A COMPARATIVE STUDY OF MEASLES COMPLICATIONS IN VACCINATED VERSUS NON-VACCINATED CHILDREN

Amir Mohammad, Mohammad Irshad, Behram Khan

Department of Pediatrics,
Lady Reading Hospital, Peshawar - Pakistan

ABSTRACT

Objective: *To find out and compare the frequency of measles complications among vaccinated and non-vaccinated children.*

Methodology: *This hospital based cross-sectional comparative study was conducted in Pediatrics Unit, PGMI/LRH, Peshawar All the patients were divided into two groups. In group 1, 100 vaccinated and in group 2, 100 non-vaccinated children were included. Both groups were compared for complications of measles.*

Results: *In group 1, majority (51%) cases were in age range of 1-3 years and in group 2, majority (59%) cases were also in age range of 1-3 years. In group 1, male were 55 (55%) and 45 (45%) were female. In group 2, male were 53 (53%) and 47 (47%) female. In group 1, complications include bronchopneumonia in 49 (49%), upper respiratory tract infection in 39 (39%), diarrhea in 32 (32%), oral ulcer in 31 (31%), dehydration in 15 (15%), otitis media in 10 (10%), malnutrition in 2 (2%), encephalitis in only 1 (1%) case. In group 2, bronchopneumonia in 51 (51%), diarrhea in 50 (50%), upper respiratory tract infection in 24 (24%), oral ulcer in 22 (22%), dehydration in 20 (20%), otitis media in 17 (17%), malnutrition in 12 (12%), and encephalitis in 11 (11%) patients.*

Conclusion: *Nearly 50% of children in both groups were less than 5 years of age. This indicates that many children of this age group are still unprotected. Overall difference in vaccinated and unvaccinated groups was statistically significant (P value = 0.001).*

Keywords: *Measles, vaccine, complications, URTI, diarrhea, bronchopneumonia.*

INTRODUCTION

Measles is more common in preschool age group. Transmission is through respiratory tract by droplet spray, mostly during the prodromal period (7 days before and 7 days after rash appearance). Measles continues to be a major health problem worldwide. It is endemic throughout the world and epidemics tend to occur mostly during spring season[1].

The global incidence of measles is 39.9 million cases, 777,000 deaths and 28 million disability adjusted life years[2]. In Pakistan the estimated measles deaths are 81,000 annually among children <5 years old[3].

Measles remains one of the leading causes of childhood mortality in the world, despite the availability of a safe, effective, relatively inexpensive vaccine. It is also one of the leading causes of childhood blindness in the developing world[4].

Approximately 30% of reported measles cases leave one or more complications which are more common among children <5 years and adults >20 years old[5,6].

In developed countries the measles attack rates are high among children < 12 months and more severe in children with vitamin A deficiency. Common complications of measles are pneumonia, diarrhea, dehydration, stomatitis, inability to feed, otitis media and acute encephalitis.[7] Pneumonia is the commonest complication of measles[8-10].

Measles vaccine is a live attenuated vaccine which produces mild or uncommunicable infections. Measles antibodies develop in about 95% of children vaccinated at 12 months of age and 98% of children vaccinated at 15 months of age[11]. Adequate immunization coverage results in considerable reduction of incidence, morbidity and mortality from measles[12].

In Pakistan measles vaccine is given as a single dose at the age of 9 months. The routine

vaccination coverage for measles in Pakistan remains below 60%[8]. The main reasons for failure to vaccinate are the lack of information and lack of motivation[13]. The risk of measles complications is higher in non-vaccinated cases and vaccination is protective against the occurrence of complications[14].

Keeping in view the outbreaks of measles, its associated complications and the current status of routine immunization in Pakistan, the present hospital based study was undertaken to compare the frequency of measles complications among vaccinated and non-vaccinated children admitted in Pediatrics department, Postgraduate Medical Institute, Lady Reading Hospital, Peshawar.

METHODOLOGY

This Hospital based cross sectional comparative study was conducted in Pediatrics department of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar for one year from 28/09/2004 to 27/09/2005. A total of 200 pediatrics patients of measles, 100 vaccinated and 100 non-vaccinated, of both sexes, with $\geq$ 9 months of age and $\leq$ 18 years of age and with clinical diagnosis of measles (having a typical rash of measles) were included in the study and patients without a proper history of vaccination were excluded from the study.

