

FACTORS ASSOCIATED WITH A MEASLES OUTBREAK IN DISTRICT SKARDU, GILGIT-BALTISTAN, PAKISTAN

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Abstract

Background: In Pakistan, annually 20,000 children deaths reported due to measles. This outbreak was investigated with the objectives to identify the associated risk factors and recommend appropriate control measures to prevent future outbreaks.

Methods: A case was defined as any child presented with fever, generalized maculopapular rash with one of the following symptoms; cough, coryza or conjunctivitis during March-April 2011 in Skardu district. Two healthy age and sex matched controls were selected for each case from the same neighborhood. Information was collected on demographics, date of onset of illness and possible risk factors.

Results: A total of 29 suspected measles cases were identified. The overall attack rate was 19% and the most affected age group was 9-19 months (attack rates 16%). Measles vaccination was lower among children with measles (OR 4, CI 1.8-12.5, $p < 0.05$). The proportion of parents who consider measles as dangerous was significantly higher among the parents of cases (OR 3.6, CI 1.4-9.3, $P 0.006$). Better educated mothers were more likely to get their child vaccinated (OR 4, CI, 2.1-7.9, $p < 0.05$) and history of contact was found associated with the disease (OR 7.2, CI 3.5-12.7, $p 0.002$). Multivariate analysis yielded significant association of following risk factors; vaccination status (OR 3.8, CI 1.8-12.5, $p 0.005$) and history of contact (OR 3.2, CI 1.0-10.7, $p < 0.05$) with the disease.

Conclusion: Lower vaccination coverage and lack of awareness about measles among parents was the most probable cause of this outbreak. Improvement in routine vaccination coverage and health education on the safety of immunization was recommended.

Keywords: Immunization, measles, outbreaks, health education, vitamin a, gilgit-baltistan

Introduction

Measles is one of the leading causes of death among young children most and is most contagious diseases often occurs in explosive epidemics(1). Complication following measles infection like pneumonia, crop and diarrhea can lead to child mortality and malnutrition and also causes lifelong disabilities, including blindness, brain damage, and deafness(2)

In 2010, there were 1.39 million measles deaths globally - nearly 380 deaths every day or 15 deaths every hour. More than 95% of measles deaths occur in low-income countries with weak health infrastructures. Measles vaccination resulted in a 74% drop in measles deaths between 2000 and 2010 worldwide. In 2010, about 85% of the world's children received one dose of measles vaccine by their first birthday through routine health services - up from 72% in 2000 (3)

To eliminate measles, regional goal was to reduce the measles associated mortality by 90% by 2010 and to reduce the incidence of measles to 1 case per million. Although measles associated mortality has been reduced by 90% from 2000 to 2007 in the EMRO region, yet measles outbreaks continue to occur in Pakistan where the incidence of measles in 2007 was reported as 2 cases per thousand children less than 5 years of age(4)

In order to effectively control measles, routine measles vaccine coverage of >90% is required. Another key element of measles control is to ensure that every child receives at least two doses of measles vaccine, preferably after 1 year of age. Until 2007, a single dose of measles vaccine was being used in Pakistan's national immunization programme at 9 months of age, and the coverage of this single dose was only 60%(5). Therefore, up to 2 million children were left unvaccinated against measles every year. Realizing the potential occurrence of major measles outbreaks, a nationwide one year measles vaccine supplementary immunization activity (SIA) was conducted in 2007-2008 (9). This campaign was reported to be the largest measles vaccine campaign in history and reportedly more than 66 million children aged 9 months to 13 years (97% of the target population) were vaccinated(6). In 2004, an estimated 454,000 deaths were caused by measles; most of those concentrated in developing countries such as Pakistan(7). Pakistan Demography and Health Survey (2006- 2007) reports a country-wide coverage of 50-60% for measles immunization and Gilgit-Baltistan has measles vaccination coverage of 51%, and measles vaccination coverage is % among children under one year of age(8) Despite this extensive supplemental immunization campaign, measles outbreaks have continued to occur in Pakistan. It is therefore imperative to determine the effectiveness of this measles SIA by determining what proportion of children are still susceptible to the disease. This outbreak investigation was conducted with the objectives to identify the risk factors responsible for measles outbreak among children in Skardu district and formulate recommendations for control and future prevention.

