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Заболеваемость корью в Южном Вьетнаме во время пандемии Covid-19

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Резюме

В работе представлены данные о случаях кори, выявленных в 18 провинциях Южного Вьетнама (ЮВ) в 2020 г. во время активной фазы пандемии нового коронавируса SARS-CoV2. Вирус кори активно циркулировал в ЮВ в первые месяцы 2020 г.: средний показатель заболеваемости корью составил 1,27 на 100 тыс. населения. В возрастной структуре преобладали дети в возрасте до 5 лет (71%). Абсолютное большинство заболевших – не вакцинированные против кори лица, а также лица, не имеющие сведений о прививках; совокупно их доля составила 97,4%, но среди заболевших были вакцинированные и ревакцинированные лица. Существенно чаще IgM-корь антитела регистрировали в образцах, полученных из г. Can Tho (n = 57), где расположен инфекционный госпиталь, принимающий больных из соседних областей ЮВ. Наибольшее количество случаев кори регистрировали также в провинциях Dong Thap (n=57), Hao Glang (n = 62) г. Хошимин (n = 15). То есть в эпидемический процесс кори прежде всего были вовлечены жители крупных городов, промышленных и медицинских центров. Показано резкое снижение заболеваемости корью с апреля 2020 г., когда в ЮВ были введены меры по ограничению распространения COVID-19. Следует отметить, что нарушение вакцинации, связанное с пандемией COVID-19, после отмены санитарно-эпидемиологических ограничений может привести к повышению заболеваемости и развитию вспышек кори во Вьетнаме и других вовлеченных в пандемию странах. Следовательно, для предотвращения будущих вспышек потребуется усиление мер надзора и контроля кори для достижения ее элиминации.

Ключевые слова: *Южный Вьетнам, корь, возрастные группы, территории, пандемия, COVID-19, элиминация*

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The Incidence of Measles Infection in Southern Vietnam during COVID-19 Pandemic

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Abstract

The paper presents data on measles cases identified in 18 provinces of South Vietnam (SV) in 2020, during the active phase of the pandemic of the new coronavirus SARS-CoV2. The measles virus actively circulated in SV in the first months of 2020: the average measles incidence rate was 1.27 per 100,000 population. Children under 5 years of age dominated in the age structure (71%). The vast majority of cases are people who have not been vaccinated against measles, as well as people who do not have information about vaccinations; in total, their share was 97.4%, but there were vaccinated and revaccinated individuals among the sick. Significantly more often, IgM-measles antibodies were recorded in samples obtained from the city of Can Tho, (n=57) where the infectious diseases hospital is located, receiving patients from neighboring regions of the SV. The largest number of measles cases were also recorded in the provinces of Dong Thap (n=57), Hao Glang (n=62) and Ho Chi Minh City (n=15). That is, residents of large cities, industrial and the medical centers were primarily involved in the measles epidemic process. A sharp decrease in the incidence of measles has been shown since April 2020, when measures to limit the spread of COVID-19 were introduced in SV. It should be noted that violations of vaccination associated with the COVID-19 pandemic, after the lifting of sanitary and epidemiological restrictions, may lead to increased morbidity and the development of measles outbreaks in Vietnam and other countries involved in the pandemic. Therefore, preventing future outbreaks will require strengthening measles surveillance and control measures to achieve its elimination.

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Keywords: *South Vietnam, measles, age groups, territories, pandemic, COVID-19, elimination*
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Introduction

Measles is an acute and highly contagious disease that is caused by the measles virus (MeV), a single-strand and negative-sense RNA virus belonging to the *Morbillivirus* genus of the *Paramyxoviridae* family [1.2]. It is an airborne virus transmitted through respiratory droplets or direct contact with the body fluids of the infected individual [3]. The estimated reproduction of MeV is 12–18, which is highest among various respiratory viruses, while the SARS-CoV-2, the cause of the COVD-19 pandemic, has a reproduction number of approximately 1.4–2.5 [4.5]. Patients infected by MeV normally develop erythematous and maculopapular rash symptoms, and most of the cases quickly recover within a week [2]. In particular, the early syndromes include acute fever, cough, running nose (coryza), red eyes (conjunctivitis) that usually appear from 7 to 14 days after the exposure to the virus. Thereafter, patients may develop small white spots, also called the Koplik spots, inside the mouth. From 3–5 days following the first symptoms, the final syndrome is a rash (flat red dots) that begins to erupt on the face, then spreads down to arms and legs. The most severe complications of measles are meningitis, encephalitis, pneumonia, otitis media, diarrhea in children under the age of five while in adults over the age of thirty-five and miscarriage, fetal death, induced abortion in pregnant women may occur. In addition, MeV infection can lead to intense immunosuppression that makes patients more prone to a secondary infection and thus results in high mortality of children [6].

