

Original Article

EFFECT OF MEASLES ANTIBODIES IN THE BREAST MILK AND SERA OF MOTHER ON SEROCONVERSION TO MEASLES VACCINATION.

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The objective of this study was to determine the role of the presence of measles antibodies (MV) in the serum and breast milk of lactating mothers. Blood and breast milk samples were collected pre and 8 week post vaccination mothers and their 9-month-old children brought to the Institute of Child-Health, from University College Hospital, Ibadan for routine measles vaccination. The samples were assayed for the presence of MV antibodies using the haemagglutination inhibition method. The result showed that 2.0% of the 396 children had MV antibodies in their sera prior to vaccination as against 20.2% of their mothers in either breast milk or sera. All the eight children positive for MV antibodies pre-vaccination were from seronegative mothers. However there was no statistical significant difference in the seroconversion rate between children from seropositive mothers and those from seronegative ($p>0.05$). There was also no evidence of interference with seroconversion. The low seroconversion rate observed in the study could therefore be attributed to the low potency of the vaccines used rather than the presence or absence of MV antibodies in the sera or breast milk of mothers.

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INTRODUCTION

Measles vaccine is one of the six vaccines for preventable diseases of children. This specific prophylaxis for most viral diseases has resulted in the decline of such diseases all over the world. Unfortunately, since the introduction of the measles vaccine in Nigeria in 1962 (Meyers *et. al*, 1964), the disease has continued to occur in vaccinated as well as nonvaccinated children. Many reasons responsible for measles vaccination failures in Nigeria have been put forward (Adu *et. al.*, 1992, Onoja *et. al.*, 1992). These include low potency vaccines, break in cold chains, improper handling of vaccines at vaccination centers and non-adherence to vaccination schedules. The role of maternal antibody in the seroconversion to measles vaccination has been documented in Nigeria (Adu and

Adeniji, 1995). The hypothesis that the maternal antibodies transferred to the children must have been weaned before the age of 9 months, when the children were vaccinated.

It is in contrast with other findings that maternal antibodies persist at 12 months (Albercht, *et. al*, 1997). What is not clear in this environment is the level of antibodies in the children before vaccination. And this could explain the role of mother - child factor as it affects measles seroconversion after vaccination.

This study was therefore designed to determine the relationship between the measles antibody in the breast milk and sera of mothers and its effect on the seroconversion of their children after measles vaccination.

MATERIALS AND METHODS.

This study was carried out at the Institute of Child Health, University Teaching Hospital, University of Ibadan, Nigeria between January and December 1997. The study population was the children aged nine months and above who were still breast feeding and were brought for the routine measles vaccination by their mothers.

Before vaccination, serum samples were collected from the children in Ropacco^R paper using the finger prick method (Nakano, 1983). Also about 5ml of breast milk were collected from their corresponding mothers. Samples were collected only from mothers who consented. The mothers were then advised to return their children for post vaccination check up eight weeks later during which time sera samples were also collected. All samples were stored away at -20°C till ready for use.

Sera were eluted from the Ropacco^R by the addition of 0.5ml of Phosphate buffered saline (PBS) at 4°C. overnight giving a final serum concentration of 1:10 dilution. The milk was spun in a cold centrifuge at 2000g for 10 minutes. The middle clear layer was then separated into a clean tube.

Sera and milk were treated by adding 0.05ml of 20% kaolin and centrifuging at 2000g for 10 minutes, a procedure that removed non-specific inhibitors. Subsequently, 0.05ml of 50% monkey red blood cell (mrbc) was added and centrifuged at 2000g for another 10 minutes to remove agglutinins.

Haemagglutination inhibition test.

The Haemagglutination inhibition (HI) test was used to detect measles antibody in both the sera and the milk samples. Antigen for the HI test was prepared as described by Norway (1962).

Titration of vaccines

To test the potency of some of the vaccines either in the lyophilized and reconstituted forms were titrated in vero cells according to the WHO standard (1990). Titres of the vaccines were calculated according to the method of Kraeber (1931).

Data analysis

The statistical significance of factors identified as associated with seroconversion was assessed using the chi-square test at the 5% level.

RESULTS

A total of 912 blood samples were collected from the children and their mothers, while 324 breast milk samples were collected from mothers. Out of the 912 sera samples, 396 were pre-vaccination samples from the children while 396 were from the mothers and 120 were post-vaccination sera from the children.

Out of the 396 pre-vaccination sera from the children, only 8 (2.0%) were positive for measles HI antibodies, while 80 of the 396 sera from mothers were positive for measles HI antibodies. The samples, 108 (27.2%) were positive for measles HI antibodies (Table I). Of the 80 mothers with antibodies in their sera, 16 also had antibodies in their breast milk seventy two (20%) of the 316 seronegative mothers had antibody in their milk.

All the 8 pre-vaccination HI positive children were from serum negative mothers. Out of the 388 pre-vaccination negatives, 80 (20.6) were from HI positive mothers, while 308 were from serum negative mothers. Sixteen of the 388 pre-vaccination negative children were from mothers who had HI antibodies in both breast milk and sera while 204 children were from mothers without antibodies in both breast milk and sera. None of the children from the 88 breast milk positive mothers had measles antibodies in their sera (Table II). Eight children from the 236 breast milk negative mothers had pre-vaccination HI antibodies.

