Effect of Socio-demographic Variables on Anti-Parvovirus B19 Antibody Seropositivity among Children with Sickle cell Anaemia in Jos, North Central Nigeria

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Citation

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Abstract

Background: Several Studies have identified socio-demographic variables as risk factors for the acquisition of many viral infections. Against the backdrop of the inherent susceptibility and vulnerability of patients with sickle cell anaemia to the human parvovirus B19, this study aims to determine the effect of certain selected socio-demographic variables on the risk of acquisition and seropositivity for Anti-Parvovirus B19 IgG antibodies among Children with Sickle cell Anaemia attending a Nigerian teaching hospital.Methods: A total of 200 sickle cell anaemia patients attending the paediatric clinic of the Jos University Teaching Hospital were recruited consecutively into the study. Questionnaire was used to obtain the relevant personal, educational, social and demographical data of patients. Screening for IgG antiparvovirus antibodies was performed on each serum sample using Elisa Kit (InstitutViron/serionGMbHWurzbury, Germany) Results: The relationship between the extent of crowding, fathers' occupational group, age and serological status of subjects were statistically significant, $P<0.05$. Other studied demographic parameters (mother's educational level, having a sibling with SCA and gender) did not statistically influence Parvovirus antibody status of subjects ($P>0.05$)Conclusion: Parental occupational group (an index of socio- economic status), age and overcrowding appear to increase the risk of acquisition and seropositivity for the human parvovirus B19 infection among sickle cell anaemia patients. There is therefore need to urgently address the menace of overcrowding, poverty and illiteracy in Nigeria.

INTRODUCTION

Human parvovirus B19 (parvovirus B19) is the only member of the Parvoviridae family known to be pathogenic to human[1]. It is a small deoxy-ribonucleic acid (DNA) virus that infects and destroys human erythroid progenitor cells. Since its accidental discovery about 30 years, parvovirus B19 has increasingly been recognized as an important human pathogen causing significant morbidity and mortality in various patient population groups[2].

Infection with parvovirus B19 occurs worldwide[3,4]. Antibody prevalence (reflecting prior exposure and probable immunity to the virus) rises rapidly between the ages of 5 and 15, and continues to rise with age so that by the age of 60, most individuals are positive[5]. Transmission of the virus is thought to be mainly via respiratory droplets, contaminated blood products and vertically, from mother to foetus[6]. Effective transmission notably occurs after exposure by close person to person contact[7]. Nosocromial infections have also been described, although infrequently[8]. With respect to transmission occurring through blood and blood-derived products, the risk of infection from single donor products is reported low (1:500, 000)[9].

Infection with parvovirus B19 occurs most commonly in childhood. Disease due to the virus therefore tends to cluster in children. The prevalence of IgG antibodies ranges from 2% to 15% in children 1 to 5 years old, 15% to 60% in children 6 to 19 years old, 30% to 60% in adult, and more than 85% in the elderly[3].

Many authors have ascribed the acquisition and high prevalence of some viral antibodies in their localities to low socio-economic conditions and poor hygiene[10]. However, there is paucity of data on the epidemiological pattern of parvovirus infection in Jos and its surroundings. The aim of this study was to examine the effect of living conditions and a few other selected demographic factors on parvovirus antibody seropositivity among children with sickle cell

anaemia, who are particularly prone and vulnerable to parvovirus B19 infection. This is with a view to obtaining an epidemiological basis for the development of preventive programs for this viral infection.

MATERIALS AND METHODS

The study was conducted at the Jos university teaching hospital Jos from January to November 2009. Two hundred children ages 1-18 years with sickle cell anaemia attending the paediatric clinic of JUTH were recruited consecutively into the study. Their samples were taken and analyzed for the presence of anti parvovirus B19 IgG antibodies. All tests were done using kits manufactured by Institut virion Germany[11] . The kit is based on ELISA methodology. The manufacturer's procedures were strictly followed.

Relevant information on selected socio-demographic characteristics of subjects was obtained via a short questionnaire which was administered on subjects. The selected socio-demographic variables included age, gender, father occupational group, mother's educational level, extent of crowding and whether or not subjects had sibling with SCA. Overcrowding was considered to exist if more than two persons over 9 years of age, of opposite sexes, not husband and wife sleep in one room[12]. Ethical approval was obtained from the research and ethical committee of JUTH. Informed consent was obtained from all participants. The data were analyzed using epi info computer software version 3.3.2. Simple proportion was used to describe positivity for parvovirus B19 IgG antibodies. Socio-demographic variables were cross tabulated against serological status of subjects to determine if there were any relationships. Odds ratios with 95% confidence interval were calculated to examine the association between parvovirus B19 seropositivity and individual explanatory variables (like age group, sex and socio-economic indices like father's occupation.). Chi square with Yate's correction, and when appropriate, fisher's exact tests for assessing the significance of associations were used to compare these variables between children with positive parvovirus B19 antibody tests and children with negative results. Logistic regression analyses were conducted to obtain adjusted odds ratios (with 95% confidence intervals) after adjustment for potential confounding factors. Probability (p) values of less than 0.05 were taken as significant.

RESULTS

The age and sex distribution of subjects is shown in table 1. One hundred and eight (54%) were males while 92 (46%) were females giving a male: female ratio of 1.17:1. Most of the children, 93% (186/200), were under 15 years. The mean age of the study population was 6.8(±4.6) years. Out of the 200 samples subjected to antiparvovirus IgG antibody serology, 79 were positive for the antibody, giving an overall seroprevalence rate of 79/200 or 39.5%. (Table2). The age-specific seroprevalence rates show that the prevalence rate was lowest (21.7%) in the age group 1-5 years. It increased with age, reaching over 90% in children above 15 years. Table 3 shows the results of anti-parvovirus B19 IgG seropositivity rates stratified by socio-demographic variables among the study population. Although over-all prevalence rate for female (38/92 or 41.3%) was higher than that of males (41/108 or 38%), there was no significant statistical association between gender and seropositivity (P>.0.05).

