

Meningococcal carrier rates in parts of eastern Nigeria *

A. N. NJOKU-OBI¹ & J. A. C. AGBO²

A survey of the meningococcal carrier rate was conducted in the Nsukka area (eastern Nigeria) during an interepidemic period. It was found that approximately 10% of 1126 individuals studied carried one serogroup or other. The predominant serogroup was B (58.1%), followed by C (24.2%). The highest percentage of isolates was from the age group 11–20 years (12.00%), followed by the age group 6–10 years (10.5%). The proportion of isolations was only 6.0% in the age group 31 years and above. Isolates from urban communities were resistant to sulfadiazine: 71.43% (group A), 63.9% (group B), 80.0% (group C), and 100% (group D). The percentage of resistant isolates from the villages was lower. Ninety-five per cent of all isolates were sensitive to penicillin, streptomycin, chloramphenicol, trimethoprim, and erythromycin.

The carrier rate for meningococci in the Nsukka area of eastern Nigeria has not previously been reported. In view of the proximity of Nsukka to the meningococcal meningitis belt of Nigeria and the occurrence of sporadic cases of the disease, we decided to undertake this study to investigate the prevalence of different serotypes of *Neisseria meningitidis* and their antibiotic sensitivity patterns.

Nsukka town is situated on a sparsely vegetated plateau approximately 430 m above sea-level. The main occupation of the people is rural agriculture, and most of them live in small villages dotted around the main township. The town is approximately 80 km from the southern edge of the meningitis belt.

MATERIALS AND METHODS

The study was carried out by simple random sampling. Five hundred individuals of various ages were sampled from the township area and 626 individuals sampled from a village 12 km distant from the township.

Specimens from asymptomatic carriers were obtained from the nasopharynx with bent wire swabs. Care was taken to avoid the oral mucosa. Swabs were immediately streaked out on Thayer-Martin (1) medium (Difco) and incubated at 37°C under 5–10% carbon dioxide for 48 h. Colonies typical of meningococcus were restreaked on Mueller-Hinton agar for purity. Fermentation tests on glucose, sucrose, maltose, and lactose were then carried out. In addition the production of oxidase was determined and cultures typed serologically by slide agglutination. Antisera for groups A, B, C, and D were obtained from Difco Laboratories.

Sensitivity to antibiotics was tested on Mueller-Hinton agar medium. Commercial discs containing the following antibiotics were used: chloramphenicol 30 µg, tetracycline 25 µg, streptomycin 25 µg, ampicillin 10 µg, penicillin 5 µg, gentamicin 10 µg, nitrofurantoin 200 µg, trimethoprim 30 µg.

The resistance of isolates to sulfadiazine was also tested on Mueller-Hinton agar. The minimum concentration of the drug inhibiting growth and the percentage of isolates resistant to it were determined after incubation at 37°C for 48 h. The percentage of meningococci sensitive to trimethoprim was determined by plating on Mueller-Hinton agar with 5% horse blood (discs containing 30 µg/ml).

* From the Epidemiological Research Unit, Faculties of Medicine and Biological Sciences, Department of Microbiology, University of Nigeria, Nsukka, Nigeria.

¹ Professor of Microbiology.

² Junior Fellow.

RESULTS

During the survey, we isolated 112 strains of meningococci from the nasopharynx of 1126 individuals. Table 1 presents the distribution of various serotypes. The predominant serotype isolated from both city and village dwellers was B (58.1% and 56%, respectively), followed by C (24.2% and 30%, respectively). There was no significant difference between the percentage of isolates of either serotype and the habitat of the carriers (city or village), possibly because Nsukka Town is contiguous with the adjoining villages, which permits full social interaction.

Table 1. Serotypes of *Neisseria meningitidis* isolated from carriers in the Nsukka area.

Serotypes	Urban		Village	
	No. of strains	%	No. of strains	%
A	7	11.3	4	8
B	36	58.1	28	56
C	15	24.2	15	30
D	2	3.2	3	6
Untypable	2	3.2	0	0
Total	62	100	50	100

Table 2 shows the carrier state of *Neisseria meningitidis* in different age groups. The highest percentage of isolates was found in persons within the age group 11–20 years (12.0%), followed by the age group 6–10 years (10.5%). The proportion of isolates was only 6.0% in the age group 31 years and above.

Table 2. Carrier state of *Neisseria meningitidis* in different age groups in the Nsukka area

Age group (years)	No. of individuals tested	Carriers	
		No.	%
2½-5	56	5	8.9
6-10	201	21	10.5
11-20	493	59	12.0
21-30	189	13	6.9
31 and above	187	14	7.5

Table 3. Monthly distribution of *Neisseria meningitidis* carrier state in the Nsukka area

Month	No. of individuals tested	Carriers	
		No.	%
<i>1973</i>			
March	116	13	11.2
April	168	15	8.9
May	106	10	9.4
June	101	13	12.8
July	125	11	8.8
August	110	8	7.2
September	200	16	8.0
<i>1974</i>			
January	118	17	14.4
February	82	9	11.0

The study was conducted over a period of nine months, from March to November. Table 3 shows the monthly distribution of the *Neisseria meningitidis* carrier state. The differences in the number of carriers or percentage of isolations by month are not statistically significant.

