

ASSOCIATION OF ACUTE SORE THROAT WITH GROUP A BETA HAEMOLYTIC STREPTOCOCCI CARRIAGE AMONG CHILDREN IN A PUBLIC SCHOOL IN CALABAR - IMPLICATIONS FOR THE CONTROL OF RHEUMATIC FEVER/ RHEUMATIC HEART DISEASE (RF/RHD) IN DEVELOPING COUNTRIES

C. O. ODIGWE, S. M. UDO, M. M. MEREMIKWU and N. OHIA

(Received 28 August 2001; Revision accepted 23 January 2002)

ABSTRACT

Two Hundred and Seventeen (217) throat swabs were obtained from apparently healthy children aged 4-13 years attending a public primary school in Calabar, South Eastern Nigeria. The swabs were transported in Stuart's transport medium to the Microbiology Laboratory of the University of Calabar Teaching Hospital, Calabar Nigeria and examined bacteriologically using 7% sheep blood agar incubated in 5% carbondioxide environment at 37°C for 48 hours. Seventy one (32.7%) were found positive for Group A beta-haemolytic streptococci (GABHS). Children aged 4-5 years had the highest carriage rate, (45.0%). Carriage rate decreased with age but did not vary significantly with sex. The rate of detection of GABHS was highest among children with current sore throat, (76.9%). Relative risk ratio associating GABHS with acute sore throat was 7.2 (95% C.I, 2.23-0.71). This high odds ratio provides a strong positive predictive index for the diagnosis of GABHS in cases of acute sore throat. These findings further re-enforce the view that the target group for primary prevention of RF/RHD is young school-aged children. We suggest that all cases of acute sore throat in children be treated for GABHS. Control efforts should include improvement in overall living standards, nutrition and integration of primary preventive strategies for RF/RHD into Primary Health Care (PHC) / School Health programmes.

RUNNING TITLE: Streptococcal throat carriage among Nigerian children.

INTRODUCITON

Rheumatic fever/Rheumatic heart disease (RF/RHD) remains a leading cause of cardiovascular morbidity and mortality, particularly in the developing countries of the world¹. It is the most common cardiovascular disease in children and young adults in many countries of Southeast Asia, Africa and Latin America². Although the prevalence of the disease in industrialized countries began to decline early this century, the recent resurgence of rheumatic fever in middle-class families in the USA has re-emphasized the public health importance of this disease in the developed countries as well³. In some developing countries with available data, the prevalence of RF/RHD in school children

ranges from 1.0 to 10 per 1000 with a high rate of recurrence and severity⁴. In some communities, it is reported to be as high as 20-50 per 1000 school children and 5-20 per 1000 in the population⁵. In a recent survey in Calabar, Nigeria, we found that 21% (185/820) of all adult cardiac admissions over a 5-year period were due to RF/RHD⁶. On the whole, it is conservatively estimated that about 12 million people are affected by RF/RHD with 400,000 deaths annually, and several more thousands, mainly children and young adults disabled¹.

Pharyngitis or sore throat is quite common and occurs all over the world particularly in children. The World Health Organisation (WHO) has estimated that every child has at least one

episode per year and that during the wet or rainy season in the tropics and winter in the temperate regions, when infections are at their peak, Group A, B-Hemolytic streptococci (GABHS) can be isolated from 20 – 35% of clinically acute sore throat cases, but that only 0.3 – 3% go ahead to develop RF/RHD⁴. The precise pathogenetic mechanism of RF/RHD is still poorly understood. However, two concurrent factors necessary to initiate the process are well recognized. They are Group A beta-hemolytic streptococcal (GABHS) infection of the throat and a specific susceptibility of the individual patient⁷. Prompt detection and effective treatment of streptococcal throat infections is therefore a major step in the primary prevention of RF/RHD.

In Nigeria, control activities are virtually non-existent and the problem of RF/RHD may worsen with the economic downturn in the country and diminished access to prompt medical treatment of common diseases. In order to determine the current pattern of GABHS infections among children in a major Nigerian city, we undertook a study of school-aged children attending a public primary school in Calabar. It is expected that the findings would draw attention to this neglected public health problem and provide base-line information for health policy, planning and further research.

MATERIALS AND METHODS

The study was undertaken in a

TABLE 1
AGE-RELATED PREVALENCE OF SPREPTOCOCCAL THROAT CARRIAGE APPARENTLY HEALTHY PRIMARY SCHOOL CHILDREN IN CALABAR.

