. Conversely, the study site being a referral site might have accounted for the high prevalence rate observed in this study.

The Provider Initiated HIV Testing and Counselling guideline (UNAIDS/WHO, 2015; UNAIDS/WHO, 2007) is useful in identifying HIV infection in patients presenting to health facilities who do not have the classic symptoms and signs of the infection, thereby limiting missed opportunities for early detection and care. In this study, of such children without the classic symptom of HIV Infection, 12 (14.1%) were found to be seropositive for HIV infection. This finding gives credence to the need to offer routine screening to all children presenting in health facilities as provided in the WHO guideline (UNAIDS/WHO, 2015; UNAIDS/WHO, 2007). In addition, HIV infected children may present with conditions which are also seen in HIV uninfected children in the general population, as highlighted in this research.

The PMTCT accounting for 82.8% of infection in this study indicates the need to intensify efforts to get PMTCT services to the large numbers of Nigerian women. Transmission via blood transfusion and loss of baby as an HIV carrier in this study, also reported in other parts of Nigeria (Adejuyigbe *et al*., 2003, Angyo *et al*., 1998; Oniyangi *et al*., 2006; Emodi and Okafor, 1998) calls for the need to improve blood transfusion services and the need for paediatricians to always consider other modes of transmission when attending to HIV infected adolescents.

The clinical presentation of children with HIV infection in this selected study area is similar to that of other parts of Africa (Oniyangi *et al*., 2006; Emodi and Okafor, 1998; Taha and Gray, 2000). These symptoms and signs are also seen in HIV negative children, but the Odds Ratio shows the higher likelihood of HIV infected children presenting with these features. The shortage of antiretroviral in this study 44.1% and nutritional support that could lead to malnutrition, as observed, could lead to prevalent clinical syndromes in HIV infected African children, as reported by Adejuyigbe *et al*. (2003), Emodi and Okafor (1998) and Bakaki *et al*. (2001). It has been recognised and reported as an underlying contributing factor to childhood morbidity and mortality, and contributes to about 56% of under-five mortalities in developing countries.

Based on the revised WHO Paediatric Clinical Staging of HIV/AIDS (WHO, 2006), about 31.7% of the patients in this study presented in advanced clinical stages 3 and 4, and similar observations had been reported from other parts of Nigeria. Although 24.7% show mild, with 14.1% have no symptoms. Also, 56.5% were severely immunosuppressed, which also compares with 55.7% with severe immunosuppression as reported by Ugochukwu *et al*. (2006). In addition, 36.7% had viral loads >2400 - < 3200 copies/ml. These findings imply that most children presented at the advanced stages of the disease are associated with poor prognosis and a need for antiretroviral therapy. There is thus a need to evolve methods of early identification and proper management of HIV infected children to prevent clinical and immunological deterioration, which further reiterates the need for implementing the PMTCT guidelines. HIV contributes significantly to the orphan rate, with rates as high as 25.75% and 10.8% in sub-Saharan Africa and Nigeria, respectively (UNICEF 2015; UNAIDS/WHO, 2015). In addition, efforts need to be intensified to reduce HIV infection and AIDS related deaths in adults by scaling up HIV prevention interventions and improving access to antiretroviral therapy, as this will reduce paediatric HIV from MTCT and the number of AIDS orphans.

The stigmatization among the children observed in this study 35.8% among HIV positive children is higher figures of 26.3% have been reported from other parts of Nigeria (Adejuyigbe *et al*., 2003; Oniyangi *et al*., 2006; Angyo *et al*., 1998), while in a prospective 5 year study of HIV infected Rwandan children (Spira *et al*., 1999), the estimated risk of death as a result of stigmatization at 2 and 5 years of age was 45% and 62%, respectively and the risk of dying was 21 times higher than in uninfected children.

Conclusion

The burden of HIV among children under 5 years old in Nsukka Local Government Area is higher among the older age category. The high prevalence is associated with being born to mothers with unknown HIV status at conception, absence of CPT during pregnancy of the index child, absence of infant NVP prophylaxis, mixed feeding of infants, home delivery, and living far from the health facility. This not only shows limitations in testing efforts, but it also suggests the need for reshaping the current national HIV testing policies for women and men so that pre-pregnancy HIV status is prioritised. However, the findings underscore the need to focus on improved preventive health care before pregnancy, the pre- and post-natal period for mothers and babies, in order to reduce the risk of MTCT of HIV in areas with similar settings. Strengthening health and education programmes will have a direct benefit as it increases awareness of their children's needs to prevent them from acquiring infection. Although there has been some development in this area, the available evidence in this study population, the children under five years old, is still limited. Hence, these pieces of evidence obtained from this study will serve as a reference baseline to compare with other epidemiological surveys that will help to determine the efficiency of interventions.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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