The sensitivity to sulfadiazine of the meningococcal strains isolated is shown in Table 4. Among isolates from the urban community, 71.4% of A, 63.9% of B, 80.0% of C, and 100% of D serotypes were resistant to sulfadiazine. The isolates from village communities showed lowered resistance, 25% of A, 46.4% of B, 53.3% of C, and 33.3% of D serotypes being resistant to the drug.

Table 4. Sensitivity to sulfadiazine of *Neisseria meningitidis* isolated from carriers^a

Serotype	Urban		Village	
	No. of Strains	% Resistant	No. of Strains	% Resistant
A	7 (5)	71.4	4 (1)	25.0
B	36 (23)	63.9	28 (13)	46.4
C	15 (12)	80.0	15 (8)	53.3
D	2 (2)	100.0	3 (1)	33.3

^a Strains resistant to 1 µg/ml or more of sulfadiazine.

DISCUSSION

In this study the most prevalent serotype of *Neisseria meningitidis* isolated from asymptomatic carriers was B, followed by C. This finding indicates the changing pattern of the meningococcal carrier rate. Studies in Israel showed that serotypes C and B were the commonest in both carriers and patients, and serotype A was not found (2). In the United States of America, group A meningococci were rarely isolated during the period 1964-70; over 90% of the isolates were serotypes B and C. In our study we encountered only two strains that were untypable, because X, Y, and Z typing sera were not available.

The high carrier rate in the age group 2½-5 years underlines the epidemiological importance of this pre-school group, which, together with the age group 6-10 years, may well be the primary focus of dissemination of the pathogen and is at risk during epidemics. The carrier rate is higher in the age group 11-20 years and then declines. A recent study of the seroepidemiology of *Neisseria meningitidis* in the normal population in the Nsukka area has shown low antibody titres in the pre-school age group and higher titres in adults. The apparent relationship between antibody titres and carrier rate may explain

the findings of this study. In the United Kingdom, Fraser et al. (3) reported the highest carrier rate in the age group 11-20 years.

The resistance pattern of the isolated serotypes to sulfadiazine found in this study is comparable with those reported elsewhere. In the Israeli study mentioned above (2), it was reported that 68% of group C isolates from patients and 62% of those from carriers were resistant to the drug. The corresponding figures for Group B were 54% and 55%, respectively. Pateraki et al. (4) have reported higher frequencies of resistance to sulfadiazine in the United States of America. Our higher figures, especially in isolates from urban communities, may reflect the ready availability of sulfa-drugs to the town dwellers, who are known to use them freely for self-medication. About 16% of all isolates were not inhibited by high concentrations of the drug (up to 200 µg/ml).

Sensitivity to other antibiotics gives hope of treatment of the disease. Over 95% of the strains isolated were sensitive to penicillin, streptomycin, chloramphenicol, trimethoprim, and erythromycin, although to varying degrees. With further improvement of the polysaccharide vaccine developed by Artenstein et al. (5), it is expected that the explosive epidemics of previous years may not recur.

RÉSUMÉ

TAUX DES PORTEURS DE MÉNINGOCOQUES DANS CERTAINES PARTIES DU NIGÉRIA ORIENTAL

Une enquête sur les taux de porteurs de méningocoques a été menée dans la région de Nsukka (Nigéria oriental) pendant une période interépidémique. On a constaté que, sur les 1126 sujets étudiés, 10% environ étaient porteurs de méningocoques d'un sérogroupe ou d'un autre. Le sérogroupe B prédominait (58,1%), suivi de C (24,2%). Le plus fort pourcentage d'isolements a été obtenu dans le groupe d'âge de 11 à 20 ans (12,0%), puis dans celui de 6 à 10 ans (10,5%). Dans le groupe d'âge de 31 ans et plus, le pourcentage d'isolements

n'était que de 7,5%. Les microorganismes isolés dans les collectivités urbaines étaient résistants à la sulfadiazine, mais dans des proportions variables, à savoir: 71,43% pour le groupe A; 63,9% pour le groupe B; 80,0% pour le groupe C; et 100% pour le groupe D. Parmi les méningocoques isolés dans les villages, le pourcentage de résistance était plus faible. Sur la totalité des souches isolées, 95% étaient sensibles à la pénicilline, à la streptomycine, au chloramphénicol, à la triméthoprimine et à l'érythromycine.

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