Short Communication

Risk factors for measles outbreak in Al-Dali Governorate, Yemen

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ABSTRACT

Background: In addition to the recent civil war in Yemen, the COVID-19 pandemic resulted in a collapse of the health system, a decline in vaccination coverage, and the spread of numerous outbreaks. In 2022, a measles outbreak impacted Al Dali governorate. This study aimed to describe the demographics of measles patients, measles risk factors, and disease outcomes in Al Dali Governorate, Yemen. **Methods:** All measles-infected children who sought medical attention at Al Tadhamon Hospital in Al Dali, Yemen, between February and December 2022 were included in this prospective and observational study. **Results:** During the study period, 154 parents gave their consent to enroll their children in this study; 88 (57.1%) were males, and 66 (42.9%) were females. The mean age of the children was 3.56±2.90 (0.3–12 years). More than half of the mothers (n=88, [57.1%]) were illiterate or had a basic educational level, while most of the fathers (n=126, [81.8%]) were well-educated. Nutritional status was normal in most children (n=146, [94.8%]), and all children were unvaccinated. Most children (n=152, [98.7]) came from areas having measles and most of them (n=130, [84.4]) were in contact with measles cases. Health facilities were close (<3 km) to many children (n=151 [98.1]), and house ventilation was good in 66.2% (n=102) of cases while crowdedness was found in 135 (87.7) cases. Family members were 7 or more in 90 (58.4) cases. Two children under the age of 5 years died because of the disease. **Conclusion:** Our study showed that the main risk factor for the recent measles outbreak in Al Dali governorate was lack of vaccination, as all involved children were unvaccinated. Routine immunization needs to be reinforced through health centers in different districts and community education about the dangers of the disease and the benefits of the vaccines should be enhanced to prevent outbreaks from recurring.

Key words: Al Dali governorate, Measles outbreak, Risk factors, Yemen

Measles is a highly contagious seasonal disease that has affected almost everyone in his lifetime. Before the release of measles vaccine in 1963 and widespread vaccination campaigns, major epidemics occurred about every 23 years and measles was thought to be the cause of 2.6 million deaths per year [1]. Increased vaccination efforts have led to a significant reduction in measles-related deaths. Global measles mortality dropped by 73% from an estimated 536,000 cases in 2000 to 140,000 cases in 2018 [2]. In 2019, there was a precipitous increase in measles outbreaks worldwide with 413,308 confirmed cases and 207,500 measles-related deaths, compared to 140,000 deaths in 2018, 110,000 deaths in 2017, and 89,780 deaths in 2016 [1,2].

During the 2020 COVID-19 pandemic, more than 22 million infants missed their first dose of measles vaccine, the highest number in 20 years and an increase of 3 million from the previous year. This posed a serious risk for outbreaks [3]. However, reported measles cases dropped by more than 80% in 2020 compared to the previous year, most likely because measles surveillance worsened during the COVID-19 pandemic [3]. On the other hand, compared to the same period in 2021, there were 79% more measles cases reported globally in the first 2 months of 2022. It is a worrying sign of an increased risk for the spread of the highly contagious virus and other vaccine-preventable diseases as this reported rise could signal the start of significant measles outbreaks around the world [4].

In Yemen, according to the Yemen Ministry of Public Health and Population, in the first 5 months of 2022, the number of measles cases in the Yemeni government-controlled areas reached 2924 cases, including 34 deaths, excluding the governorates under the control of the Houthis' faction [5]. In Al Dali governorate, which is located in the Yemeni government-controlled areas, we observed a sudden increase in childhood measles cases from February 2022. Therefore, we conducted this study to describe measles patient demographics, measles risk factors, and disease outcomes in Al Dali Governorate, Yemen.

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MATERIALS AND METHODS

Study Design, Setting, and Population

This prospective and observational study was conducted at Al Tadhamon Hospital, Al Dali, Yemen. All measles-infected children who sought medical attention at the facility between February and December 2022 were included in the study. Al Dali is one of the Yemeni governorates created after the unification of Yemen (Fig. 1). The population of the province accounts for 2% of the total population of the republic. The governorate is divided into 9 districts, some districts are under government control and others are controlled by the Houthis faction. The city of Al Dali is the administrative center of the governorate. This study was conducted in the Yemeni government-controlled areas.

Definitions and Data Collection

A suspected case of measles is defined as any person with a fever and a generalized maculopapular rash plus one of the following conditions: cough or runny nose, or conjunctivitis (red eyes), or anyone who is suspected by a clinician to have measles. A laboratory-confirmed measles case is a suspected case of measles that has been positively confirmed by testing at a competent laboratory and in which vaccine-related disease has been ruled out [6]. All measles cases in our study were clinically diagnosed due to a lack of laboratory facilities to confirm the diagnosis. Measles outbreaks are declared when the number of reported cases in an area is higher than the expected number of cases [7] and the case is considered vaccinated if he/she has received at least one dose of the vaccine [6]. The data were collected by the investigators in a special data collection form approved for this study. It included sex, age, immunization status, place of residence, parental education level, nutritional status, home ventilation, distance between home and health facility, and number of family members, and outcomes.

Statistical Analysis

For quantitative variables, the data were reported in the form of mean±standard deviation. Qualitative variables were presented as numbers and percentages. Data were analyzed using the SPSS version 20.0 for Windows (SPSS, Inc., Chicago, IL, United States of America [USA]).

