

# The Seroprevalence of Herpes Simplex Virus Type-1 Among Children in Jos, Nigeria

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**Abstract:** This study was to determine the prevalence rate of Herpes Simplex Virus Type-1 (HSV-1) among children in Jos metropolis. Herpes simplex virus type-1 is mostly acquired in childhood and is responsible for orolabial ulcers or lesions. Prevalence of oro-facial herpes simplex virus type-1 infection is a common worldwide problem. There is little or no public awareness of herpes simplex virus in Jos, plateau state, Nigeria. A total of 188 samples were collected and analyzed using Enzyme Linked Immunosorbent Assay (ELISA) kit by GeneFront Inc. CA. USA to test for HSV-1 specific glycoprotein IgG. Out of the 188 samples tested, 157 (83.5%) were seropositive. The seroprevalence among male was 86.8%, and female 78.4%. The Age group 6-10 years had the highest prevalence of 88.8% while 0-5yrs had 75.0% which had significant association ( $P < 0.05$ ). This study showed high prevalence of HSV-1, with the highest prevalence in aged 6-10 years which suggests that, HSV-1 is common among school-aged children. HSV-1 infection is acquired during early childhood and therefore age is an important factor in the epidemiology of HSV-1 infection. Further larger studies are needed in North Central Nigeria.

**Keywords:** Herpes Simplex Virus Type-1, Seroprevalence, Children, Nigeria

## 1. Introduction

Herpes Simplex Viruses (HSV-1 and 2) are viruses of the family *Herpesviridae*. They are the leading cause of human viral diseases, acute and recurrent infections in humans, second only to influenza viruses [1-3]. HSV-1 is mostly acquired in childhood and is the main cause of orolabial ulcers (Herpes infections on the mouth/lips, including cold sores or fever blisters). While HSV-2 is acquired in the sexually active age and is responsible for anogenital ulcers [4, 5] Although HSV-2 is the primary cause of genital herpes, HSV-1 can also cause genital herpes, probably as a result of oral-genital sexual practices [6]. HSV-1 infection is almost worldwide. This is because most infections do not clinically

manifest and virtually 100% of adults have antibodies in their serum and most individuals become infected in the first few years of life [7].

HSV-1 is primarily transmitted by direct contact with the viruses found in cold sores, saliva and surfaces around the mouth [8]. It can also be transmitted through oral sex with infected persons to cause genital herpes [9]. Mother-to-child transmission can be possible during delivery, if the mother has HSV-1 genital herpes, kissing, or sharing eating/drinking utensils with infected persons increases the chances of contracting the HSV-1 infection [2].

HSV-1 has an incubation period of 2-12 days and most

patients may not show symptoms during the first exposure to the virus and remain latent in the ganglia [7]. Reactivation of the virus can be triggered by stress, immunosuppression, sun, subsequent exposure and fatigue [9]. HSV-1 can occur at any age but mostly, first infection might occur early in childhood with mild symptoms or even absent [10]. Clinical manifestation may include; itching or burning sensation, painful sores or blisters filled with fluid around the lips or edge of the mouth [11]. Prevalence of oro-facial herpes simplex virus type-1 infection is a common worldwide problem [12]. Other complications may include herpes keratitis, neonatal herpes and HSV-1 encephalitis [13-15]. Reports on the prevalence of HSV-1 antibodies in children show variation. For children at age of 4-5 years, the prevalence of 20% was reported in England [16], 25% in Sweden [17], 30% in Germany, 35% in Estonia [18], and 50% in Hong Kong [15]. Abdulfatai *et al* reported that the distribution of HSV-1 in Nigeria with various age groups showed 16-18 years to have the highest seroprevalence of 36.75%, followed by 13-15 years with the seroprevalence of 7.5% [19]. A reasonable number of people, even those who have been infected for years are unaware that those oral-facial outbreaks are a form of herpes and are therefore highly contagious. This is because there are little or no public awareness, education on herpes [20]. Psychosocial and poor socioeconomic factors fuel HSV-1 transmission, but the acquisition pattern of these infections varies greatly in different locations and populations [21]. There is paucity of data on the prevalence of HSV-1 especially among school-aged children. Therefore, the study aim was to determine the seroprevalence of HSV-1 in children (aged 0-10 years) in Jos Metropolis, Nigeria.

