

# Impact of Measles Supplementary Immunisation Activity on Health of Children in District Rawalpindi

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## Author's Contribution

<sup>1,2,3</sup> Conception of study  
<sup>1,2,3</sup> Experimentation/Study conduction  
<sup>1,2,3</sup> Analysis/Interpretation/Discussion  
<sup>1,2,3</sup> Manuscript Writing  
<sup>1,2,3</sup> Critical Review  
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## Abstract

**Objective:** To evaluate the impact of measles supplementary immunization activity campaign of 2018 on children health and control of measles in district Rawalpindi, Pakistan.

**Methods:** This prospective analytical case study was conducted at Allied teaching hospitals of Rawalpindi Medical University Rawalpindi, from January 2019 to March 2019. One month to 10 years old children presenting with measles and its complications, were hospitalized and subsequently enrolled in the study. The measles cases presented during the study period were compared with the measles cases reported to the Allied Hospitals of Rawalpindi medical university during the same time period in 2018. Data on the campaign implementation and measles surveillance was reviewed and analyzed by statistical methods using SPSS 22.

**Results:** 53 cases of measles were reported during the study period (Jan-Mar 2019) compared to 405 cases in the same time period of 2018. Rapid coverage surveys showed that 98.09% of children were vaccinated during the campaign. From Jan to March 2019, after the campaign, the number of measles cases was reduced by 86.91% compared with the same period of 2018 with significant decrease in mortality and morbidity.

**Conclusions:** A massive vaccination campaign approach for controlling measles in Rawalpindi with a vast migrant population has proved effective.

**Keywords:** Measles, Audit, SIA, complications, outcomes, vaccination, Children.

## Introduction

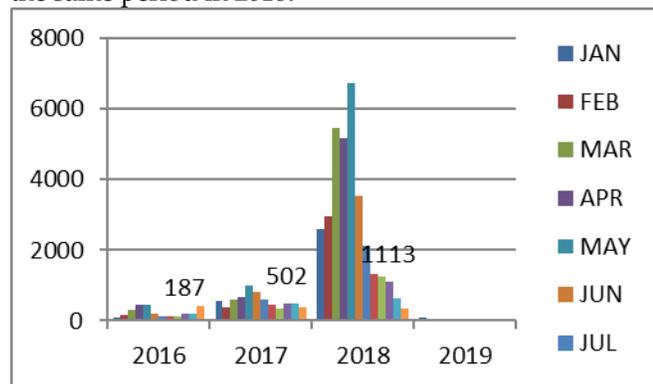
Measles is a highly contagious viral illness which results in high morbidity and mortality rates among affected population especially children under 5 years of age.<sup>1</sup> Before the introduction of measles vaccine in 1963, around 90% of children worldwide were infected with measles before their 15<sup>th</sup> birthday resulting in >90% deaths annually.<sup>2</sup> But the post vaccine era saw a dramatic reduction in measles associated morbidity and mortality by 74% and 85% respectively.<sup>3</sup> According to Global Measles & Rubella Strategic Plan 2012-2020, the target is to achieve measles and rubella

elimination in at least five WHO regions by 2020.<sup>4</sup> Strengthening of immunization systems is essential for achieving these elimination goals. Nationwide supplementary immunization activities (SIA) conducted to increase immunity levels in susceptible populations is one of the key strategies in achieving the target of measles elimination. Measles supplementary immunization activities (SIAs) are campaigns that supplement routine vaccination programs with a recommended additional dose for children of different ages, without taking in account their previous vaccination status.<sup>5</sup> They are conducted every 2-4 years and over a few weeks, mainly in

resource poor countries of South East Asia and Africa.<sup>6</sup> Despite the SIAs having high vaccination rates, it still needs to be documented and confirmed whether they reach the children who miss their routine measles vaccine dose. Determining the population covered by SIAs is vital to understanding their effectiveness, as well as to measure progress towards measles control. WHO is the lead technical agency responsible for coordination of immunization and surveillance activities, with an aim of achieving a world free from measles. World Health Organization (WHO) and United Nations Children's Fund (UNICEF) joined the Government of Pakistan in kick-starting a nationwide measles campaign to vaccinate more than 32 million children, one sixth of the population of Pakistan in October 2018.<sup>7</sup>