Methodology

Outbreak investigation was conducted in district Skardu between March - April, 2011. A 'case' was defined as any child residing in Skardu district, presented with fever, maculopapular rash (non-vesicular) and one of the following sign/symptoms i.e., cough and coryza or conjunctivitis between March - April 2011 were included in the study. A structured questionnaire was used to collect information on demographics and risk factors suspected to be associated with measles outbreaks which includes child feeding, nutritional (including food restriction behavior), immunization status, mothers' educational level, socio-economic status and preventive measures taken during illness. Immunization histories were obtained from immunization cards and verbal statement of parents. Same number of healthy children who had no history of febrile rash and who lived in the same villages as those with measles cases were taken as controls, Children were matched by sex and age (± 6 months). The villages were visited soon after receiving measles alert from the health facility in charges or Lady Health Workers (LHWs), and the children were examined and their parents interviewed. Data were analyzed using EPI Info .7 (CDC Atlanta, Georgia, US), frequencies, univariate and multivariate Analysis done with Odds Ratios (ORs) calculated.

Results

Measles vaccination was 27.5% (n=8) among cases compared to 74 % (n=43) among controls. 48 % (n=14) parents of cases had vaccination cards available while 51 % (n=30) parents among controls. 59 % (n=16) parents of cases told that they usually visit health facility for

treatment and vaccination and 59 % (n=34) among controls (Fig-1).

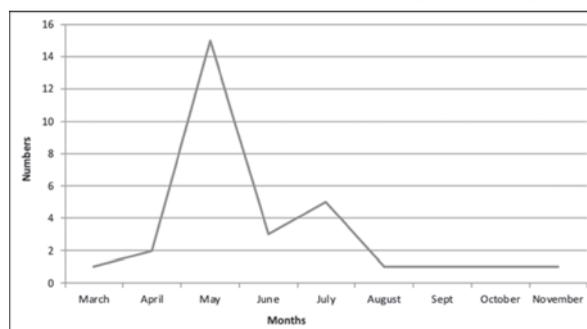


Figure 1. Epi curve showing the cases by the date of onset of illness in Skardu March-October 2011

Less than half (41 % (n=12)) children received vitamin A during last six months while 72 % (n=41) among controls. Frequency of exclusive breast feeding was 34 % (n=10) among cases and 59 % (n=34) among controls. The overall attack rate was 16%. The most affected age group was 9-19 months (attack rate 16%) followed by age group 20-30 months (AR 09%) (Table 1).

Table 1: Demographic, clinical, feeding and immunization characteristics of Children interviewed (both cases and controls)

Variables	Cases(n=29)	Controls(n=58)
Age Groups (months)		
9-19	16	32
20-30	9	18
31-40	3	6
41-50	1	2
Sex		
Male	17	34
Female	12	24
Exclusive Breast feeding(for six months)	10(34%)	34(59%)
Measles immunization status	8(27.5%)	43(74%)
Vaccination card available	14(48%)	30(51%)
Vitamin A received (in past six months)	12(41%)	41(72%)
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No. of household Members(more than five)	23(79%)	20(34%)
No. of rooms in house(more than two)	18(62%)	50(87%)
Source of drinking water(tap water)	6(20%)	30(51%)
Type of toilet facilities(with flash tank)	25(86%)	39(67%)
Place of child vaccination		
Health facility	16(59%)	34(59%)
Vaccinator(outreach)	13(44%)	24(41%)
Time taken to reach health facility(more than 30 min)	16(55%)	31(53%)
Mode of transport to health facility		
Vehicle	16(55%)	34(59%)
Walk	13(45%)	24(41%)
Type of health care provider during illness		
Doctor	5(18%)	7(12%)
Type of health care provider during illness		
Doctor	5(18%)	7(12%)
Nursing	20(69%)	45(78%)
Others	4(13%)	6(10%)
Diet restricted during illness	19(58%)	10(19%)
Isolated from other children during illness	4(16%)	20(33%)
Mother has knowledge about sign/symptoms of measles	16(55%)	41(71%)
Considers measles as dangerous	21(72%)	31(53%)
History of recent travel (within 28 days)	2(7%)	9(15%)
History of contact with measles case	7(24%)	6(10%)
Cooking fuel used in house		
Firewood	15(52%)	33(57%)
Kerosine/Gass	14(48%)	25(43%)

Parents who practice isolation of children during illness were 33 % (n=20). Only 55 % (n=16) cases mothers had knowledge about sign/symptoms of measles compared to 71 % (n=41) among controls. Measles Immunization coverage was significantly lower among the children who had measles (24%) compared to controls (67%) (OR. 4, C.I; 1.8-12.5, p<0.05). Mother's education was significantly associated with child vaccination status (OR 4, CI: 1.6-10.7 p<0.05). exclusive breast feeding for 6 months were less likely to contract measles (OR=.04, p-value <0.05.). The proportion of mothers who practiced food restriction behavior was higher among the group with measles (65%) in comparison to controls (42%) but the difference was not statistically significant (p-value= 0.50) (Table 2).

