

Sero-Conversion to Measles IgG-Antibodies after Measles Vaccination among Infants, Iraq/ Baquba.

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Abstract

Objectives : This study was conducted for estimation of association between Parent's , infant's characteristics & mother's characteristics , with seroconversion rate after measles live virus vaccination among infants aged 9-12 months .

Subjects and Methods: A cross –sectional study, was conducted in a selected primary health care centers in Diyala Governorate. The study sample included 117 infants (56 males & 61 females), aged 9-12 months, selected at a random during their routine vaccination, for the period extending from the 1st of February/2007 to the 31st January/2008. Anti measles IgG antibodies (Abs), were detected in the serum by Enzyme Linked Immuno-Sorbent Assay, using "Dade Behring" standard test kit.

Results: The results revealed that the mean & geometric mean measles IgG Abs titers, before measles vaccination were negative (cut off= <330 mIU/ml). After measles vaccination, the mean changed to a positive value (cut off= >330mIU/ml- <1909mIU/ml), but geometric mean titer remained in a negative level. Significant association was limited to few paternal, maternal and child's characteristics with measles seroconversion.

Conclusion & recommendations: The study concluded that the main effect for seroconversion, was vaccination with measles vaccine rather than parental & infant characteristics, and recommended empowerment of strategy for health education for measles vaccination.

Key words: Inherited measles IgG antibodies, Sero-prevalence of measles IgG. Acquired sero-conversion to measles vaccine; Measles vaccine; Primary vaccine failure after measles vaccine.

Introduction

Measles Virus Vaccine, Live, Attenuated (Dried) is prepared in avian leucosis-free chick embryo fibroblast cultures from the Edmondston Strain of attenuated measles virus [1]. This vaccine is recommended routinely for all children at, or as soon as practicable after, their first birthday, and should be deferred in the presence of any acute illness, including febrile illness. Minor illnesses, such

as the common cold, are very prevalent in children and are not contraindications to immunization; however, febrile illness is a reason to defer immunization [2]. Maternal passive immunity is a type of naturally acquired passive immunity, and refers to [antibody](#)-mediated immunity conveyed to a [fetus](#) by its mother during pregnancy [3]. Maternal antibodies (MatAb) are passed through the [placenta](#) to the fetus by an [FcRn](#) receptor on placental cells. This occurs around the third month of [gestation](#) [4]. [Immunoglobulin G](#) is the only antibody [isotype](#) that can pass through the placenta [5]. Infants are generally protected by maternal antibodies until 5-9 months of age that is why most of developing countries vaccinate against measles at 9th month of age [6,7]. An approximately 85% of infants immunized at age 9-months develop immunity, and 95% of children immunized at 12-months and above will be protected [8].

This study was conducted for estimation of association between Paternal, infants & mother characteristics, and seroconversion rate after measles live virus vaccine for infants aged 9-12 months.

Subjects and Methods

A cross-sectional study, was conducted in a selected primary health care centers (PHCCs) in Baquba City (center of Diyala Governorate), for the period extending from the first of February 2007 to the 31st of January/ 2008. Random sample from infants aged 9-12 months, undergoing routine measles vaccination. The questionnaire used contained questions about the socio-demographic characteristics of the infants, parents, and the vaccine. Serum samples of a total 117 (56 males & 61 females) healthy infants, were collected and analyzed for estimation of specific measles IgG Abs titer, using Enzyme Linked Immunoassay Assay (ELISA) with a standard kit (Dade Behring), for the qualitative detection and quantitative determination of IgG antibodies to measles virus in human serum and plasma. Blood samples were collected from the child by a veine-puncture. An informed written consent was obtained from the parents for participation of their children in the present study. Special questionnaire was designed for collection of socio-demographic data about the parents & the infants included in this study. Data feeding followed by descriptive and analytic statistics, were carried out utilizing the "Statistical Package for Social Science" (SPSS) for windows software (SPSS-16.0). The tests used in the analysis were descriptive tests, including geometric mean titer (GMT), and analytic test.

Results

Serological profile of infants aged 9-12months before, versus after measles vaccination, presented in table (1).

Table (1): Serological profile of infants aged 9-12months before, versus after measles vaccination.

Serological variables		IgG titer mIU/ mL before vaccine	IgG titer mIU/ mL after vaccine
Number	Valid	117	111
	Missing	0	6
Mean		73.8342	517.1440
Std. Error of Mean		18.10047	54.29644
Geometric Mean		19.1518	256.9578
Median		12.6862	382.0811
Std. Deviation		195.78652	572.04853
Range		1382.51	4665.80
Minimum		3.21	6.66
Maximum		1385.72	4672.46
Percentiles	25	6.6606	95.6103
50		12.6862	382.0811
75		30.0735	643.2549

demonstrates the

Table (2)

association between measles virus vaccine seroconversion and parental characteristics for infants in group - 2. This table shows that the highest rate of seroconversion (76.4%), was found for fathers aged 30-39 years old, (76.1%) for relative parents, (100.0%) for retired fathers and (100.0%) for illiterate and father read & write. Significant statistical difference (p value =0.046) for father education, but no statistical difference with other father characters.

