Complement Fixing Antibodies to Respiratory Viruses in Children in Jos, Nigeria

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Summary

One-hundred serum samples obtained from children in Jos were tested for the presence of complement fixing antibodies against several respiratory viruses. Sixty-two per cent of the samples were positive for adenoviruses, 53 per cent for para-influenza viruses, 47 and 41 per cent for influenza A and B, respectively, 31 per cent for respiratory syncytial virus, 29 per cent for coronaviruses, and 19 per cent for reoviruses.

Introduction

Acute respiratory infections (ARI) are a major cause of morbidity and mortality throughout the world. Studies by the World Health Organization (WHO) show that ARI account for 2.2 million deaths throughout the world each year.^{1,2} Although morbidity for ARI is approximately the same in developed and developing countries, the associated mortality has been estimated to be up to 30 times more in most developing countries.³

Data on ARI is scanty or non-existent for most developing countries including Nigeria. Most of the work carried out in Nigeria is on morbidity and mortality due to ARI in hospital settings and the work done is mainly in the southern part of Nigeria.⁴⁻⁷ The only data from the northern part of Nigeria is work carried out in Zaria.^{8,9} This paper presents the result of a serosurvey carried out in Jos in northern Nigeria.

Materials and Methods

Study area

This study was carried out in Jos the capital of Plateau State located in the guinea savannah of northern Nigeria. It is 1250 m above sea level and, therefore, has milder climate than the rest of the country. The mean maximum temperature is 27.8°C and the mean minimum 16.6°C. A dry season occurs from November to April when the north-easterly harmattan winds blow across the Sahara desert.

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Patients and samples

The subjects for this study were 100 children aged 0–12 years old, attending the Jos University Teaching Hospital out-patients paediatrics clinic and two government health clinics in Jos. The subjects from government health clinics were healthy children brought to the clinics for immunization, while the subjects from the Jos University Teaching Hospital were patients suffering from diseases other than respiratory disease. Blood was obtained from these children by venepuncture and the serum from it extracted and stored at –20°C. The samples were subsequently lyophilized and carried to the Institute of Infectious and Parasitic Diseases of the Medical Academy in Sofia, Bulgaria for analysis by the complement fixation test.

Complement fixation test (CFT)

The CFT was used to test for antibodies to adenoviruses, respiratory syncytial virus, influenza viruses types A and B, para-influenza viruses, coronaviruses and reoviruses in the 100 serum samples.

The antigens for the CFT were produced in various cell cultures as follows: primary cell culture of human fetal kidney for adenoviruses (types 1–7); MK cells for respiratory syncytial virus (strain Long); embryonated chicken eggs for influenza viruses; human diploid cell culture for para-influenza (types 1–3) and coronaviruses (stains 229E); MK and Vero cell lines for reoviruses (type 1–3). The CFT was performed according to a micromethod applied in ARI Laboratory, Institute of Infectious and Parasitic Diseases.¹⁰

Results

Our results show that among 100 children 0–12 years of age in Jos 62 per cent had complement fixing antibodies to adenoviruses; 31 per cent to RSV, 47 per

TABLE 1
Percentage of children in Jos with complement fixing antibodies against respiratory viruses

Age	Number	AV	RS	IA	IB	PI	Cor	Reo
0-6 months	12	58.3	41.7	50.0	50.0	41.7	33.3	25.0
7-12 months	18	61.1	22.2	44.4	38.9	27.8	16.7	11.1
1-3 years	35	57.1	22.9	48.6	40.0	48.6	25.7	25.7
4-7 years	19	63.2	31.6	47.4	36.8	68.4	15.8	15.8
8-12 years	16	75.0	50.0	43.7	43.7	81.2	62.5	12.5
0-12 years	100	62.0	31.0	47.0	41.0	53.0	29.0	19.0

AV—adenovirus; RS—respiratory syncytial virus; IA—influenza A virus; IB—influenza B virus; PI—para-influenza virus; Cor—coronavirus; Reo—reovirus.

