

Evaluation of Pediatric Measles Cases Hospitalized in 2019

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What is already known on this topic?

- The European measles epidemic that started in 2018 continued and ended in 2019 in our country.
- Measles is an infectious disease that usually has a benign course but may also have complications.
- Studies on measles prophylaxis are of great importance in terms of infection control.

What this study adds on this topic?

- We could not find any literature about the demographic data and follow-up processes of children affected by the 2018-2019 measles epidemic in our country. We thought we could contribute to the literature on the general course of the cases in our country. We found that more emphasis should be placed on studies regarding postexposure prophylaxis against measles.

ABSTRACT

Objective: Outbreaks of measles were seen throughout the world in 2018-2019, including Turkey. Measles outbreak in Turkey may be attributed to cases imported from European countries and increased rate of unvaccinated children due to the massive influx of refugees from neighboring countries.

Materials and Methods: The demographic details and clinical and laboratory findings of the patients hospitalized with diagnosis of measles in the Pediatric Clinic of Adana City Hospital in 2019 were evaluated retrospectively.

Results: Among the 38 children enrolled, 18 were female (47.4%), the median age was 12 months (3-199 months), 20 were Turkish citizens (52.6%), and 18 (47.4%) were refugees. Twenty-seven children had vaccination data available, with 25 unvaccinated for measles. None of the families declared vaccine hesitancy. Of the unvaccinated subgroup ($n = 25$), 19 (76%) were younger than 12 months. The mean duration of hospitalization was 5.13 ± 2.67 days, no mortalities occurred. Measles was encountered in the social circle of 10 cases, although only 2 families applied for prophylaxis.

Conclusions: Among the children with measles, 10 of the cases were reported to be within the household of previously diagnosed measles cases, but only 2 of them were given prophylaxis. Awareness regarding use of post-exposure prophylaxis against measles should be increased. Efforts to keep the measles vaccination coverage rate above optimal levels should be encouraged in regions with concentration of irregular refugees.

Keywords: Measles, child, Turkey, prophylaxis

INTRODUCTION

Measles morbillivirus is a single-stranded, lipid-enveloped, non-segmented RNA virus of the genus *Morbillivirus* within the family *Paramyxoviridae*.¹ It is the cause of measles. Humans are the only host of the measles virus.² The transmission of the disease occurs via virus-loaded droplets through the respiratory system or conjunctivae. The virus can survive in the air for approximately 1 hour after the host exits the environment. Patients are considered to be contagious from 3 days prior to and upto 4-6 days after appearance of the rash.² An individual with no immunity to the virus might suffer measles with a 90% probability in the event of contact.

The incubation period for measles is 10-14 days, with fever, cough, symptoms similar to common cold, conjunctivitis, and pathognomonic Koplik's spots seen in the prodromal period. A maculopapular rash develops, starting on the face, and characterized by cephalocaudal dissemination.¹ The rash and cough may persist for 7 and 10 days, respectively, in uncomplicated cases.

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Among the primary complications of the disease are otitis media, bronchopneumonia, laryngotracheobronchitis, and diarrhea. The incidence of acute encephalitis with a clinical course of severe brain damage is 1/1000 cases.¹ Subacute sclerosing panencephalitis (SSPE) is a clinical picture involving severe central nervous system degeneration, and seen in around 4–11/100 000 children with measles, and may manifest 7–11 years after infection with the wild type virus. The mortality rate associated with the disease is increased in children aged less than 5 years, and in cases with immune suppression and severe malnutrition.¹

Measles was a leading cause of morbidity and mortality in children worldwide until the 1960s, being responsible for more than 2 million deaths every year.³ Vaccinations against measles started in 1963, resulting in a 99% decrease in incidence. Measles vaccinations started in 1970 in Turkey, and a second dose of measles vaccine was added to the routine vaccination program in 1998. Measles immunity of 95% and above in the population is known to be protective in terms of epidemiology.⁴

Recently, an unfortunately increasing rate of vaccine hesitation has contributed to the decrease in vaccination rates in Europe. The decline in measles vaccination to 45% due to the anti-vaccination movement was held responsible for the measles outbreak in Ukraine in 2018.⁵ Vaccine hesitancy may also be seen in developing countries including Turkey. The number of vaccine-hesitant families in Turkey was reported to be 23 000 in 2017, although an increasing trend is noted.⁶ The World Health Organization (WHO) declared vaccination hesitancy to be one of the 10 main threats to human health globally in 2019.⁷

Since the turn of the century, the number of measles cases reached peak levels in 2018–2019 in the European continent. The increased number of measles cases in Turkey may mostly have been imported from the European continent. Based on epidemiological studies, maintaining a vaccination rate of around 95% and above should be warranted for the control of local outbreaks. Given the massive number of refugees entering Turkey due to recent conflicts within the neighboring countries, the local vaccination rates in cities of Turkey close to the south-east border may be lower than optimal levels. The early diagnosis of cases of measles, vaccinating, or providing prophylaxis to at-risk individuals is required in order to prevent the development of an outbreak.