## 2. Methodology

This cross-sectional study was carried out in selected hospitals located within Jos metropolis, Plateau state, central Nigeria. The hospitals were; AIDS Prevention Initiative in Nigeria, Jos University Teaching Hospital (APIN JUTH), Plateau Specialist Hospital Pediatric Unit and Samantha Hospital Apata. Sixty three samples each were collected in Jos university teaching hospital and plateau specialist hospital pediatric unit, while sixty two samples were collected in Samantha Hospital Apata, making a total of 188 children who were consecutively recruited between February, 2015 and May, 2015. A well-structured questionnaire was administered and patients demographic data were collected. The questionnaire was used to gather socio-demographic and mothers HIV status information since most recruited children were from HIV treatment Centre APIN JUTH. Patients' sera were used for the HSV-1 IgG and HIV immunoassays. Blood samples were collected in labeled sterile screw cap sample containers and allowed to clot and sera separated by centrifugation at room temperature. Sera storage was at -20°C until enough samples were collected for assay.

### Population and Sampling

The study participants aged  $\leq 1$  to 10 years were enrolled

by simple consecutive sampling as they presented at the various hospitals. At enrollment, all caregiver's who volunteered to participate were interviewed and demographic data obtained. Blood specimen of 5 ml venous blood were collected from all the enrolled children by the help of trained nurse and Phlebotomist where available (JUTH) in dry test tubes, processed and stored at -20°C freezer in aliquots until analyzed. The sera samples were subjected for HSV-1 IgG detection.

### 2.1. HSV-1 IgG Assay Procedures

This was achieved by the use of Enzyme-Linked Immunosorbent Assay (ELISA) kit by GeneFront Inc, 2950 Scott Blvd Santa Clara, CA 95054-USA. This is a glycoprotein G-based enzyme-linked immunosorbent assay technique and test result was qualitative. All specimen and kit reagents were allowed to assume 25°C (room temperature) and gently mixed. The laboratory procedure was performed according to the manufacturer's instructions.

### 2.2. HIV-1 Testing Procedures

The HIV statuses of the mothers of prospective patients recruited were previously determined using Laboratory tests carried out. Two different rapid HIV tests: Uni-Gold (Trinity Biotech Plc Bray Co Wicklow, Ireland) and Determine HIV-1/2 test (Determine Alere Medical Co., Ltd 357 Matsuhidai, Japan) were used.

#### Ethical Approval

Ethical clearance of the study was obtained from Health Research Ethics Committee of Plateau State Specialist Hospital, and the children's caregivers gave their consent.

### 2.3. Data Analysis

Data collected was analyzed using the SPSS version 16 computer software. Fishers exact was used to test association. Statistical significance was ascribed based on  $P < 0.05$ .

## 3. Results

This study recorded 83.5% of prevalence of HSV-1 infection out of 188 (157/188) samples that were examined. One hundred and fourteen 114 (60.6%) males were tested and 99 (86.8%) were observed to be HSV-1 seropositive, while 58 (78.4%) females were HSV-1 seropositive out of the 74 (39.4%) that were tested. The mean age of the study subjects was 5.9 years, in this research, age group 6-10 years had the highest seroprevalence of 103/116 (88.8%), followed by age group 0-5 years with the seroprevalence of 54/72 (75.0%). Those residing in the rural settlements had the highest seroprevalence of 85.7%, those staying more than two in a room also had the highest seroprevalence of 84.3% as compared to the 70.0% of those staying less than two in a room. In the same vein, children from HIV positive mothers had the highest prevalence (81.9%) rate (127/188) (Table 1). But these results were not statistically significant.

