

The African Journal of Medicine and Medical Sciences

Editor: L.A. Salako
Assistant Editors: A.O. Falase and B. Adelusi

Editorial Board:

A.K. Addae	R.A. Elegbe	N.C. Nwokolo
S.A. Adebonojo	G. Emerole	H.O. Obianwu
O.O. Adekunle	J.G.F. Esan	S.A. Oduntan
A. Adeloye	E.E. Essien	E.O. Ogunba
A.F. Aderounmu	G.O. Ezeilo	O. Ogunbode
C.O. Adesanya	A. Fabiyi	M.O. Olatawura
A. Adetugbo	J.B. Familusi	D.A. Olatunbosun
A.A. Adeyokunnu	D. Femi-Pearse	E.O. Olurin
A. Agboola	A.F. Fleming	Oyin Olurin
O.O.O. Ajayi	K.A. Harrison	A. Omololu
E.O. Akande	P.A. Ibeziako	B.O. Onadeko
O.O. Akinkugbe	A.C. Ikeme	G. Onuaguluchi
O.O. Akinyemi	A.O. Iyun	A.O. Osoba
A.U. Antia	F. Jaiyesimi	B.O. Osotimehin
T. Atinmo	A.O.K. Johnson	B.O. Osunkoya
O. Ayeni	T.O. Johnson	B.O. Osuntokun
E.A. Ayoola	T.A. Junaid	D.D.O. Oyebola
E.A. Bababunmi	T.M. Kolawole	A.B.O.O. Oyediran
O. Bademosi	K. Knox-Macaulay	E.H.O. Parry
E.A. Badoe	O.A. Ladipo	T.F. Solanke
T.O. Cole	S.B. Lagundoye	O. Tomori
O.A. Dada	C.O. Mbanefo	F.A.O. Udekwo
A.B.O. Desalu	D.G. Montefiore	A.O. Uwaifo
L. Ekpechi	E.O. Nkposong	

Volume 14
1985

BLACKWELL SCIENTIFIC PUBLICATIONS
Oxford London Edinburgh Boston Palo Alto Melbourne

In search of the aetiology of deafness in Nigeria — the probable role of rubella infection

ADEFUNKE OYEMADE AND AKINLOLU ODELOLA

*Department of Preventive and Social Medicine, University College Hospital, and Department of Pharmaceutics
and Clinical Pharmacy, University of Ibadan, Ibadan, Nigeria*

Summary

The present study attempts to establish a relationship between maternal rubella and congenital deafness in Nigeria. For the purpose of the survey, the immunological status with respect to rubella infection of 179 healthy but deaf school children (study group) and 248 school children with normal hearing (control group) was determined. The serological technique employed was the haemagglutination inhibition (HI) test. The percentage of immunized persons ranged from 48.6 to 74.2% in the study group and 55.3 to 68.3% in the control group. Furthermore, the HI antibody titres for the study group were not significantly different from those of the control group although both groups were found to exhibit low HI antibody titres. The presence of low titres of HI antibodies in both groups and the absence of any significant correlation between the state of hearing and HI antibody levels seem to indicate that intrauterine rubella is not an important cause of congenital deafness in Nigeria.

Résumé

Cet étude-ci essaie d'établir une relation entre la rubéole maternelle et la surdit e cong enitale au Nig eria. Dans cet enqu ete l' etat immunologique concernant l'infection de la rub eole chez 179  coliers en  tat sains mais sourds (groupe  tudi e) et 248  coliers avec l'ou ie normale (t emoins) a  t e d etermin e. La technique s erologique employ ee  tait le test d'agglutination (HI). Le pourcentage des individus immunis es s'est  chelonn e de 48,6   74,6% chez le groupe  tudi e et de 55,3%   68,3% chez les t emoins. En outre, les taux d'anticorps (HI) chez le groupe  tudi e n' etaient pas significativement

diff erents de ceux du t emoins bien que les deux groupes ont expos e les taux bas. La pr esence de taux bas de l'anticorps (HI) chez les deux groupes et l'absence de quiconque cor elation entre l' etat d'ou ie et les taux d'anticorps (HI) semble indiquer que la rub eole intraut erine n'a pas de cause importante de la surdit e cong enitale au Nig eria.