In district Rawalpindi, measles SIA was conducted in the month of October (15-27) 2018. During this 12 days drive, 890580 children aged six months to 7 years were vaccinated out of the tentative target of 852554. A total of 3200 health care officials took part in this activity comprising 663 outreach and 221 fixed teams that approached every house hold in the district to vaccinate the children.<sup>8</sup>

We analyzed the measles cases reporting to the Allied Hospitals of Rawalpindi Medical university from Jan 2019 to March 2019 and compared with the measles cases reported to these hospitals of Rawalpindi during the same period in 2018.



## Materials and Methods

This prospective analytical study was conducted at Allied teaching hospitals of Rawalpindi medical University Rawalpindi, from January 2019 to March 2019. One month to 10 years old children presenting with measles and its complications, were hospitalized and subsequently enrolled in the study. The measles cases presented during the study period were

compared with the measles cases reported to the Allied Hospitals of RMU Rawalpindi during the same period in 2018.

The data was entered and analyzed by using SPSS version 22 software. The descriptive analysis was done in terms of pre and post campaign cases in same time period of the years for age, gender, measles complications and outcomes. The mean with standard deviation, median, frequency and percentages were reported. The Pearson Chi-square test was used to test for differences between the cases, complications and outcomes in measles before and after the campaign. A p-value of less than 0.05 was considered significant. Only cases resident of district Rawalpindi were included in this study

## Result

Total of fifty three cases were reported from Jan to Mar 2019 from all teaching hospitals of district Rawalpindi while in the same time period of year 2018, 405 cases of suspected measles were reported. This sharp decline in the number of cases reported signifies an 86.7% decline in incident rate of measles in district Rawalpindi in the post SIA-2018 period.

Demographic profile	Pre- SIA (Jan- Mar) 2018 N = 405	Post SIA (Jan-Mar) 2019 N = 53
<b>Age in months</b>		
Mean (SD)	26.08 ± 29.4	10 ± 21.78
Median (IQR)	18	10
<b>Age in categories</b>		
Up to 12 m	216 (53%)	32 (60.5%)
1 - 5 years	145 (36%)	13 (24.5%)
5 - 10 years	44 (11%)	8 (15%)
<b>Gender</b>		
Male	228 (56.3%)	30 (56.6%)
Female	178 (43.7%)	23 (43.4%)

The mean age of measles suspects in 2018 was observed to be 26.08 months (SD 29.4), while it significantly declined post SIA to mean age of 10 months (SD 21.78). However no major change in the age groups was observed pre and post campaign. The male to female ratio remained almost same at 1:1.3

**Table 2: MEASLES CASES PRE AND POST SIA 2018**

Measles cases	2018				2019			
	Jan	Feb	Mar	Total	Jan	Feb	Mar	Total
BBH	26	97	117	240	05	06	19	30
HFH	24	53	73	150	08	07	06	21
DHQ	00	09	06	15	00	02	00	02
<b>TOTAL</b>	405				53			

Frequency distribution of complications related to Measles showed 87% decline in pneumonia, gastroenteritis and otitis media. However, the complication rates for these conditions remained almost the same. No case of measles encephalitis was reported in post SIA period with mortality declined from seven in pre measles SIA period to zero post measles SIA period.