AGE-GROUPS (YEARS)	NO. TESTED	NO. (%) POSITIVE
4 – 5	20	9 (45.0)
6 – 7	52	20 (38.5)
8 – 9	61	20 (32.8)
10 – 11	61	20 (32.8)
12 – 13	23	2 (8.8)
TOTAL	217	71(32.7)

government (public) primary school located within Calabar, the densely populated capital of Cross River State, in South-Eastern Nigeria. It was undertaken during the month of June/July (wet season) 1996. A total of 217 children aged 4 – 13 years were selected by stratified sampling technique from all the classes (one to six). All the children were in school for their usual educational activities and were therefore assumed to be in apparent good health. Consent was obtained from the school authorities who represented the interest of the Parents-Teachers Association (PTA).

Throat swabs were obtained from the children under strict aseptic conditions. The swab sticks were broken into Stuart's Transport medium and transported to the Microbiology

TABLE 2 STREPTOCOCCAL THROAT CARRIAGE IN ASYMPTOMATIC AND SYMPTOMATIC CHILDREN

MEDICAL HISTORY	NO. TESTED	NO. (%) POSITIVE
Currently has throat pains but no fever	9	6(66.7)
Currently has throat pains with fever	4	4(100.0)
No throat pain now or in the recent past	86	27(31.4)
History of throat pain in the recent past but not now.	118	34(28.8)

*The difference in carriage rate between currently symptomatic and asymptomatic children is statistically significant. ($X^2 = 10.2$; $p < 0.005$).

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TABLE 3 PREDICTIVE VALUES OF SORE THROAT FOR GABHS AMONG SCHOOL-AGED CHILDREN IN CALABAR USING ODDS RATIO (OR) ANALYSIS

(a) GABHS AMONG 13 CHILDREN

STUDY GROUPS	GABHS CARRIAGE		TOTAL
	YES	NO	
Cases (Sore throat)*	10	3	13
Controls	27	59	86
	37	62	101

OR = 7.28 (95% C.I. 2.23 to - 0.51)

*High predictive value

(b) GABHS AMONG 118 PREVIOUS CASES OF SORE THROAT AND 86 CONTROLS

STUDY GROUPS	GABHS CARRIAGE		TOTAL
	YES	NO	
Previous sore throat**	34	84	118
Controls	27	59	86
Total	61	143	204

**OR = 0.9 (95% C.I. 0.66 to - 0.55)

Very low predictive value

*C.I. Confidence interval.

Laboratory of the University of Calabar Teaching Hospital. The samples were processed immediately on arrival in the Laboratory.

Two samples were plated on one 7% Sheep Blood Agar plate freshly prepared on the day of sampling. The plates were incubated in 5% Carbondioxide incubator at 37°C for 48 hours. They were then examined for the presence of Beta-haemolytic colonies in the Sheep Blood Agar plates. All beta-haemolytic colonies were subcultured onto fresh blood agar plates for purity. Identification of the beta-haemolytic colonies was based on sensitivity to Bacitracin disk (1.0/ug) and agglutination with Lancefield group A anti-serum using the Slidex Strepto-A sensitized latex reagent for the rapid-Lancefield grouping of group A, beta-haemolytic streptococci (Biomerieux-France).

The results were analyzed and presented as frequency tables with simple proportions. Chi-square test (with Yate's correction factor) was used as the statistical test of significance at P-

value less than 0.05 (table 2). The predictive values for associating sore throat with the isolation of GABHS using ratio analysis is also presented in Table 3.

RESULTS

A total of 100 girls and 117 boys were studied. The age distribution of the pupils and age-related rates of streptococcal throat carriage are shown in Table:1. The overall point prevalence of streptococcal pharyngeal carriage was 32.7%; more males (41/117, 35.0%) were affected than females (30/100, 30.0%), though the difference was not statistically significant (P=0.1). Carriage rate was highest among 4 - 5 year olds and lowest among 12-13 year olds, decreasing with increase in age (Table 1.) Table 2 shows the rates of streptococcal carriage in asymptomatic and symptomatic children. The carriage rate among the 13 symptomatic children (with sore throat) was 76.9% while the rate in 204

asymptomatic pupils was 29.9% (Yate's corrected $X^2 = 10.2$; $P < 0.005$). In table 3, we present the odds ratio for associating GABHS with sore throat among the children studied. Odds ratio of 7.2 (95% CI 2.23 to 0.51) is associated with the children who had sore throat and Group A beta haemolytic streptococci isolated in their throat swabs. The odds ratio for children with previous history of sore throat but not harbouring pharyngeal streptococci at the time of study is 0.9 (95% CI, 10.66 to -0.55). These findings show that sore throat is highly predictive of throat infection with group A beta haemolytic streptococci.

