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Short Communication

Assessment of Vaccination Coverage Among Measles Cases in Children Aged 10 Months to 5 Years at Civil Hospital Karachi

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Abstract

Background: Measles remains a global health concern, particularly in developing countries, and despite improvements in global vaccination efforts, certain regions, including Pakistan, continue to report cases. This study aims to assess the frequency of vaccinated children among measles cases, shedding light on potential vaccine failure factors.

Methodology: A comprehensive analysis was conducted on 139 children diagnosed with measles in an emergency department. The vaccination status of each child was determined through a thorough examination of their vaccination history and available vaccination cards. In cases where records were unavailable, relevant data were meticulously recorded on a standardized Performa.

Results: Among the 139 children studied, 30.94% were found to have received vaccinations, and only 35.9% had completed the recommended two-dose schedule. The average age for receiving the first and second doses was 9.6±1.05 months and 15.67±0.82 months, respectively.

Conclusion: The findings underscore that a substantial proportion of measles cases occurred in unvaccinated or partially vaccinated children, emphasizing the critical role of complete immunization. However, despite vaccination efforts, many children still contracted the disease, indicating the necessity for further in-depth research in this domain.

Keywords

Measles, Morbidity, Mortality, Infection, Vaccination.

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Introduction

Measles, an infectious disease first identified in Boston in 1675[1], remains a significant cause of morbidity and mortality among children worldwide, particularly in non-industrialized nations, exhibiting an almost 100% infectivity rate. The causative agent, the Morbili virus, belongs to the Paramyxoviridae family and is primarily transmitted through large respiratory droplets or airborne routes as aerosolized droplet nuclei. Patients with measles typically manifest high-grade fever, cough, conjunctivitis, coryza, malaise, and a maculopapular rash across the body.

In an effort to mitigate the impact of infectious diseases, the World Health Organization (WHO) initiated immunization against vaccine-preventable diseases, including measles, in children in 1974[2]. This program was introduced in Pakistan in 1978, with a single measles vaccine dose scheduled at nine months of age. Despite this intervention, the measles frequency persisted, leading to the incorporation of a second booster vaccine into Pakistan's extended immunization program (EPI) at 15 months of age in 2009[2-4]. Globally, before vaccination efforts, an estimated 2.6 million deaths occurred annually due to measles, decreasing to 122,000 deaths in 2012[5].

However, measles outbreaks were observed in locations such as Peshawar, Pakistan[6], despite vaccination initiatives. Studies reported high incidences of measles among vaccinated children, raising concerns about the efficacy of the vaccination[7]. Notably, a survey in Kharian, Punjab, found that out of 100 measles cases, 36% had received the measles vaccine[8]. In this context, our clinical observations have identified cases where patients previously received measles vaccination, prompting an investigation into the effectiveness of vaccination against this potentially fatal disease. Continuous surveillance of vaccine efficacy is crucial, as recommended by the World Health Organization (WHO)[9]. This study aims to determine the frequency of vaccinated children among measles cases visiting the pediatrics department of Dr. Ruth KM Pfau Civil Hospital Karachi.

Methodology

Study Design:

This cross-sectional study was designed to investigate the prevalence of vaccinated children among measles cases from July to December 2022.

Setting:

The study was conducted at the Pediatrics Department of Dr. Ruth KM Pfau Civil Hospital Karachi, a tertiary care hospital serving a diverse population in Karachi, Pakistan.

Participants:

A total of 139 children diagnosed with measles, aged between 10 months to 5 years, were included in the study. Participants were selected from those presenting at the outpatient department (OPD) or emergency department with measles.

Variables:

In this study, measles diagnosis served as the dependent variable, while vaccination status, age, and gender were examined as independent variables. Measles diagnosis was confirmed clinically, while vaccination status was determined from records or parental history. Age, ranging from 10 months to 5 years, and gender were also considered. These variables were analyzed to understand their potential associations with measles diagnosis.

Data Sources/Measurement:

Data were collected through medical records and parental history to ascertain vaccination status. The diagnosis of measles was confirmed clinically by healthcare professionals at the hospital. Demographic variables such as age and gender were recorded for each participant.

Bias:

Efforts were made to minimize bias by including children with accessible vaccination status and obtaining informed consent from parents. Exclusion criteria were established to exclude confounding factors such as unknown vaccination status and immunocompromised conditions.

Study Size:

The sample size was determined using the Open Epi calculator, considering a 36% prevalence of vaccinated children among measles cases, with an 8% absolute precision and a 95% confidence interval.

Quantitative Variables:

Continuous variables such as age were described using mean and standard deviation. Qualitative variables such as vaccination status and gender were presented as frequencies and percentages.

Statistical Methods:

Descriptive statistics were employed to summarize the characteristics of the study population. The chi-square test was utilized to assess differences between demographic variables (age, gender) and outcome variables (measles in vaccinated children). Logistic regression analysis was performed to explore associations in different age groups. Statistical significance was considered at $P < 0.05$. Data were analyzed using SPSS statistical package version 23.0.

