MEASLES ASSOCIATED DIARRHEA AND PNEUMONIA IN SOUTH INDIA

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ABSTRACT

A prospective study was undertaken from April 1988 to April 1989, to assess the diarrheal and respiratory complications of measles. Standard definitions were used for the cases, Measles Associated Diarrhea (MAD) and Measles Related Pneumonia (MRP): Children with diarrhea not related to measles were recruited for comparison for MAD. There was a total of 454 cases, measles 53 (11.7%), measles associated diarrhea (MAD) 113 (24.9%), measles related pneumonia (MRP) 186 (41.0%) and MAD with MRP 102 (22.5%). Children under 10 months and 24 months were 11% and 51.5%, respectively. Altogether 215/401 (53.6%) and 288/401 (71.8%) had diarrhea and pneumonia. Children who had been measles vaccinated were 8.4%. The overall case fatality was 4.2%. Case fatality in pneumonia was 1.1%. There was no statistically significant difference between the MAD and diarrhea in relation to religion, tiater supply, the method of excreta disposal, nutritional status and immunization status other than measles vaccination. There was significant difference in the nature of stools between the two groups, the stools of MAD were more of dysenteric in nature ($p< 0.005$). Vitamin A deficiency as evidenced by eye signs, was significantly more in MAD than in diarrhea ($p<0.001$). It is recommended that Vitamin-A be given to all children with measles, complication due to diarrhea be promptly and adequately treated and to consider measles vaccination earlier than 9 months.

Key **words:** *Measles; Measles associated diarrhea; Measles related pneumonia.*

In developing countries, it is estimated that 67 million cases of measles occur every year and it is responsible for 1.5 million deaths(l). Measles is frequently associated with complications like diarrhea and bronchopneumonia and continues to have high degree of morbidity and mortality. Measles related pneumonia (MRP) is as high as 30% which is estimated to be 7.5 % of pneumonia cases(2). Diarrhea is one of the frequent, and often severe complications of measles(l). It can occur both in the period of measles infection or following it. The incidence of diarrhea associated with measles (MAD) is 20%-72% in various studies(2) and it has been estimated that 8% of total diarrheal episodes in the first year are related to measles(3). The objective of the study was to assess the diarrheal and respiratory complications of measles and their related factors. This information will be useful for better management of these cases.

Material and Methods

All children hospitalized for measles, MAD, and MRP at the Institute of Child Health, Madras from April '88 to April '89 were prospectively recruited. Other complications were very few. Diagnosis of measles was based on clinical grounds(4). In brief, children with generalized maculopapular rash associated with cough, running nose and/or red eyes were diagnosed as measles.

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Diarrhea was defined as passing three or more liquid stools in 24 hours or stools with blood and/or mucus. MAD is one that has onset of diarrhea within 6 days pre-rash and upto 13 weeks post rash. Children with fever and cough along with fast breathing, respiratory rate > 50/minute in infants and > 40/minute in children, were considered to have pneumonia and diagnosed on clinical and/or radiological findings of pneumonia or bronchopneumonia. If there was homogenous opacity radiologically it was considered as pneumonia (consolidation) and if there was segmental lesions with peribrochial thickening it was taken as bronchopneumonia. MRP is one that has onset with or within 13 weeks of post-rash. The indications for hospitalization of measles patient were high fever and refusal of feeds (50%), febrile seizures (45%) and not retaining the feeds (5%). All these patients during hospital stay later turned out to be measles. All the cases were recruited and epidemiological and clinical data were recorded by a single research officer, a pediatrician. The stool smear was examined for evidence of parasites, bacteria, RBCs and leukocytes. To compare the characteristics of MAD, children with diarrhea not related to measles, matched for age(+lmo) and sex were recruited concurrently. Data were analyzed using SPSS PC+ software. Chi square test was used for statistical significance.

Results

The total number of cases recruited were 454. The number of children with measles, MAD and MRP were 53, 113 and 186, respectively. There were 102 children who had both MAD and MRP. The age distribution of cases is shown in *Table I.* Children under 24 months of age were 51.5%. The features related to measles and its complications are shown in *Table II.* Thirty two per cent of fathers and 44% mothers of children with measles and its complications were illiterate. As to the immunization status, 64% had BCG vaccination and 58.6% had OPV and DPT vaccination. Twenty three (8.4%) children had immunization with measles vaccine, 10/63 (15.9%) at 9-11 months, 6/121 (5 %) at 12-15 months, 2/220 (0.9 %) at > 15 months and in 5 the age could not be ascertained. The chances of vaccine failure are more if the immunization is done at earlier than 15 months particularly less than 12

TABLE I - *Age Distribution of Children with Measles and its Complications*

Age	Measles		MAD*		MRP**		MRP+MAD		Total	
(mo)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<9	3	(5.7)	12	(10.6)	19	(10.2)	16	(15.7)	50	(11.0)
9-11	6	(11.3)	28	(24.8)	12	(6.5)	17	(16.7)	63	(13.9)
12-23	9	(17.0)	29	(25.7)	54	(29.0)	29	(28.4)	121	(26.7)
>23	35	(66.0)	44	(38.9)	101	(54.3)	40	(39.2)	220	(48.4)
Total	53	(100.0)	113	(100.0)	186	(100.0)	102	(100.0)	454	(100.0)