DISCUSSION

This survey has shown a high carriage rate of *S. pyogenes* (32.7%) among these apparently healthy children. This rate is comparable with findings in some other developing countries^{4,5}. The high rate of throat carriage of GABHS detected in school children in this community indicates that streptococcal throat infection and the attendant complications of RF/RHD are still common health problems here. The decline in the incidence of RF/RHD in economically developed countries of the world in the 1960s has been attributed to the overall improvement in the socio-economic well-being of the people as well as prompt treatment of streptococcal infections².

Detection of affected children for primary preventive measures by treatment with an appropriate chemotherapeutic agent is considered a vital component of the RF/RHD control programme proposed by the World Health Organization and the World Heart Federation. It will take effective community education to get the parents of symptomatic children to present them for treatment. The fact that up to 76.9% of symptomatic children were positive for *S. pyogenes* cultures shows that the presence of throat pain is a reliable index for detecting infected children in endemic communities, (Sensitivity = 76.9; specificity 70.1). It would be expected that awareness of the possible grave consequences of failure to treat streptococcal throat infection would motivate parents to seek medical care early when a child is affected.

Periodic survey of school children and other population groups at risk (teachers, child care assistants and health workers) may improve the detection of cases. The role of asymptomatic carriers in the spread of infection has been previously highlighted^{8,9}. Currently, treatment is only recommended for symptomatic persons⁴. It is expected that appropriate case management would reduce the incidence of complications and reduce the infection-contagion rate. Poor socio-economic status has been associated with high incidence of RF/RHD⁷. Our survey was among children in a large public school most of whom belong to low income families, since most well-to-do parents in this community prefer private primary schools¹⁰.

The data produced in this study has revealed a very high carriage rate of GABHS among school children with sore throat. This finding provides a very high positive prediction for GABHS to be associated with acute sore throat. It is possible to suggest that acute sore throat could be used as a predictive symptom for Group A Beta haemolytic streptococcus infection.

In order to realize the objective of control programmes for prevention of RF/RHD in children, appropriate chemotherapy (Amoxycillin and Erythromycin) should be given to all school aged children with acute sore throat at the School Health Clinic. This approach is very appropriate as medical facilities with Laboratory capabilities to carry out culture for GABHS are very few in rural areas of South Eastern Nigeria. We suggest a further study in the dry season and to include at least 1000 – 10,000 children in various parts of Nigeria in order to increase the validity of these findings.

ACKNOWLEDGEMENT

We thank Mrs. Grace Udofia for typing the manuscript.

REFERENCES

- World Health Organisation. 1980. Community control of rheumatic heart disease in developing countries. A major public health problem. WHO Chronicle 34: 336-337.

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- Kaplan E. L., 1986. The Worldwide impact of rheumatic fever. Realistic approaches to prevention of RF/RHD in developing countries. Heart Beat No. 1.
- Yeasey E. J., 1987. Resurgence of acute rheumatic fever in the Inter Mountain Area of the USA - N. Engl. J. Med. ; 316, 421 - 427
- World Health Organisation /ISFC., 1995. Strategy for controlling rheumatic fever/rheumatic heart disease, with emphasis on primary prevention: Memorandum from a joint WHO/ISFC meeting. Bull WHO, ; 73 (5): 583 - 583.
- World Health Organisation (WHO), 1986 - 1990. program for the prevention of rheumatic fever/rheumatic heart disease in 16 developing countries: report from phase I Bull. WHO (1992); 70:213 -218.
- Odigwe C. O. and Esin R. A., 1991. Analysis of Adult Cardiac admissions into the University of Calabar Teaching Hospital; A 5 - year retrospective study. (Proceedings of the Nigerian Cardiac Society (Pfizer) Benin; pp. 70 - 75.
- Taranta A. Markowitz M., 1989. Rheumatic Fever - 2nd Ed. Bosten/London Kluwer Academic Publishers
- Cole, T. O., 1978. Rheumatic Fever and rheumatic heart disease in the tropics with particular reference to Nigeria. Nigeria Med. J.; 6, 123 - 126.
- Fiorentino M., 1996. The Return of rheumatic fever. Clin Microbiol Newsletter: 18, 25-29.
- Asuqou; P. N., 1997. Cost, Financing and Management of Primary Education in Cross River State. Primary Education Commission (NPEC), Kaduna.