When seroconversion to measles vaccine studied in association with maternal characters, as the same **table** shows, we found that the highest rate for seroconversion (83.3%), was for mothers < 20 years, (78.9%), was for housewife mothers, (100.0%) for illiterate mothers and (100.0%) for

crowding index >5. Statistical significant difference was found with mother working status (p. value was 0.004).

Table (2): Association between Parents characteristics and seroconversionrate after measles live virus vaccine for infants aged 9-12 months.

*** The Pearson Chi-square statistic is significant at the 0.05 level**

Parental characteristics of infants aged 9-12 months	IgG titer 2 mIU/mL After				Chi square & P-value
	Negative (<330)		Positive (>=330)		
	No	%	No	%	
Father age 10—19	-	-	-	-	1.366;2;0.505
20—29	12	34.3%	23	65.7%	
30—39	13	23.6%	42	76.4%	
40--	5	23.8%	16	76.2%	
Father relation : Relative	16	23.9%	51	76.1%	0.848;1;0.357
Not relative	14	31.8%	30	68.2%	
Father work: Working	16	23.5%	52	76.5%	2.404;3;0.493
Unemployed	1	25.0%	3	75.0%	
With income	13	35.1%	24	64.9%	
Retired & Others	-	-	2	100.0%	
Father education : Illiterate	-	-	3	100.0%	11.310;5;0.046 *
Read & Write	-	-	4	100.0%	
Primary	3	18.8%	13	81.3%	
Secondary & intermediate	11	39.9%	43	81.3%	
Diploma after secondary & higher	16	47.1%	18	52.9%	
Mother age : < 20	1	16.7%	5	83.3%	2.186;3;0.535
20—29	18	30.5%	41	69.5%	
30 + >	11	26.2%	35	73.8%	
Mother work : Working	11	52.4%	10	47.6%	8.442;1;0.004*
House wife	19	21.1%	71	78.9%	
Mother education: Illiterate	-	-	5	100.0%	6.821;5;0.234

Read & Write	1	25.0%	3	75.0%	
Primary	8	22.9%	27	77.1%	
Secondary & intermediate	8	45.7%	29	79.3%	
Diploma after secondary & higher	13	43.3%	17	56.7%	

Regarding infants characteristics, in association with measles seroconversion, we found the highest rate of seroconversion were with following infants characteristics (75.9%) for female infants ,(73.6%) for exclusive breast feeding with (75.9%) for more than 6 month duration of breast feeding. in spite of small number of infants receive vitamin A with measles virus vaccination , we found (100.0%) seroconversion for them .(74.3%) seroconversion for infants normal in weight for their age, (84.6%) for infants of third birth order , (87.%) for infants with history of previous illness. All these data was summarized in **table (4)**, which showed that no significant difference with these characters.

Table (3): Association between infants' characteristics and seroconversion rate after measles live virus vaccination of infants aged 9-12 included in the study .

	IgG titer 2 mIU/mL After				
	Negative (<330)		Positive (=>330)		
	No	%	No	%	
Gender :Male	16	30.2%	37	69.8%	0.514;1;0.473
Female	14	24.1%	44	75.9%	
Type BF :Exclusive BF	19	26.4%	53	73.6%	0.042;1;0.837
Non-exclusive BF	11	28.2%	28	71.8%	
Duration of BF :6 months and below	11	34.4%	21	65.6%	1.231;1;0.267
More than 6 months	19	24.1%	60	75.9%	
Vitamin A supplementation :Yes	-	-	1	100.0%	0.374;1;0.541
No	30	27.3%	80	72.7%	

Weight status :Under weight for his age	2	50.0%	2	50.0%	1.697;2;0.428
Normal weight for his age	27	25.7%	78	74.3%	
Over weight for his age	1	50.0%	1	50.0%	
Child birth order :1 st	17	34.7%	32	65.3%	2.890;3;0.409
2 nd	7	21.9%	25	78.1%	
3 rd	2	15.4%	11	84.6%	
4 th &>	4	23.5%	13	76.5%	
History of skin rash	2	33.3%	4	66.7%	1.009;2;0.604

Mother variables in association with measles vaccine seroconversion, was demonstrated in **Table (5)**. in this table we found the highest seroconversion rate 100.% for children go to day nursing . When we studied mother history of measles vaccine, 71.6% of infants with positive seroconversion , their mothers had measles vaccine during their early childhood , and 76.7% of infants with positive seroconversion were , of mothers didn't had this vaccine before. Infants of mothers with history of previous illness ,had 76.7% and those with measles history were 66.7% .Regarding mothers use no treatment 72.7% seroconversion found in their infants .Nearly equal rate for normal or surgical delivery ,with higher rate for home delivery Significant difference was found with ,mother health education (p. value was 0.025).as the same table shows .