Measles continues to be an important health problem both in developed and developing countries. Vaccine hesitancy may be held responsible for the increased rates of measles in the developed countries, while war and migrations could be responsible in developing countries. We aimed to evaluate the demographic data and clinical course of the measles cases hospitalized in a third degree hospital in 2019.

METHODS

Study Plan

The study is designated as a retrospective descriptive case series study. The study was held at the Pediatric Clinic of the Adana City Hospital between January 1, 2019 and December 31, 2019. Thirty-eight cases in the pediatric age group who were

hospitalized with measles were enrolled. The diagnosis of measles virus infection was made based on a positive serologic test for serum measles IgM antibody. Data of the patients were obtained from the patient files. The demographic data of the patients, including age, gender and nationality, date of admission, and medical data such as requirement of intensive care, type of complication, leukocyte count, absolute neutrophil count, transaminase levels, and creatine kinase levels were evaluated.

Statistical Analysis

The statistical analysis was performed using the Statistical Package for Social Sciences Version 20 (IBM Corp., Armonk, NY, USA) software package. The Kolmogorov–Smirnov test was used to evaluate whether the numeric variables of the study group met the assumption of normal distribution. Descriptive statistics of the numerical parametric variables were calculated as mean \pm standard deviation; non-parametric variables were calculated in the median (minimum–maximum); and categorical variables were expressed as a percentage (%). A chi-square test was used for the comparison of categorical variables between groups. A *P* value of $< .05$ was considered statistically significant.

RESULTS

Demographic Data

Among the 38 children evaluated, 18 were female (47.4%) and 20 were male (52.6%). The mean age was 24.53 ± 34.2 months (median, 12 months; range, 3–199 months). Among the cases, 22 (57.9%) were aged 12 months or younger, 20 were Turkish citizens (52.6%), and 18 (47.4%) were refugees. When the date of admission was evaluated in terms of seasons, it was found that 26 (68.4%) children admitted in the spring, 10 (26.3%) in the summer, and 2 (5.3%) in the winter. The demographic data are summarized in Table 1.

Vaccination Status

Of the 27 children with available vaccination records, 25 were unvaccinated and 2 were vaccinated. One of the children who had measles despite having been vaccinated had a history of malnutrition and long-term hospitalization. Of the

Characteristics	n (%)
Age	
<1 year old	22 (57.9)
>1 year old	16 (42.1)
Sex	
Female	18 (47.4)
Male	20 (52.6)
Nationality	
T.R.	20 (52.6)
Non-T.R. (Refugees)	18 (47.4)
Season of admission	
Spring	26 (68.4)
Summer	10 (26.3)
Winter	2 (5.3)
Autumn	0

unvaccinated children, according to available vaccination records ($n = 25$), 19 (76%) were younger than 12 months and 6 (28%) were older than 12 months. One of those 6 cases was of Turkish nationality (24 months old at presentation), whose parents declared that vaccination had been forgotten in the process of the family moving house, while the other 5 were refugees between the ages of 13 and 64 months at presentation. No adherence to the anti-vaccination movement was recorded in the families of any of the 6 cases.

When the history of the patients was evaluated, it was found that measles was encountered in the household of 10 children, 6 of whom were older than 1 year, and 4 were younger than 1 year. Measles symptoms developed in spite of prophylaxis in 2 of the cases of children who were older than 1 year, who had been vaccinated. The time period between exposure and vaccination was more than 72 hours in both cases.

Laboratory Findings

The white blood cell count was $8.29 \pm 3.96 \times 10^3/\text{mm}^3$; absolute neutrophil count $3.44 \pm 2.02 \times 10^3/\text{mm}^3$; mean aspartate aminotransferase (AST) was 61.2 ± 28.5 U/L; alanine aminotransferase (ALT) was 27.5 ± 20.4 U/L; and creatine kinase was 135.38 ± 103.4 U/L (median: 94, min: 47, max: 356). The absolute neutrophil count was less than $1.5 \times 10^3/\text{mm}^3$ (neutropenia) in 8 cases (21.06%), while no patients were found to have severe neutropenia. As for measles complications, 12 children (31.6%) had lower respiratory tract infection, 5 (13.1%) had gastroenteritis, 1 (2.6%) had mild hepatitis, and 20 (52.6%) were hospitalized due to feeding intolerance. All cases were given vitamin A. Mean duration of hospitalization was 5.13 ± 2.67 days (median: 5, range: 3–18), while no admission to intensive care was required and no mortality developed. A clinical picture of the disease was not seen in any of the healthcare personnel providing care to these patients with measles.