The incidence of measles in America was reported to range between 0.08 (95% CI, 0.05–0.12) in 2004 and 2.06 (95% CI, 1.99–2.22) in 2014. Notably, from 2001 to 2015, infants aged 6 to 11 months had the highest incidence compared with different age groups [7]. Fortunately, starting from the 1960s, the development and introduction of measles vaccines have made a tremendous impact on eradicating measles. A rapid decline of measles – related deaths was observed in which the global number of cases fell from 2.6 million deaths in 1980 to merely 254,928 cases in 2015 [8,9]. This information emphasizes the importance of vaccination to reduce mortality and prevent the future outbreak of measles. As measles vaccines are safe, affordable, and widely available; the World Health Organization (WHO) has set the goal to eliminate measles in all regions by 2020. Suddenly, many countries have reported the occurrence of measles outbreaks in recent years. In particular, measles cases surged 556% from 132,490 in 2016 to 869,770 in 2019, the highest since 1996 [10]; and resulted in more than a two-fold increase of measles mortality rate within just four years [11]. Of note, the delay of the childhood immunization programme due to COVID-19 pandemic has provoked a recurrence of other public-health concerns, including measles. A recent study from Pakistan has reported a 30% increase in measles incidence in children under five years after COVID-19 appearance [9]. In the Lancet, Gignoux and colleagues emphasized that global mobilization is needed to combat the waves of measles infection in post-COVID-19 era [12].

Vietnam is a country in the Western Pacific Region, with the national surveillance system for infectious diseases divided into four main parts at the north, south, the center and the highland areas. Its activities are supervised by four preventive health institutes including National Institute of Hygiene and Epidemiology, Pasteur Institute in Ho Chi Minh City, Pasteur Institute of Nha Trang and the Highland Institute of Hygiene and Epidemiology, respectively. Suspected measles patients are normally detected by the local Center for Disease Control and Prevention, then their samples and data are collected and transferred to the corresponding institute for further examination.

The implementation of measles vaccines into national routine immunization started early in the 1980s that helped to lessen the incidence of measles to 93 cases per million citizens in the 2008–2010 period [13]. From 2010 to 2016, we had achieved over 95% vaccination coverage with the first dose of measles-containing vaccine (MCV1), with an exception in 2014 (94%); while the immunization program with the second dose of measles vaccine (MCV2) achieved 83% – 98% in this same period [14].

Unfortunately, Vietnam was not an exception in a global recurrence of measles outbreaks. Particularly, our number of measles patients increased at least two-fold from 2017 to 2018, in which more than 30% of the cases were children under four years. Remarkably, most patients were unvaccinated [15]. As we had to delay vaccination in the COVID-19 epoch, measles is predicted to rise again in our population. It requires urgent actions to suppress the development of this catastrophe beforehand.

In 2020, a report from the European measles surveillance network had underlined an unexpected break in the dynamic of measles outbreak, showing a sharp decline of measles cases during the circulation of SARS-CoV-2 [1]. We studied the spread

of measles in South Vietnam during the COVID-19 pandemic. Our brief report describes the incidence of measles in Southern Vietnam under the outbreak of SARS-CoV-2. We also reveal the future challenges and propose actionable advice towards measles elimination in the post- COVID-19 era.

Materials and methods

Case definitions

Measles surveillance is mandatory in Vietnam, following the instruction of the Ministry of Health. The criteria for defining measles patients are the presence of acute fever and rash in combination with at least one of the following syndromes: cough, running nose, red eyes, lymphadenopathy, and joint pain. Notably, it is possible to collect specimens from all sporadic cases, and only 80% of patients in a measles cluster.

The sera and investigation forms (personal information, a history of vaccination, clinical information) were collected from all suspected measles cases in provinces in Southern Vietnam from Jan-2020 to Dec-2020 (Table 1) and sent to the laboratory of respiratory viruses at Pasteur Institute of Ho Chi Minh City for laboratory testing.

We used measles infection cases confirmed by laboratory testing (see below) for data analysis. All statistical analyses were performed using SPSS (Version 25, IBM, USA).

Ethical approval

This study was approved by The Institutional Ethics Committee Biomedical research – Pasteur Institute in Ho Chi Minh City (06/GCN-PAS) on March 02, 2020.

Specimen collection and the measurement of measles IgM response

Samples of blood serum were collected within 3rd to 28th day from rash onset day, stored at 2–8 °C (no more than 72 hours after collection), and sent to the laboratory on ice pack. The samples were stored for a long time at a temperature of -20 °C and below.