Increasing age was significantly associated with seropositivity (P<0.05); the likelihood of seropositivity as measured by odds ratio increased significantly with age. Children whose fathers were reported to be traders had the highest seropositivity rate (20/37 or 54%) followed by farmers (23/44 or 52.3%), and artisans (20/50 or 40.4%). The difference in Seroprevalence rates between children from different fathers' occupational groups was statistically significant (P<0.05).

The odds of being seropositive were higher in children whose fathers were traders (0.R 5.88, 95%CI 0.98-60.44), farmers (0.R5.48, 96%CI 0.97-55.30) and artisans (0.R 3.33, 95% CI 0.63-33.89) compared to children whose fathers were professionals. Mother's educational level, another determinant of socio-economic status, was however not significantly associated with seropositivity (P>0.05).

The seropositivity rate among children who live in over crowded rooms (>3 per room) was 61.6% (45/73) compared to 26.8% (34/127) in those who live in less crowded dwellings. This difference was statistically significant (P<0.05). The risk of seropositivity is higher among children who live in overcrowded dwellings (0.R 4.73; 95% CI 2.43-9.28). The risk remained high even after adjustment for age and father's occupation (adjusted 0.R 4.65; 95% CI 2.39-8.86)

Figure 3

Table 3 Anti-parvovirus B19 IgG seropositivity among children with sickle cell anaemia in steady state in Jos stratified by socio-demographic variables

CHARACTERISTIC	FREQUENCY (%) n=200
Sex	
Male	108(54.0)
Female	92(46.0)
Total	200(100)
Age group (in years)	
1-5	92(46.0)
6-10	76(38.0)
11-15	18(9.0)
Above 15	14(7.0)
Total	200(100)

Figure 2

Table 2: Anti parvovirus B19 Ig G Seroprevalence among children with sickle cell anaemia in Jos

Age group	No Tested	No seropositive Male	Female	Total	Prevalence rate %
1-5	92	7	13	20	21.7
6-10	76	20	14	34	44.7
11-15	18	7	5	12	66.6
Above 15	14	7	6	13	92.8
TOTAL	200	41	38	79	39.5

{image:3}

DISCUSSION

Several studies in different regions of the world have identified different socio-demographic variables like age, gender, socio-economic status and environmental conditions as risk factors for acquisition of parvovirus B19 infection. For example, age has been consistently shown to be a major predictor of anti parvovirus B19 IgG seropositivity[13,14,15]. This has been amply demonstrated also in this study which shows that the risk of seropositivity increases with increasing age in a dose-response manner.

This study however has not demonstrated any association between gender and risk of seropositivity as the seroprevalence rates were not significantly different between males and females. This finding is in agreement with those reported in most population based studies that involved children[5,15,16,17]. However some reports have shown that females are at increased risk of seropositivity[18.]

The relationship between socio-economic status and health outcome is well known[19]. Disparities in morbidity and mortality by socio-economic status are well established: there is an inverse relationship between socio-economic status and susceptibility to infections[19]. In this study, two determinants of family socio-economic status and hence that of the child were assessed- the father's occupation and mother's literacy level. Father's occupation may be directly related to the family income and therefore to the general health status of the child, while mother's increasing literacy level may positively affect health awareness and health promoting behaviors in the family[19]. It was found that children whose fathers were in the lowly ranked occupational groups like artisans, farmers and traders were more likely to be seropositive than those whose fathers were professionals or civil servants. Although significant association between mothers' education level and seropositivity was not established in this study, it is evident that children whose mother's educational attainment was low were more likely to be seropositive than those whose mothers were better educated. These findings when taken as a whole, may suggest that an inverse relationship exists between seroprevalence rate and socio-economic status among children with sickle cell anaemia. Larger population-based studies in both developed and developing countries have however failed to show such a relationship[17,18]

This study has also highlighted the effect of overcrowding, which is defined by the World Health Organization[12] "as more than two persons living in a standard room of $16m^2$" on the prevalence rate for parvovirus B19. The Seroprevalence rate remained significantly higher in children who live in overcrowded dwellings even after adjustment for the confounding effects of age, father's occupation and mother educational level. This finding is not unexpected as parvovirus B19 is known to spread from person to person mainly by droplet infection[20]. This mode of spread is favored by overcrowding. Although no published studies to the best of the author's knowledge evaluated the impact of overcrowding on the prevalence of parvovirus B19 in this environment, Alao and co-workers[21] in Jos also found overcrowding as a significant risk factor for infection with cytomegalovirus- a virus that has similar transmission

dynamics to parvovirus B19 [22]. The finding from this study is also consistent with that of Kuei-Hsiang and colleaques[23]who reported higher parvovirus B19 prevalence rate in urban compared to rural areas of Taiwan. This was attributed to overcrowding in the urban areas.

Human parvovirus B19 is known to be highly infectious. Secondary attack rates of between 50 to 60% have been reported in families with more than one child with sickle cell anaemia when one child is acutely infected[13]. it should therefore be expected that the prevalence rate of anti parvovirus B19 IgG would be higher in children who have at least one sibling with SCA. However no significant association between having a sibling with SCA and IgG seropositivity was demonstrated in this study.

Conclusion and Recommendation: This study shows that overcrowding, age and father's occupational group, which is an index of parental socio-economic status statistically influence the serological status of children with sickle cell anaemia for the human parvovirus B19 IgG antibody. These findings call for an urgent need to address the growing problems of overcrowding and poverty in Nigeria.

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