After admission, an informed consent was taken from the parent for detailed history, physical examination and relevant investigations. Complete blood count, chest x-rays, were carried out in all these patients. Lumber puncture was done only in patients with clinically diagnosis of encephalitis. As the diagnosis of measles is usually apparent from the characteristics clinical picture so there was no need for carrying out measles IgM antibodies. All these patients were divided into two groups. Group I having 100 patients with proper record of measles vaccination, and group II of 100 patients having no history of measles vaccination. All these patients were observed during their stay in hospital for complications of measles including pneumonia, diarrhea, dehydration, stomatitis, inability to feed, otitis media and acute encephalitis.

All the studied variables including demographic features, and complications were analyzed for comparative statistics. For age, duration of hospital stay, mean $\pm$ standard deviation was calculated. Male to female ratio was calculated for sex-wise distribution. The results were expressed/presented through frequency tables or graphs and charts. Chi square test was used to compare the complications of both groups of vaccinated and non-vaccinated children. P value was used for significance which was $\leq$ 0.05. All the study data was analyzed by using computer program SPSS version 12 for windows.

RESULTS

In this study a total of 200 patients with measles were admitted to Pediatrics ward. All the 200 patients were equally divided into two groups, 100 patients in each group. In Group 1 of 100 patients, vaccination was already done and in other

Table 1: Age incidence of the patients in two groups (n=200)

Variable	Group 1 Vaccinated Children (n=100)	Group 2 Non-Vaccinated Children (n=100)
Age Distribution of Patients Both Groups	**No. of Cases (%)**	**No. of Cases (%)**
9-11 months	9 (9%)	8 (8%)
1 - 3 years	51 (51%)	59 (59%)
4 - 6 years	21 (21%)	14 (14%)
7 - 9 years	14 (14%)	11 (11%)
10 - 12 years	4 (4%)	7 (7%)
13 - 15 years	1 (1%)	1 (1%)
Gender-wise Distribution of Patients of Both Groups		
Male	55 (27.5%)	53 (26.5%)
Female	45 (22.5%)	47 (23.5%)

Table 2: Complications Noted in Two Groups (n=200)

Complications	Group 1 Vaccinated Children (n=100)		Group 2 Non-Vaccinated Children (n=100)		P-Value
	No. of Cases	% Age	No. of Cases	% Age	
Bronchopneumonia:	49	49%	51	51%	0.777
Upper respiratory tract infection:	39	39%	24	24%	0.622
Diarrhea:	32	32%	50	50%	0.002
Oral ulcer:	31	31%	22	22%	0.149
Dehydration:	15	15%	20	20%	0.352
Otitis media:	10	10%	17	17%	0.147
Malnutrition:	02	02%	12	12%	0.006
No complications:	02	02%	02	02%	1.00
Encephalitis:	01	01%	11	11%	0.003

[Overall $X^2 = 25.216$, df = 8, P value = 0.001].

group 2 of 100 patients, vaccination was not done. In group 1, male were 55 (55%) and 45 (45%) were female with male to female ratio of 1.22:1. In group 2, there were 53 (53%) male and 47 (47%) female with male to female ratio of 1.12: 1.

In group 1 the age of the patients ranged from 10 months to 13 years with mean age of 3.60 $\pm$ S.D 3.01958 years, and in group 2, it also ranged from 10 months to 13 years with mean age of 3.57 $\pm$ S.D 3.29349 years. In group 1, majority of the patients, 51 (51%) were in the age range of 1-3 years and in group 2, majority 59 (59%) were also in the age range of 1-3 years. More details are summarized in Table 1.

The incidence of various complications encountered in two groups, is given in Table 2.

P-value calculated for each complication occurring in the 2 groups clearly revealing that the difference in vaccinated and unvaccinated group has been statistically significant. Overall $X^2 = 25.216$, df = 8, P value = 0.001 (Significant) (Table 2).