Table 2: Univariate analysis of variables found associated with measles (cases and controls)

Variables	Cases(n=29)	Controls (n=58)	Odds ratio (95% C.I)	P value
Exclusive Breast feeding	10(22%)	34(77%)	2.7 (1.1-6.8)	0.03
Measles immunization status	8(27%)	43(74%)	4 (1.8-12.5)	0.0003
Vitamin A received in past six months	12(41%)	42(72%)	3.7(1.5-9.4)	0.004
No. of household Members	23(79%)	20(34%)	7.2(2.6-20.7)	0.0008
Diet restriction during illness	19(58%)	10(19%)	4.9(2.1-13.0)	0.0006
Isolation from other children during illness	4(16%)	20(33%)	3.2(1.0-10.7)	0.04
Considers measles as dangerous	21(72%)	31(53%)	3.6(1.4-9.3)	0.006

Number of household members >5 (OR 7.2 CI, 3.5-12.7) showed strong association with the disease and having measles vaccination (OR 0.13 C.I.0.8-12.5) and Vitamin A supplementation (OR 0.26 CI, 0.10-0.68) found to have protective effect (Table 3).

Table 3: Multiple Logistic regressions of factors associated with Measles cases and controls

Variables	Cases (n=29)	Controls (n=58)	Odds ratio (95% C.I)	P value
Measles immunization status	8(27%)	43(74%)	OR 0.13 (0.8-12.5)	0.005
Vitamin A received in past six months	12(41%)	42(72%)	OR 0.26 (0.10-0.68)	0.005
No. of household Members More than five	23(79%)	20(34%)	OR 7.2 (3.5-12.7)	0.0002

Discussion

Measles is a leading disease in Pakistan like other developing countries resulting in increase in mortalities in children particularly below age 5. Here we for the first time in Skardu, Baltistan retrospectively evaluated vaccination status and awareness in parents and linked that we the current outbreak of Measles in 2005. Proportion of measles immunizations were significantly lower among the children who had measles compared to those who had not suggesting that poor immunization coverage plays a crucial role in measles outbreaks. Our findings are consistent with other studies in developing countries showing increase attack rate of Measles in children having low vaccination status than vaccinated children against Measles(9). Measles vaccination coverage is stagnating, or even decreasing, in some parts of Pakistan and this could be related to increasing inequities. Similarly low vaccination was reported in a study conducted in Lasbela, Sindh Pakistan(10). Even when overall vaccination coverage in a country is increasing, this may mask considerable and even increasing inequities in coverage, particularly among the most vulnerable households(11)

Cases were more likely to be from a larger family than controls as the average household was more than five among cases. Vaccination status of children was merely on the basis of the available vaccination card or verbal statement of the mothers. This approach could result in an underestimation of vaccine coverage to misclassification of vaccinated subjects who had lost their cards or forget about last vaccine, such misclassifications could lead to a lower estimation of vaccination coverage, some developed country authors have suggested that maternal recall is not a good enough Indicator of vaccination status compared with health facility records(12-13). However, a study from Italy found that parental recall alone was similar to other measures of vaccination status and concluded that "verbal recall should be accepted as reasonably reliable in the absence of cards(14), while in Australia

parental recall of measles vaccination coincided as well as vaccination cards with the presence of antibodies. Most mothers lacking knowledge of a vaccine preventable illness, considering vaccination worthwhile, and discussing vaccinations within the family as Mothers education was significantly associated with child vaccination status and vitamin A supplementation (OR 4, p<0.005). This finding is consistent with a study, conducted in Bangladesh, where parent's illiteracy and low-mother knowledge were reported for low or delayed immunization in children(15). Vitamin A supplementation has the protective role in reducing the morbidity and mortality during the measles outbreak. Vitamin-A deficiency is an established risk factor for children having Measles(16). Moreover, significantly low mortality due to Measles was found in hospitalized children who were receiving mega-doses of Vitamin-A(17-18)

Conclusion

Poor measles vaccination coverage, lack of awareness regarding measles and Lack of Vitamin A supplementation are the factors responsible for this outbreak, boosting the immunization status of pre-schoolchildren seem to be essential for controlling and preventing measles outbreaks. Implementation of measles Supplementary Immunization Activities every 3-5 years should be seriously considered. Health education on the dangers of measles and the safety of immunization should be provided to the mothers and fathers and this could increase vaccination coverage in children. More research is needed as to the reasons children are not vaccinated and given vitamin A and on the importance of food avoidance behavior in reducing vitamin A intake at such a vulnerable time.

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