Table (4): Association between mother' characteristics and seroconversion rate after measles vaccine of infants aged 9-12 months , including in the study .

Mothers characteristics of infants aged 9-12 months.	IgG titer 2 mIU/mL After				Chi square & p-value
	Negative (<330)		Positive (=>330)		
	No	%	No	%	
Mother left infant at: home	28	28.0%	72	72.0%	1.176;2;0.555
Go to kinder garten	-	-	3	100.0%	
Left with relatives	2	25.0%	6	75.0%	

Mother had measles vaccines :Yes	23	28.4%	58	71.6%	0.284;1;0.594
No	7	23.3%	23	76.7%	
Mother had chronic diseases :Yes	-	-	1	100.0%	0.374;1;0.541
No	30	27.3%	80	72.7%	
Mother had measles infection :Yes	1	33.3%	2	66.7%	0.062;1;0.803
No	29	26.9%	79	73.1%	
Type of birth :Normal vaginal delivery	21	27.6%	55	72.4%	0.045;1;0.833
Cesarean section	9	25.7%	26	74.3%	
Place of birth: Home	5	20.0%	20	80.0%	0.808;2;0.668
Governmental hospital	18	29.0%	44	71.0%	
Private hospital & others	7	29.2%	17	70.8%	

* The Pearson Chi-square statistic is significant at the 0.05 level.

Discussion

In the present study, mean measles IgG Abs titer increased sharply from negative level before measles live vaccine, to a positive one after vaccination. GMT which was, of a negative value, increased but, remained in a negative level after measles vaccination. {Table(1)}. These changes in the serological profile of the study children, attributed to successful response and positive seroconversion after measles vaccination.

In regard to the association between paternal and maternal socio-demographic characteristics with seroconversion rate after measles live vaccine inoculation, the findings, showed that no significant association between most of these characteristics and measles seroconversion rate, but significant association ($p=0.046$) & ($p= 0.004$) was found with father education and mother work respectively as shown in table (2). Young age may assisted mothers (< 20 year) to kept their active immunity acquired by measles vaccination, and help to transfer it to her infant ,than older mothers, while old mothers (40 & >), may have been exposed to wild measles virus during her early childhood, and have a good chance to transferred her natural immunity to her infant, although such condition didn't reported in the present study [9]. Increased antibody titer after subclinical measles may be common

in vaccinated children in West Africa where the intensity of exposure is high [10,11]. As measles vaccination coverage increase, the circulation of wild measles will decrease, and vaccine- induced antibody is less likely to be boosted. Thus, new epidemics, albeit milder in form, may occur in vaccinated areas which should be recognized in campaigns to eradicate measles[12,13] . This is necessitate a base line information about measles IgG Abs after vaccination, in order to document the increase in Abs titers without further vaccination. In regard to association of infant's characteristics with seroconversion rate, female infants in this sample have presented higher rate of seroconversion than male infants. Exclusive breast feeding and duration more than 6 months for breast feeding, have presented higher rate of seroconversion, this is probably because of increased period of lactation [14] .In spite of importance of vitamin- A , for infants particularly with measles vaccine, few infant had vitamin- A supplementation before, this is because of shortage of vitamin A in the Diyala Directorate of Health (DoH), no vitamin-A supplementation for about 2 years ago . So children who had vitamin -A in this study, either had received vitamin -A in Baghdad, or they took it from private clinics. A randomized , double- blind placebo–controlled trial in an urban slum community in Delhi, Infants were randomly allocated to receive 30 mg vitamin- A or a placebo with the measles immunization. Abs to measles were measured by ELISA , serum samples obtained at before (baseline) and 12 week after immunization .Overall , the seroconversion rates did not differ between vitamin- A and placebo groups [15]. The same authors found that among malnourished infants, the geometric mean titer was significantly greater in vitamin-A group compared to the placebo groups.

Surprisingly infants whose mothers were un-vaccinated (had no measles vaccine before), and infants whose mothers had no measles infection before presented higher rate of measles seroconversion.No significant association was found between mother's characteristics and infants' seroconversion rate . Table (4).

Aaby et al, examined the results of immunization campaign with Schwarz standard measles vaccine carried out in Guinea –Bissau. Children were followed to death, migration or the age of 5 years .Children immunized at 4-8 months of age, of whom may were later re- immunized, had lower mortality between nine months and 5 years of age compared with children vaccinated at 9-11 months of age .The improved survival may be related to better protection against measles, no sign of socio-cultural difference between children immunized at different ages. Vaccination before 9 months of age is apparently safe and it may reduce childhood mortality compared with the currently recommended strategy of immunizing from nine months of age [8].

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