DISCUSSION

Measles is a highly contagious disease with significant morbidity and mortality. Major epidemics have continued to occur over the last decade in many regions of the world. These epidemics have occurred in non-vaccinated children as well as in adults. Low vaccination coverage rates, receipt of less than two doses of measles vaccine, waning immunity and vaccine failure have been the main factors in the resurgence of measles[15].

In this study of 200 patients with measles, 50% patients were vaccinated and 50% were unvaccinated. The incidence of measles in vaccinated children could be due to low efficacy of vaccine, waning of immunity with age, loss of vaccine potency due to improper cold chain maintenance, improper technique of administration, the vaccine serotype, inadequate vaccination schedule and lower than optimal vaccination coverage in the community. Similar results have also been reported by Tariq P, Younas M et al, and Aurangzeb B et al[8,10,16].

Measles vaccine is given as a single dose at 9 months of age both in Pakistan and India.[8] That's why we have excluded children with measles less than 9 months age.

The majority of our patients in both groups were between one to three years old which is similar to the various studies from abroad and within the country[4,10,16-19].

An important thing to note from these results is that nearly 50% of children in both groups (vaccinated and un-vaccinated) were less than 5 years of age. This indicates that many children of this age group are still unprotected. The possible reasons could be vaccine efficacy, interference of maternal antibodies with the vaccine and/or low vaccination coverage. Vaccination at the age of 12-15 months and a booster dose of measles vaccine at 4-6 year of age can bring the disease under control in the future.

Of the 200 children of both groups, males had a higher rate as compared to females. Male preponderance is also reported by studies of Tariq P, Younas M, Aurangzeb B et al, Mood BS et al[8,10,18,20]. In our study malnutrition rate was not very high and overall 30% of the children were malnourished in both groups. These findings are in

contrast to the other studies in which malnourished children experienced more severe measles infection at a greater frequency because of their altered immune response leading to widespread viral infections.[21] The previous studies from Pakistan had shown the incidence of severe malnourished with measles to be 41.33% [10] and 71%[16].

Bronchopneumonia is a serious common complication of measles, which occurs in majority (49% and 51%) of children in group 1 and group 2 respectively in our study. It is the most common complication in our study similar to that reported from various national and international studies[8,10,16,22]. Diarrhea was the second common complication having rate of 42% in our study whereas it was also reported in some studies with more or less frequencies[8,10,18,23-25]. Other complications include upper respiratory tract infection, oral ulcer, dehydration, otitis media and encephalitis as 31.5%, 26.5%, 17.5%, 11%, and 6% respectively. Few other studies have also reported more or less rate of similar these complications[8,10,16].

Measles is extremely contagious. Outbreaks in Europe remain common although fatalities are now rare; 12 deaths were reported in the European Union in 2005, 11 in Romania and one in Germany[26].

According to WHO's latest data, global deaths from measles have fallen from an estimated 873000 in 1999 to 345000 in 2005. In Africa, progress has been even greater, with deaths from measles falling by 75%, from an estimated 506000 to 126000[26-28].

In many developing nations, however, case fatality rates range from 1 to 5%, and can reach 30% in refugee settings and among malnourished children. Despite there being a safe and effective vaccine available for over four decades, measles is still a leading cause of death for young children[26].

In our study no mortality has been observed in any group although all patients were admitted with various complications of measles. These complications were treated with proper medication and in time measurers were taken to reduce these complications.

CONCLUSION

According to our results, it is concluded that the vaccination program in Pakistan as a single dose at 9 months of age, for production of immunity against measles, is insufficient and the children who are vaccinated with measles vaccine before their first birthday should be considered unvaccinated and should receive two doses of measles vaccine according to the standard schedule (at age of 15 months and a booster dose at 4-6 years of age).

Vaccination at the age of 12-15 months and a booster dose of measles vaccine at 4-6 year of age can bring the disease under control in the future.

The study reported that nearly 50% of children in both groups (vaccinated and un-vaccinated) were less than 5 years of age. This indicates that many children of this age group are still unprotected. The possible reasons could be vaccine efficacy, interference of maternal antibodies with the vaccine and/or low vaccination coverage. Further investigation is needed.

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Address for Correspondence:
Dr. Amir Muhammad
Senior Registrar,
Pediatrics B Unit
Lady Reading Hospital, Peshawar - Pakistan.