Figure 1: Al Dali governorate (red colored area)

Ethical Considerations

Permission to conduct this study was obtained from the hospital administration as there is no research committee in the governorate. An informed consent process was performed to explain the aim and importance of this study to parents, and verbal consent was obtained from parents who agreed to enroll their children in this study.

RESULTS

During the study period, 154 parents gave consent to enroll their children in this study; 88 (57.1%) were males and 66 (42.9%) were females. The mean age of the children was 3.56±2.90 (0.3–12 years). More than half of the mothers (n=88, [57.1%]) were illiterate or had a basic education, while most fathers (n=126, [81.8%]) were well educated. Nutritional status was normal in most children (n=146, [94.8%]) and all children were unvaccinated. Table 1 describes the demographics of the participants and the educational level of their parents.

Most children (n=152, [98.7]) came from areas having measles and most of them (n=130, [84.4]) were in contact with measles cases. Health facilities were close (<3 km) to many children (n=151 [98.1]), and house ventilation was good in 66.2% (n=102) of cases while crowdedness was found in 135 (87.7) cases. Family members were 7 or more in 90 (58.4) cases. Two children under age of 5 years died because of the disease. Table 1 describes the risk factors for measles and its outcome.

DISCUSSION

The COVID-19 pandemic has delayed measles-related supplementary immunization activities worldwide. Yemen experienced three waves of COVID-19 infections between April 2020 and August 2021 [8]. The COVID-19 pandemic, alongside the bloody civil war, has led to a sharp drop in vaccination coverage in Yemen, the country that ranks among the top 5 countries with the most unvaccinated children against measles in 2021 and therefore suffers the most cases of measles cases, along with Pakistan, Tanzania, India, and Nigeria [9].

In Yemen, according to the Yemen Ministry of Public Health and Population, in the first 5 months of 2022, the number of measles cases in the Yemeni government-controlled areas reached 2,924 cases, including 34 deaths, excluding the governorates under the control of the Houthis' faction [5]. In response to the measles outbreak in the southern governorates, the United Nations Children's Fund (UNICEF) supported the implementation of a measles outbreak control campaign in 76 districts of 10 governorates, targeting a total of 1,371,169 children aged 6 months–10 years [10]. A total of 1,239,129 children (90%) were

Table 1: Demographics of the participants, risk factors for measles outbreak and its outcome, in Al-Dali governorate, Yemen

Variables	Number of cases
Age	
Mean±standard deviation	3.56±2.90 (0.2–13 years)
<5 y	111 (72.1)
≥5 y	43 (27.9)
Residence	
Urban	44
Rural	110
Father education	
Illetrate-basic	28 (18.2)
Secondary-university	126 (81.8)
Mother education	
Illetrate-basic	88 (57.1)
Secondary-university	66 (42.9)
Nutritional status	
Malnutrition	8 (5.2)
Normal	146 (94.8)
Vaccination	
Vaccinated	0
Unvaccinated	154 (100)
Contact to measles case	
Contact	130 (84.4)
No contact	24 (15.6)
Presences of measles in the same area	
Yes	152 (98.7)
No	2 (1.3)
House ventilation	
Bad	52 (33.8)
Good	102 (66.2)
Distance to health facility	
≥3 km	3 (1.9)
<3 km	151 (98.1)
Crowding	
≥3 persons	135 (87.7)
<3 persons	19 (12.3)
Family size	
<7	64 (41.6)
≥7	90 (58.4)
Sex	
Male	88 (57.1)
Female	66 (42.9)
Outcome	
Mortality	2 (1.3)

reached with the measles-rubella vaccine. UNICEF's response to the outbreak was aimed at preventing a large-scale measles outbreak in the affected and adjacent districts and preventing excess mortalities and morbidities among children. However, as this study pointed out, the main risk of this measles outbreak was the lack of vaccination, as all children involved in this study were unvaccinated, which indicates that they either refused vaccination or missed various opportunities to receive the vaccine allocated by the health authorities. Similarly, many studies conducted worldwide have shown a significant association between non-vaccination and measles outbreak [11-13].

In response to the outbreak, we notified the relevant health authorities who responded promptly by providing measles vaccines to the affected districts and their surroundings within 4 months of the start of the outbreak. In December 2022, the number of measles cases dropped significantly; however, many parents were reluctant to bring their children for vaccination. Rather than focusing only on physical access issues, it would be beneficial to investigate societal, communication, and other programmatic issues as potential causes for refusing vaccination. Given that the majority of the mothers of the study's participants were illiterate or only had primary education, further efforts are needed to increase maternal awareness about measles and the benefits of measles vaccine in reducing morbidity and mortality among their children, with a focus on changing their cultural attitudes and behaviors towards measles vaccine.

This study has several limitations. First, the main limitation of this study was the diagnosis of the cases, which was made clinically due to facility limitations. Second, we could not follow patients for complications and relapses, especially those who lived far from the hospital. Third, this study was limited to areas under government control, with the exception of governorates under Houthis faction control, so we cannot generalize our results. However, our study is the first to highlight the outbreak in Al Dali governorate.

CONCLUSION

Our study showed that the main risk factor for the recent measles outbreak in Al Dali governorate was lack of vaccination, as all involved children were unvaccinated. Routine immunization needs to be reinforced through health centers in different districts and community education about the dangers of the disease and the benefits of the vaccines should be enhanced to prevent outbreaks from recurring.

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