Measles-specific IgM antibodies in sera were detected using SERION ELISA classic Measles Virus IgM kit (SERION Immunologics, Würzburg, Germany) following the manufacturer's instructions.

Population sizes were taken from the website of the General Statistics Office (Vietnam) (https://www.gso.gov.vn/en/homepage/). Data analysis based on SPSS software (Version 25, IBM, USA).

Results

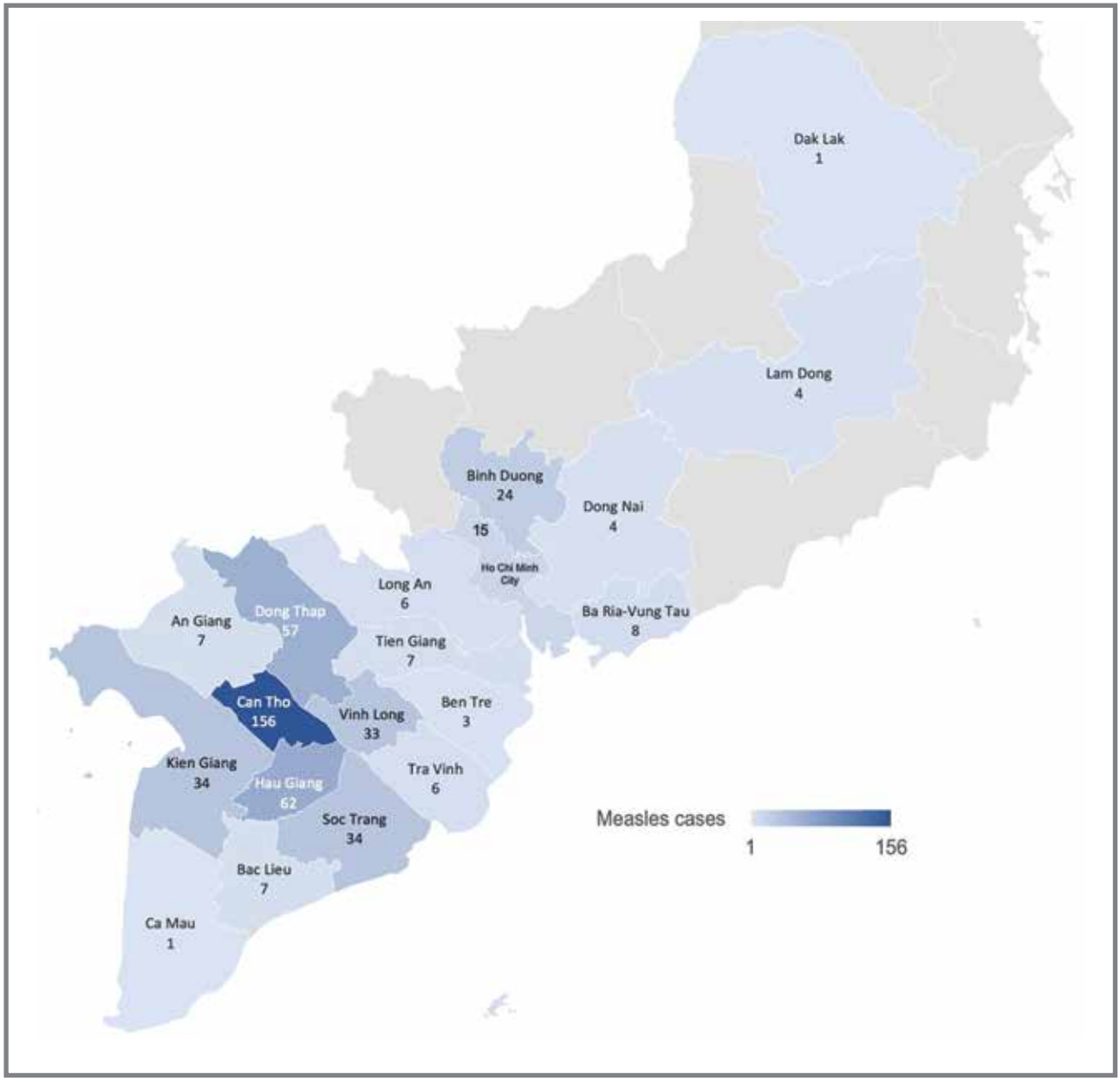
In 2020, 469 measles cases were detected in Southern Vietnam. The age of patients was 1 month to 48 year old (mean 6.1 years). The rate of females and males were 43.92% and 56.08%, respectively (Table 1).