**Table 1.** Prevalence of anti-HSV-1 infection among children in relation to socio-demographic variables.

Results of Testing			
Variables	Negative n=31 (16.5%)	Positive n=157 (83.5%)	p-value
Gender			
Male	15 (13.2)	99 (86.8)	0.127
Female	16 (21.6)	58 (78.4)	
Age group			
0-5yrs	18 (25.0)	54 (75.0)	0.007
6-10yrs	13 (11.2)	103 (88.8)	
Residence			
Urban	11 (22.9)	37 (77.1)	0.167
Rural	20 (14.3)	120 (85.7)	
Population in a room			
< 2	3 (30.0)	7 (70.0)	0.119
>2	28 (15.7)	150 (84.3)	
Mothers HIV-1 status			
HIV (-)	3 (9.1)	30 (90.9)	0.208
HIV (+)	28 (18.1)	127 (81.9)	

## 4. Discussion

The seroprevalence of HSV-1 infection is high in most geographic regions across the world and more prevalent than type 2 HSV infection among known high-risk populations [18]. The HSV-1 distribution is particularly high among young children [11]. In this study, a total of 188 samples were examined for the presence of HSV-1 antibodies (HSV-1 IgG), and seroprevalence was 83.5% (157/188). This agreed with the study of Nag *et al.* in Indian children [22] which reported that most individuals become infected in the first few years of life. The distribution of herpes simplex virus type-1 according to age group indicates that age group 6-10yrs had the highest seroprevalence of 88.8% ( $P=0.007$ ). This finding showed that age had a significant association with HSV-1 infection, and this is in agreement with an earlier study which states that the prevalence of HSV-1 infection increases progressively from childhood [23]. A similar study in New Mexican children found HSV-1 prevalence to be 59% among aged 1–5 years and 79% in 6–15 years old [24]. In Syria (55-80% was observed children [25], HSV-1 prevalence was lower (31%) among aged 1–5 years children, and high among aged 6–16 years 44%–49%, HSV-1 prevalence among newborns was 46%–49% in England and Wales [26, 27]. Other studies in Africa have documented high prevalence (67-91%) among young children and adolescents which corroborates our findings [28-30]. This finding showed that HSV-1 infection is endemic at young children at different populations. The acquisition of HSV-1 during childhood and adolescence especially in low-risk individuals increases sexual transmission of HSV-1 at older ages (15-20 years) [31].

Distribution of HSV-1 with respect to residence in rural setting and number of persons more than 2 in a room showed seroprevalence of 85.7% and 84.3% respectively. This agreed with earlier reported findings that geographic and socioeconomic differences impact on the high rates of HSV-1 infection in various populations [16]. The distribution of HSV-1 infection with regard to mothers HIV status was high (81.9%).

The role of the female sex and mothers HIV status with HSV-1 seropositivity has been documented to have an association with HSV-1 infection [32], though in our study there was no significant association. However, this may be as a result of the study small sample size. The high HSV-1 infection among children suggests the transmission from their mothers who may be latently infected and intrafamilially transmitted due to close contacts [2]. The role of close contact between mothers, family members or caregivers and young children has been described as a common route of transmission among individuals. This can be further buttressed by poor socioeconomic conditions, hygiene practices and living conditions of children, which play an important role in the HSV-1 prevalence rates in a population [33]. A limited amount of bio data was collected with small sample size to determine only prevalence of HSV-1 IgG among the children presented at the hospitals.

## 5. Conclusion

The study showed high prevalence of HSV-1 and age has a strong association with the infection. Young and school aged children (adolescents) appeared to be more susceptible to HSV-1 infections in our population. This study suggests the need for mass surveillance in order to device public intervention strategies to reduce the rate of HSV-1 infection among children. Further, larger studies are recommended to determine routes of transmission and risk factors associated with age specific infection.

## Authors' Contributions

Authors' individual contributions as follows: JAA- EUE- Conception or design of the work, MA, JO-Data collection, JOO, EUE-Data analysis and interpretation, JAA, SRK- Drafting the article, EUE, OA, HZ, Critical revision of the article, JAA, SRK, HJZ, EUE,OA- Final approval of the version to be published.

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