Introduction

Deafness in childhood is a serious disorder of perception and communication that results in defective speech and impaired social relationships. The problem is of considerable socio-economic consequences to the child, his family and the community within which he lives. Although modern medicine and advanced education have much to offer deaf children, the ultimate solution to the problem lies in its prevention and this depends on accurate information concerning the aetiology of the deafness in any particular community.

Previous studies have shown that maternal rubella in the first trimester of pregnancy is an important aetiological factor in deafness (Campbell, 1961; Horstmann *et al.*, 1965; Siegel, Fuerst and Duggan, 1968). However in Nigeria, very little information of a similar association is available (Fadahunsi, 1978). Such gap in our knowledge can partly be attributed to some research constraints which include the non-availability of relevant medical history of pregnant women during the ante-natal period as many of the expectant mothers are usually cared for outside recognized medical institutions. Even where such women are seen at regular intervals in health clinics, maternal rubella being a mild and transient infection may occur unrecognized and undiagnosed, and this

is particularly so in dark-skinned persons. Finally, the practice of comprehensive screening for handicaps in young children does not exist (Oyemade, 1979); consequently, children with defective hearing are often not diagnosed until they start school (Oyemade, 1975). In view of these constraints and the knowledge that neutralizing antibody levels resulting from congenital rubella persist until adulthood (Sever & Monif, 1965), the present study will be based on serological tests performed on school children. It attempts to establish whether a relationship exists between maternal rubella and congenital deafness.

Materials and methods

The study group comprised 179 children who were sufficiently handicapped to require special education in a school for the deaf in Ibadan, the capital of Oyo State. Serum samples were obtained from all the 179 healthy but deaf pupils whose ages ranged from 6 to 20 years. The control group consisted of 248 children randomly selected from a school for children with normal hearing. The children were of comparable age and socio-economic background as the study group. Serum samples obtained from the children in both groups were stored at -20°C until tested. Each serum

sample was treated with 25% kaolin in borate saline to remove non-specific inhibitors and absorbed with 50% goose red blood cells to eliminate non-specific haemagglutinin. The serological technique employed in this study was the haemagglutination-inhibition (HI) test as described in previous studies (Odelola, Fabiyi & Familusi, 1977). Since the results of the HI test correlate well with the neutralizing antibody levels (Field *et al.*, 1967), the HI test has been adopted in this study as it is more suitable for screening large numbers of sera. Serum samples found positive from screening test were subsequently titrated to endpoints. The rubella haemagglutination (HA) antigens as well as positive and negative control sera used in this study were obtained from Wellcome Laboratories, England.

Results

The correlation of rubella immunity with age for the study and the control groups are shown in Tables 1 and 2 respectively. The percentage of immunized persons ranged from 48.6% to 74.2% in the study group and 55.3-68.2% in the control group. In both groups, the proportions of immunized children increased with age. However, no statistically significant difference was found between the proportion of immu-

Table 1. State of rubella immunity in relation to age (study group)

Age (years)	No. tested	No. (%) positive	No. (%) negative
6-10	72	35 (48.6)	37 (51.4)
11-15	72	45 (62.5)	27 (37.5)
16-20	35	26 (74.2)	9 (25.8)
Total	179	106 (59.2)	73 (40.8)

Table 2. State of rubella immunity in relation to age (control group)

Age (years)	No. tested	No. (%) positive	No. (%) negative
6-10	152	84 (55.3)	68 (44.7)
11-15	55	35 (63.6)	20 (36.4)
16-20	41	28 (68.2)	13 (31.8)
Total	248	147 (59.3)	101 (40.7)

nized children in the study group and the control group (Table 3). The age-specific distribution of HI antibody titres of the study and the control groups is shown in Table 4. Seventy-three (40.8%) of the 179 in the study groups had titres of less than 1/10, 32 (17.9%) had a level of 1/20 and the remaining 74 (41.3%) had titres which fell between 1/20 and 1/80. Similarly, 100 (40.3%) of the 284 children in the control group had titres of less than 1/10 and 33 (13.3%) had a level of 1/10 and the remainder were distributed over the entire range of dilutions tested. There were differences between the study group and the controls for the HI values in the different age groups, but the differences were not significant.