Result of Seroconversion.

Sera was collected from 120 children who were brought for post-vaccination check up. Forty four of them (36.7%) seroconverted while 76(63.3%) did not. Only 4 of the HI positive children were from serum positive mothers while the remaining 40 were from HI negative mothers. Sixteen children from serum positive mothers did not seroconvert

while 60 children from serum negative mothers did not seroconvert too. Sixteen of the HI positive children were from HI milk positive mothers, while 28 HI positives were from HI milk negative mothers. None of the children came from HI milk positive / serum positive mothers. Twenty-four were from HI milk negative mothers. Out of the 76 children that did not seroconvert, 16

were from HI positive while 60 were from HI negative mothers (Table III). A test of significant association between seroconversion and measles antibodies in sera and milk of mothers showed that there was no significant association between seroconversion and measles antibody level in the sera or breast milk of mothers. ($P > 0.05$).

Table IV. Only the non-reconstituted vaccine had a titre close to the WHO recommended standard.

Result of potency of vaccines.

A total of 3 vaccine batches collected before and after vaccination was titrated to determine their potency. Result is shown in

Table I.
Haemagglutination Inhibition test (HI) result on the different samples

Type of Sample	No of Sample	No of Positive (%)		Geometric mean Titre
Pre-vaccination Serum	396	8	2.0	1.0
Post-vaccination	120	44	36.7	1.08
Mothers Serum	396	80	20.2	1.1
Mothers Breast Milk	396	107	27.2	1.1

Table II.
Relationship Between the Immune Status of Mothers and Sero-conversion of their Children.

Type of Serum	Children			Immune Status of mothers					
	No Tested	No +ve	No -ve	Milk +ve	Milk -ve	Serum +ve	Serum -ve	Milk +ve Serum -ve	Milk -ve Serum +ve
Pre-vaccination	396	8	388	0	8	0	8	0	8
HI +ve serum	8	8	0	0	8	0	8	0	8
HI-ve serum	388	0	388	88	236	80	308	16	204
Post vaccination	120	44	76	32	88	20	100	12	108
HI +ve serum	44	44	0	16	28	4	40	0	24
HI -ve serum	76	0	76	16	60	16	60	12	64

Table III
Relationship between Seroconversion and Measles Antibody in the Sera and Breast Milk of Mothers

Seroconversion in children	Serum HI		Total	Breast Milk HI		Total
	+ve Mothers	-ve Mothers		+ve Mothers	-ve Mothers	
Yes	4	40	44	16	28	44
No	16	60	76	16	60	76
Total	20	100	120	32	88	120

Table IV.
Result of Potency Test of Vaccines Used for the Immunization

Serial No	Vaccine Batch	Expiry Date	Date Collected	Titre (TCID ₅₀)
1.	131780103	18-7-96	03-2-97	Log 10 ^{1.0}
2.	M5652	18-6-98	13-03-97	Log 10 ^{1.5}
3.	L5690	22-8-98	17-03-97	Log 10 ^{2.5}
4.	L5690	17-03-97	05-05-97	Log 10 ^{3.0}

DISCUSSION

The most effective way of controlling most viral diseases is by specific vaccination. Since the introduction of measles vaccine in 1962 (Meyers *et al.*, 1964), there has been the presence of MV antibody in the breast milk and serum of lactating and breast feeding mothers on seroconversion has not been well studied in the Nigerian environment. The finding in this study that the eight children (2%) who had MV antibodies in their blood are from mothers negative for MV antibodies in both their sera and breast milk demonstrated that MV antibody in the children was not maternally derived. While not disputing the fact the maternal antibodies must have been passed from positive mothers to their children, such antibodies must have waned at the age of vaccination. This observation supports the finding of Kimati (1977) who found that maternal antibodies wane before 9 months among African children. This suggests that maternal antibodies do not play an interfering role in measles

vaccinations practiced in Nigeria. Of the 44 post-vaccination positive children, only 4 were from serum positive and 16 from milk positive mothers. All these children were however negative for MV antibodies before vaccination. These further confirm that the presence of MV antibodies in the sera and breast milk if mothers does not interfere with measles vaccination. This is in agreement with the earlier findings of Ogra *et al.* 1977 and Adu *et al.* 1995. There was no statistically significant difference ($P > 0.05$) between the seroconversion rate among children from serum/milk positive mothers and their negative counterparts. Result of potency test on some of the vaccines used during the study showed vaccines of very low potency. The poor seroconversion rate observed in the study (36.7%) is likely to be due to the use of these vaccines rather than to the presence of MV antibodies in the breast milk and sera of mothers.

The presence of MV antibodies in previously unvaccinated mothers and in children of seronegative mothers is an indication of circulation of the wild indigenous MV in the environment. The

general observation with measles in Nigeria is that many of the affected children encounter the acute disease before the vaccination age. This is due to the

endemicity and circulation of the wild virus in Nigeria. Any attempt to delay measles vaccination beyond this age may further aggravate the situation

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