Results

Over the six-month study duration, 139 children diagnosed with measles who presented at the outpatient or emergency departments were included. The mean age of the study population was 38.57±14.05 months (Table 1). Among the participants, 72 (51.8%) were male, and 67 (48.2%) were female. Of the total, 20 (27.8%) males and 23 (34.3%) females were vaccinated. The average age at doses one and two demonstrated insignificant p-values of 0.543 and 0.892, respectively.

Table 1: Demographic characteristics and vaccination status of children with measles (N=139).

Variables		N(%)
Age (months); Mean ± SD		38.57±14.05
Gender	Male	72(51.8)
	Female	67(48.2)
Frequency of vaccinated children among Measles cases	Dose 1	43(30.94)
	Dose 2	15(34.9)
Average age of children at each vaccination (months); Mean ± SD	Dose 1	9.6±1.05
	Dose 2	15.67±0.82

Discussion

Measles is a highly contagious infectious disease of the respiratory system caused by the Morbillivirus. It remains a significant cause of childhood morbidity and mortality worldwide, particularly in developing countries. Introducing the live attenuated measles vaccine in the US and Europe has significantly reduced measles infections[10]. However, the disease continues to impact developing countries due to insufficient vaccine coverage and improper vaccine handling[11].

Historically, immunization against vaccine-preventable diseases (VPDs) in children was initiated by the WHO in 1974, and in Pakistan, it commenced in 1978[12]. Generally, vaccine coverage against VPDs in Pakistan ranged between 56% and 88%, significantly varying among various provinces[13].

In recent times, a surge in the number of measles outbreaks with high morbidity and mortality has been observed in various regions of Pakistan. The key factors contributing to these outbreaks include vaccination failure due to several reasons, such as low vaccination coverage, malnutrition, vitamin-A deficiencies, inadequate vaccination facilities in remote and rural areas, mishandling of vaccines, and a lack of immunization awareness among parents, particularly in areas with lower levels of education[14].

Shah et al. have reported that seroconversion following measles vaccination in developing countries is lower, standing at 75%, attributed to certain factors[15]. Nayyar et al., after excluding other causes of the rash, found a significant number of vaccinated children contracting measles[8]. Pandey et al. reported that out of 323 children screened, only 193 (59.8%) were vaccinated against Measles, Mumps, and Rubella (MMR), while 130 children were unvaccinated[16]. Of the total 323 samples, 148 (45.8%) tested positive for MeV (measles virus) infections, with 70 (47.3%) cases from vaccinated children and 78 (52.7%) from unvaccinated children. Phadke and colleagues' study also indicated that 41.8% of reported measles cases were from vaccinated children[17].

It is crucial to note that despite the importance of immunization in curtailing the spread of measles, studies have demonstrated that immunized individuals could be at risk due to vaccine failure. A specific review highlights that when vaccine failure occurs in recently immunized individuals within a community, an outbreak or introduction of measles in that community can lead to increased transmission and propagation of the virus, resulting in measles infections among susceptible individuals[18].

We encountered cases of measles in individuals who did not have other illnesses and were not severely malnourished, prompting us to conduct this study. In our investigation, out of 43 children vaccinated against measles, only 34.9% (15/43) had received a second dose of the measles vaccine. The average age of children who received the second dose was 15.67±0.82.

Regarding measles antibody levels, our study revealed that two doses of immunization, administered after one year of age, provide superior protection compared to a single dose, resulting in 97% coverage instead of 93%. A report on a measles outbreak in Lyon, France, from 2010 to 2011 emphasized the importance of receiving two doses of measles-containing vaccination[18]. This primary measure prevented the outbreak and contributed to the elimination of measles.

Stratification of age and gender showed no statistical significance in the frequency of vaccinated children among measles cases in different age groups and between genders. The incidence of measles infection in children decreased with age. Consistent with other studies, it was found that measles predominantly affects children under five years old. Due to the endemic nature of measles, children under the age of 5 are at a higher risk of exposure, while children over 5 years old likely have acquired lifelong immunity[19].

Limitation

It is essential to consider the study's limitations when interpreting the results. The first constraint lies in the study's sample size. The second limitation is associated with time constraints, and the third pertains to restricted accessibility since only individuals visiting Civil Hospital Karachi are included in our study. Enrolling the maximum number of patients is not feasible due to timing constraints.

Conclusion

In conclusion, our study found that most children infected with measles were either unvaccinated or only partially vaccinated, underscoring the critical importance of complete immunization in children. However, a substantial number of children still contracted measles despite being vaccinated against the disease, highlighting the need for additional studies to ascertain the cause of this potential vaccine failure. Emphasis should be placed on improving vaccination coverage against measles and recognizing the significance of administering both doses.

Conflicts of Interest

The authors declare no conflicts of interest.

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