Discussion

The present study shows that in all the age

groups the proportion of deaf children with detectable rubella antibodies does not differ significantly from the proportion of children with normal hearing and with detectable rubella antibodies. These findings seem to suggest that both the study and the control groups could have had a common exogenous exposure to rubella about the same time in their lives. On the value of HI antibodies, the HI antibody titres for the study group were not significantly different from those of the control group although both groups were found to exhibit low HI antibody titre. Kenrick *et al.* (1968) in a study of rubella-virus antibodies in adults with congenital rubella found a statistically significant difference between the total rubella group for values of HI antibody less than or equal to 1/10. Our findings seem to be at variance with their results. For instance, the HI antibody titres for the study group were not significantly

Table 3. Comparison of the percentages of children immunized to rubella in the study and control groups

Age in years	Study group	Control group	Test of significance
6-10	48.6%	55.3%	$P > 0.05$ NS*
11-15	62.5%	63.6%	$P > 0.05$ NS
16-20	74.2%	68.2%	$P > 0.05$ NS

*No statistically significant difference.

Table 4. Age-specific distribution of HI antibody titres of the study and control groups

Age groups	HI antibody titre					Total No. tested
	<10	10	20	40	80	
6-10 years						
Study group	37	12	12	5	6	72
Control group	67	19	36	21	9	152
	$\chi^2 = 4.71$ $df = 4$ $P > 0.05^*$					
11-15 years						
Study group	27	12	15	11	7	72
Control group	20	8	15	7	5	55
	$\chi^2 = 0.80$ $df = 4$ $P > 0.05^*$					
16-20 years						
Study group	9	8	7	6	5	35
Control group	13	6	12	6	4	41
	$\chi^2 = 1.98$ $df = 4$ $P > 0.05^*$					

*Not statistically significant.

different from those of the control group although both groups were found to exhibit low HI antibody titre. The presence therefore of low titres of HI antibodies in both groups and the absence of any significant correlation between the state of hearing and HI antibody levels seem to suggest that intrauterine rubella is not an important cause of congenital deafness in this environment. Considering however the number of children in our society who have significant hearing deficit sufficiently severe to compromise their future schooling, other possible aetiological factors must urgently be sought through intensive research. It is hoped that information derived from such studies will not only increase our knowledge of the causes of deafness in the society but will form an important basis for preventive measures.

Acknowledgments

This study was supported by a Senate Research Grant, University of Ibadan. The assistance of Dr Oyejide and Mrs Oyewole with the statistical analysis is gratefully acknowledged.

References

- Campbell, M. (1961) Place of maternal rubella in the aetiology of congenital heart disease. *Br. Med. J.* **1**, 691-696.
- Fadahunsi, O. (1978) Congenital rubella syndrome in Lagos. *Nig. J. Paediat.* **5**, 4-11.
- Field, A.M., Vandervelde, E.M., Thompson, K.M. & Hutchinson, D.N. (1967) A comparison of the haemagglutination-inhibition test and the neutralization test for the detection of rubella antibody. *Lancet*, **ii**, 182-184.
- Horstmann, D.M., Bantvala, J.E., Riordan, J.T., Payne, M.C., Whittlemore, R., Opton, E.M. & du Ve Florey, V. (1965) Maternal rubella and the rubella syndrome in infants. *Amer. J. Dis. Child.* **110**, 408-415.
- Kenrick, K.G., Slinn, R.F., Dorman, D.C. & Mencer, M.A. (1968) Immunoglobulins and rubella virus antibodies in adults with congenital rubella. *Lancet*, **i**, 548-551.
- Odelola, H.A., Fabiya, A. & Familusi, J.B. (1977) Distribution of rubella antibodies in Nigeria. *Trans. Roy. Soc. Trop. Med. Hyg.* **71**, 425-426.
- Oyemade, A. (1975) The care of deaf school children and other handicapped in Nigeria. *Roy. Soc. Hlth. J. (London)*, **95**, No. 6, pp. 282-283.
- Oyemade, A. (1979) Screening services for handicaps in pre-school children. *Nig. Med. J.* (In Press).
- Sever, J.L. & Monif, G. (1965) Limited persistence of virus in congenital rubella. *Amer. J. Dis. Child.* **110**, 452-454.
- Siegel, M., Fuerst, H.T. & Duggan, W. (1968) Rubella in mother and congenital cataract in child. *J. Amer. Med. Assoc.* **203**, 632-636.

(Received 9 January 1984; accepted 21 May 1984)

DIGITIZED BY E-LATUNDI OLUKU LIBRARY