*MAD - Measles associated diarrhea

**MRP - Measles related bronchopneumonia

TABLE II-*Features of Children with Measles and its Complications*

Feature	Measles 53		MAD* 113		MRP** 186		MRP+MAD 102		Total 454	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
BCG vaccinated	36	(67.9)	78	(70.5)	111	(60.0)	63	(61.8)	288	(64.0)
OPV & DPT (3 doses vaccinated[$]	35	(67.3)	64	(56.6)	111	(61.7)	56	(56.6)	266	(58;.6)
Measles vaccinated[$]	5	(10.2)	8	(07.1)	9	(05.1)	1	(01.0)	23	(08.4)
Vito A deficiency[@]	10	(18.9)	36	(31.9)	53	(29.6)	38	(37.3)	137	(30.2)
Nutritional status[#]										
Normal	12	(22.6)	11	(09.7)	13	(07.0)	12	(11.8)	48	(10.7)
Gr-I	20	(37.7)	21	(18.6)	44	(23.6)	23	(22.5)	108	(23.8)
Gr-II	11	(20.7)	34	(30.1)	68	(36.6)	25	(24.5)	138	(30.4)
Gr-III	9	(17.0)	30	(26.5)	44	(23.7)	27	(26.5)	110	(24.2)
Gr-IV	1	(01.9)	17	(15.1)	17	(09.1)	15	(14.7)	50	(11.0)

*MAD Measles associated diarrhea

**MRP Measles related pneumonia
$Cases with complete data only taken for analysis
@Eye signs
#IAP classification

months younger infants. The nutritional status was Grade II in 30.4% and Grade III in 24.2% as per IAP grading as could be expected. Vitamin A deficiency as evidenced by eye signs was seen in 30.2% cases and 3 children developed keratomalacia after measles.

Comparison of characteristics between MAD cases and diarrhea is shown in *Table III.* There was no statistically significant difference in the characteristics between the two groups in relation to source of water supply, the method of excreta disposal, immunization status other than measles vaccination and nutritional status. The recovery rate was 62 % and 95 % among MAD and diarrhea, respectively. Among MAD, the case fatality (CF) during hospital stay was 5 % but 33 % of cases were taken against medical advise in a critical condition and has to be assumed atleast in most cases as death. All deaths were associated with dehydration, hyponatremia and hypokalemia. There was no difference in the incidence of complications in patients who survived, being 6% (12/201) in MAD and 5.5% (9/165) in diarrhea. There was a significant difference in the nature of stools between the two groups, the stools were more of dysenteric type in MAD. There was no significant difference in the growth of pathogens between the two

TABLE III-*Comparison of Characteristics Between Measles Associated Diarrhea (MAD) and Diarrhea*

Characteristics	MAD (n=113)	Diarrhea (n=173)	p value
Water source			
Others	62	107	
Municipal tap	51	66	0.29
Excreta disposal			
Flush latrine	54	66	
Open air defecation	59	107	0.13
BCG vaccinated	78/111	120/172	0.96
OPV & DPT (3 doses)			
Immunized	64/173	122/173	0.79
Measles vaccinated	8/112	46/171	<0.001
Nutritional status			
Normal	11	19	0.85*
Gr-I	21	38	
Gr-II	34	45	
Gr-III	30	41	
Gr-IV	17	30	
Vito A deficiency**	36	23	<0.001
Stools			
Nature of stool			
Watery	61	149	<0.001
Mucus	36	10	
Mucus and blood	15	14	
WBCs (> 5/HPF)	38	48	0.35
RBCs	17	28	0.93
Parasites			
Giardia	3	14	0.17
Ascarial ova	6	7	
Amebic cyst	1	5	

*For all grades
**Eye changes

groups. Vitamin A deficiency, (eye signs) was significantly more in MAD. Among 401 cases who had complications, 288 (71.8%) had MRP. Radiological confirmation of MRP was positive in 260 (91.6%), 175/288 (61 %) bronchopneumonia and 85/288 (29.5%) pneumonia. Radiological evidence of primary complex was present in 11/397 (2.8%). Mantoux test was positive (> 10 mm) in 6/296 (2%). The case fatality of measles and related pneumonia and diarrhea complications was 4.2 % out of which 73 % (3.1 % of CF) was due to MAD and the rest was due to MRP. There was no statistically significant difference in the case fatality in relation to malnutrition except if it was associated with Grade IV malnutrition (normal 4.2%, Grade-12.8%, Grade-II 4.3%, Grade-Ill 3.6% and Grade IV 8%).

Discussion

In our study among children who had complications, 51.5%, were under 24 months and 11 % under 9 months of age, the youngest being 4 months old. Similar observations have been reported by others(5-8). Though it is an hospital study where generally children with severe problems are admitted, still it could be observed that complications of measles were more frequent among children with PEM, 65.5% in Grade. 11°and above, meaning PEM is a contributing factor for more complications. More number of measles children (59.3%) had diarrhea appearing 3 days pre-rash, similar to that of Thailand 64.2%(9). This is probably due to measles virus itself. The stools in MAD were more often dysenteric type (45%), mucus with or without blood, compared to that of diarrhea (14%). This is similar to that reported (50%) in North Eastern Thailand(2). This is probably due to the virus causing enanthem. Our findings confirm that there was no significant difference in the incidence of MAD and diarrhea among different grades of nutrition. Vitamin A deficiency as evidenced by eye signs is more frequent among measles patients. It could be a contributing factor for measles and/or complications(10). Vaccine failure was evident from the fact that a proportion of 8.4% patients had measles vaccination. In spite of measles being a strong immunosuppressive disease, 2 % of cases had positive Mantoux test and Prasad reported 5% (7).

As vitamin A deficiency is more frequent among patients with measles and its complications, vitamin A has to be administered to all children affected by measles, particularly, the malnourished. As a significant proportion (11%) had measles and/or its complications before 9 months of age, the need for earlier immunization around 6 months, especially, the malnourished, should be considered as suggested earlier(11).

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