**Table 2: Complications**

Complications	JAN-MAR 2018	JAN-MAR 2019
Pneumonia	187 (46.2%)	23 (43.4%)
Gastroenteritis	91 (22.5%)	11 (20.7%)
Otitis Media	54 (13.4%)	07 (13.2%)
Encephalitis	1	00
Expired	07 (1.8%)	00

### Discussion

Global vaccine action plan(GVAP) has targeted for measles to be eliminated from 5 WHO regions by 2020. For termination of endemic measles transmission, at least 95% coverage with 2 doses of measles containing vaccine is required in every district.<sup>9</sup> One of the key strategies for successful elimination of measles has been SIAs, including catch-up and follow-up vaccination programs.<sup>10</sup> During 2000–2017, coverage for 1<sup>st</sup> and 2<sup>nd</sup> dose of measles vaccine in Pakistan increased considerably, to 76% and 45%, respectively, but is still well below the WHO-recommended level of ≥95%. Moreover, measles epidemics occurred during 2012–2014 and 2016–2018, revealing coverage gaps from both routine immunization services and SIAs.<sup>11</sup>Our study looked at the cases of complicated measles admitted into the pediatric wards of all

tertiary care hospitals of Rawalpindi over a period of three months. Retrospective hospitals records were compared for the same period of last year before the commencement of supplemental measles immunization campaign. We noticed a significant reduction in the proportion of measles cases admitted in the periods after the introduction of the SIAs. Routine immunization coverage rate in Rawalpindi for measles immunization remained the same for the year 2018-19 during the study period.<sup>8</sup> Since no significant change was observed in the routine immunization coverage rate, total number of children admitted before and after SIA as well as other childhood health interventions including the strengthening of surveillance system, this remarkable reduction in the number of admitted measles cases observed in this study can only be due to the supplemental measles immunization campaign. This finding is in keeping with similar observations across the world.<sup>11,12,13</sup>

In this study, a substantial reduction in the number of measles cases was found following the implementation of SIA in the District. There was a dramatic reduction in the incidence of measles in Rawalpindi. SIAs have been shown to play a key role in eliminating measles in the Americas<sup>14</sup>, and in reducing the incidence of disease in Eastern Europe.<sup>15</sup> A study of 15 province-wide SIAs in China during 2004–2008 found that there was on average an 88.1% decrease in measles incidence the year after an SIA compared to the average rate in the preceding 5 years. Measles cases also significantly declined (89% average reduction) following SIAs in 12 eastern and western African countries in 2000-2003<sup>16</sup>. In Ethiopia, reported measles cases declined 93% from after a large national catch-up campaign in 2003-2004. In southern Africa, a vaccination strategy including routine immunization, mass catch-up SIAs, and regular follow-up SIAs in six countries reduced reported measles incidence from 60,000 cases in 1996 to 117 cases in 2000.<sup>16</sup>

Especially for countries and regions with less capacity to reliably deliver vaccines through routine immunization services, SIAs appear to be a cost-effective method to distribute the second dose of measles vaccine<sup>17</sup>.

No studies have been conducted to evaluate the sensitivity and health impact of measles surveillance and completion of measles reporting in Rawalpindi is unknown. The consistency of the case reporting over the years, however, makes these RMU hospitals a valid source to examine the trend of measles. No data on sero-conversion rates following SIAs was available, which greatly limited our ability to assess the effect of

SIA on the dynamics of infection and immunity. Perhaps the greatest limitation of the current study was that it was an observational study. Nevertheless, it is ethically unacceptable to conduct an experimental study in public health to assess the effectiveness of an intervention with an already well-established benefit. It is also beyond the scope of the current study to evaluate the cost-effectiveness of SIAs. With these limitations in mind, we believe, to the best of our knowledge, that the current study is the first to document an immunization campaign conducted in district Rawalpindi to measure the outcome of SIA in terms of reduction in childhood morbidity and mortality.

## Conclusion

The measles SIA-2018 has proved effective for district Rawalpindi to control the measles outbreak and also to limit the mortality and morbidity associated with measles in children of Rawalpindi.

To achieve measles elimination, serious efforts are needed to increase the coverage of 1<sup>st</sup> and 2<sup>nd</sup> dose of measles vaccine, development of strategies to identify and reach the population not accessing immunization services especially poor communities and rural areas, and increase sensitivity of case-based measles surveillance in all districts. One such effort can be conduction of regular high quality SIAs based on WHO SIA guidelines, to ensure  $\geq 95\%$  2 dose measles vaccine coverage.

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