DISCUSSION

The total number of cases of measles throughout the world (524 718) is estimated to have more than doubled in 2019 when compared to 2018.^{8,9} Although the African continent ranks the highest in total number, the number of cases in Europe has also shown a marked increase. In Turkey, 9 cases were recorded in 2016, rising to 84 in 2017 and to 716 in 2018.¹⁰ Measles outbreaks were seen mainly in Ukraine, Georgia, Russia, and Turkey on the European continent in 2019. In 2019, the number of cases of measles was 2666 in Turkey, more than triple the number for the previous year.^{10,11}

In the present study, in 1 year (2019), 38 children with measles were hospitalized and treated, indicating that measles is still a significant healthcare problem in the region. Among the cases of measles in Turkey, 20.2% were of foreign origin in 2014, while this figure reached 42.5% in 2018.¹² The ratio of cases of foreign nationality to all cases of measles in the present study was 47.4%, and is compatible with the 2018 data for Turkey.

No data on gender differences has been encountered in literature on measles, and the disease was seen at similar rates in both genders in the present study. The disease is generally seen in children aged less than 1 year, and compatible with

the findings in literature, most of the cases (52.6%) in the present study were younger than 1 year. When the season of admission was evaluated in the present study, it was found that admissions were most common in the spring (68.42%) and summer (26.32%). It is known that the peak time of year for the disease is the spring months in moderate climates.¹

The World Health Organization is seeking to eradicate measles in its member countries.¹³ The milestones toward this goal include increasing the national and regional comprehensiveness of the first vaccination dose involving measles (MCV1) by more than 90 and 80%, respectively, bringing about a reduction in the annual measles incidence rate to less than 5 cases per million, maintaining this rate, and ultimately decreasing the estimated mortality rate for measles by more than 95% when compared to the estimations made for the year 2000. Measles vaccination coverage is 96% in Turkey, which is above the level recommended by WHO.¹¹ In our study, 6 of the patients were older than 12 months and had no known contraindication for vaccination but were not vaccinated for measles. Of these, 5 were irregular migrants and none of the families declared vaccine hesitancy. Vaccination coverage is high in the general population in our country, although efforts to keep local vaccination coverage at 80% and above should be increased in the regions where refugees and irregular migrants are concentrated.

Among the laboratory data, neutropenia was seen in 8 cases (21.1%), which has been reported to be associated with measles in literature.² AST levels were more than double the ALT levels in the cases in the present study, and similar reports of merely AST elevation have been published in literature.¹⁴

The most frequent complications of measles are otitis media (5–9%) and pneumonia (1–6%). Lower respiratory tract infection, enteritis, and mild hepatitis were identified as complications of measles in 31.6, 13.1, and 2.6, respectively, in this present study. The complications observed in the present study were different to those reported in the literature, which was thought to be attributable to the fact that all patients were hospitalized in the current study.

As one of the limitations of the primary study, we do not have the total number of (adult/children) measles cases in our region. In addition, we do not know the countrywise or local vaccine coverage rate of refugees. The total number of post-exposure measles prophylaxis (immunoglobulin, vaccination) cases in 2019 in Adana region could not be obtained. Local vaccine coverage rates including refugee population values may be a topic for future studies.

Measles is a serious disease that caused 2.6 million deaths annually before the launch of widespread vaccination programs.¹⁵ Although it is a disease that can be prevented with a cheap, effective, and safe vaccine, 140 000 deaths caused by measles, mostly in children younger than 5 years old, were reported worldwide in 2018 according to WHO data.¹⁵ No mortality occurred resulting from measles in this present study.

In the present study, we found that measles was encountered in the household of 10 of the cases with measles, although only 2 of these children received prophylaxis. The administration of

measles vaccine to children within 72 hours of contact with an index case is important in terms of disease prevention. The disease can be prevented or alleviated through the intramuscular or intravenous application of 0.5 mL/kg non-specific gamma globulin within the first 6 days of the contact in children less than 6 months old. Accordingly, awareness of the advantages of “prophylaxis following contact with measles” should be increased among healthcare personnel in the units to which patients and families are directed at the time of presentation.

CONCLUSION

Measles is still an important disease due to the associated morbidity and mortality. It was found that measles was encountered in the household of 10 of the cases with measles in the present study, although only 2 received prophylaxis. Therefore, awareness of the application of post-exposure prophylaxis against measles should be increased among healthcare personnel. None of the families declared vaccine hesitancy. Efforts to keep the measles vaccination coverage rate above optimal levels should be encouraged in regions where irregular refugees are concentrated.

Ethical Committee Approval: Approval for the study was obtained from the Clinical Research Ethics Committee of the Adana City Hospital (Dated March 11, 2020 and numbered 749).

Informed Consent: Informed consent was not obtained due to the nature of this study.

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