FIG. 1. Age prevalence of complement-fixing antibodies against respiratory viruses in children in Jos.

cent to influenza A, 41 per cent to influenza B, 53 per cent to para-influenza, 29 per cent to coronaviruses and 19 per cent to reoviruses (Table 1).

Antibody prevalence was generally high in the age group 0-6 months indicative of maternal antibody. This, however, decreased in the next age group, 7-12 months for all the viruses except adenoviruses. After the first year of life, there was a general increase in prevalence of complement fixing antibodies with increase in age for adenoviruses, respiratory syncytial virus, para-influenza viruses and coronaviruses. This, however, was not the case for influenza A and B viruses where prevalence of complement fixing antibody was approximately the same between 1-12 years of age. The prevalence of complement fixing antibodies to reoviruses in these children was generally low. However, after depletion of maternal antibody there was an increase in prevalence between ages 1-3 years after which it decreased with increase in age up to 12 years. These results are shown in Fig. 1.

The titre of complement fixing antibodies was

generally low for all the viruses except adenoviruses and influenza viruses (Table 2).

Discussion

This paper, presents for the first time, data on the presence of complement fixing antibodies to respiratory viruses in Jos, northern Nigeria. It shows that children become exposed to infection with respiratory viruses very early in life. By the age of 12 years 62 per cent of Jos children had come in contact with adenoviruses, 53 per cent with para-influenza viruses, 47 per cent with influenza A, 41 per cent with influenza B, 31 per cent with respiratory syncytial virus, 29 per cent with coronaviruses and 19 per cent with reoviruses.

Though data for viral respiratory infections in Nigeria is scanty, a few comparisons can be made. While our results in Jos show a high prevalence of 62 per cent for adenovirus infections, results obtained in Lagos show a prevalence of only 6 per cent¹¹ and in

TABLE 2
Geometrical mean titre of complement-fixing antibodies against respiratory viruses in children in Jos

Age	Number	AV	RS	IA	IB	PI	Cor	Reo
0-6 months	12	11.3	7.5	9.2	9.2	7.5	6.5	6.5
7-12 months	18	10.6	6.5	7.5	7.5	7.0	5.7	5.3
1-3 years	35	10.6	6.1	8.6	8.0	8.0	6.5	6.5
4-7 years	19	10.6	6.5	8.6	7.0	8.0	7.0	5.7
8-12 years	16	11.3	8.0	9.2	8.6	11.3	8.6	5.7
0-12 years	100	10.6	6.5	8.6	8.0	8.0	6.5	6.1

AV—adenovirus; RS—respiratory syncytial virus; IA—influenza A virus; IB—influenza B virus; PI—para-influenza virus; Cor—coronavirus; Reo—reovirus.

Ibadan 15 per cent.¹² The climatic conditions in these two places are very different; while Jos has a near temperate weather, Lagos is hot and humid. This might account for the drastic difference in adenovirus infections. Similarly, our result for the prevalence of influenza A and B of 47 and 41 per cent, respectively, is in contrast with the work of Ogunbi¹¹ in Lagos which shows only a prevalence of 6 per cent for these viruses. The results obtained in Zaria⁸ a town near Jos in northern Nigeria, showing a prevalence of 23 per cent for influenza viruses also differs from that obtained in Lagos.

Results obtained for the prevalence of respiratory syncytial virus in Jos and other cities in southern Nigeria show some similarities. It is 31 per cent in Jos, 32 per cent in Lagos,¹³ and 54 per cent in Benin City.¹⁴

Our results therefore indicate that the commonest viral respiratory infections in Jos are adenoviruses, influenza viruses, para-influenza viruses, and respiratory syncytial virus. This corroborates most of the work done in developed countries showing that these viruses are the most frequent viral agents associated with respiratory tract infections of children.^{10,15} We have also shown for the first time that coronaviruses may also be involved in childhood infections in Nigeria. However, much more long-term studies need to be carried out to fully elucidate the role of all these viruses in ARI of children in Nigeria.

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