The crude incidence rate per 100,000 population was 1.27 (95% CI, 1.15–1.38), in which the highest incidence was in the youngest group (<5 years) with 11.97 (95% CI, 10.72–13.23) while the lowest incidence was observed in the group of 15–19 years (0.04 [95% CI, -0.04–0.12]) (Table 1). In the <5 years group, approximately 59% were infants and toddlers aged 1 to 24 months. Measles infection started to decline from the age of 3, and the frequency was maintained less or roughly 1% when the patients were older than ten years. Remarkably, a large number

Table 1. Crude measles incidence rate (IR) and vaccination status of measles cases by age group in Vietnam (2020)
Таблица 1. Показатель заболеваемости и прививочный статус заболевших корью лиц разных возрастных групп во Вьетнаме (2020)

Age group, years Возраст лет	Number of measles cases Число случаев кори	Crude incidence rate per 100,000 population (95% CI) Показатель заболеваемости на 100 тыс. населения (95% CI)	Vaccination status Вакцинный статус			
			Vaccinated Вакцинированы	Re-vaccinated Ре-вакцинированы	Un-vaccinated Не вакцинированы	Unknown Неизвестно
< 5	350	11.97 (10.72–13.23)	9	2	271	68
5–9	70	2.21 (1.70–2.73)	0	0	42	28
10–14	21	0.77 (0.44–1.10)	0	1	10	10
15–19	1	0.04 (-0.04–0.12)	0	0	0	1
20–29	11	0.19 (0.08–0.30)	0	0	6	5
30–39	13	0.21 (0.10–0.33)	0	0	6	7
40–49	3	0.06 (-0.01–0.13)	0	0	2	1
⩾ 50	0	0 (0–0)	0	0	0	0
Total Всего	469	1.27 (1.15–1.38)	9	3	337	120

Figure 1. The number of measles cases in Provinces of Southern Vietnam
Рисунок 1. Число случаев кори в провинциях Южного Вьетнама



of cases were unvaccinated (71.8%) or of unknown vaccination status (25.6%) (Table 1).

Out of 469 measles cases, there were 128 patients (27.3%) with pneumonia symptoms, 46 patients (9.8%) with diarrhea, one patient (0.2%) with otitis media, and 38 patients (8.1%) who suffered of both pneumonia and diarrhea.

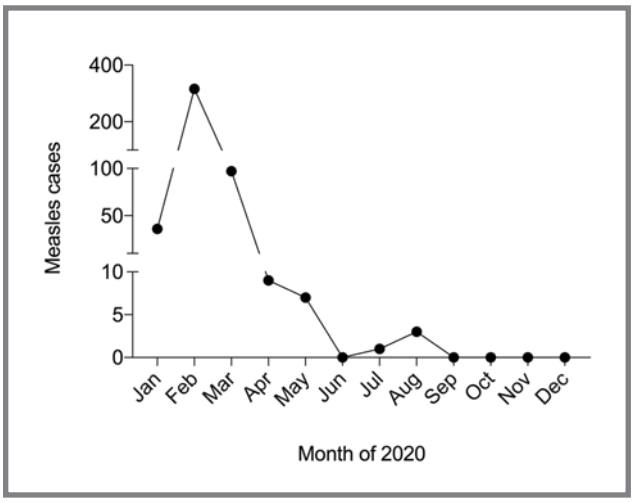
In 18/20 provinces in southern Vietnam where measles cases were reported, Can Tho province has the highest number of patients that accounted for 33.3% of total cases while there was only one confirmed patient at Ca Mau province (Figure 1). Hau Giang and Dong Thap provinces were also at the top of the chart (13.2% and 12.2%); followed by Kien Giang, Soc Trang, and Vinh Long areas, respectively (Figure 1). There were ten provinces with the number of patients less than 10 cases including Ba Ria – Vung Tau, An Giang, Bac Lieu, Tien Giang, Long An, Long An, Tra Vinh, Dong Nai, Lam Dong, Ben Tre, and Ca Mau (Figure 1). In addition, one case was also detected at Dak Lak, the area not belong to the South of Vietnam, as the patient was in close contact with one case from Dong Nai province.

Most cases were detected within the first three months of 2020, whereas a drastic decline was observed in the following months (Figure 2). Of note, no measles case was reported in the last four months of 2020.

Discussions

By the end of 2020, the goal of measles elimination in all six WHO regions has not been achieved. Moreover, the disruption of immunization activities in which more than hundreds of vaccination campaigns have been suspended in 56 countries during the first six months of the COVID-19 pandemic

Figure 2: The distribution of measles cases overtime in Southern Vietnam in 2020.
Рисунок 2: Распределение случаев кори помесячно в Южном Вьетнаме в 2020 году



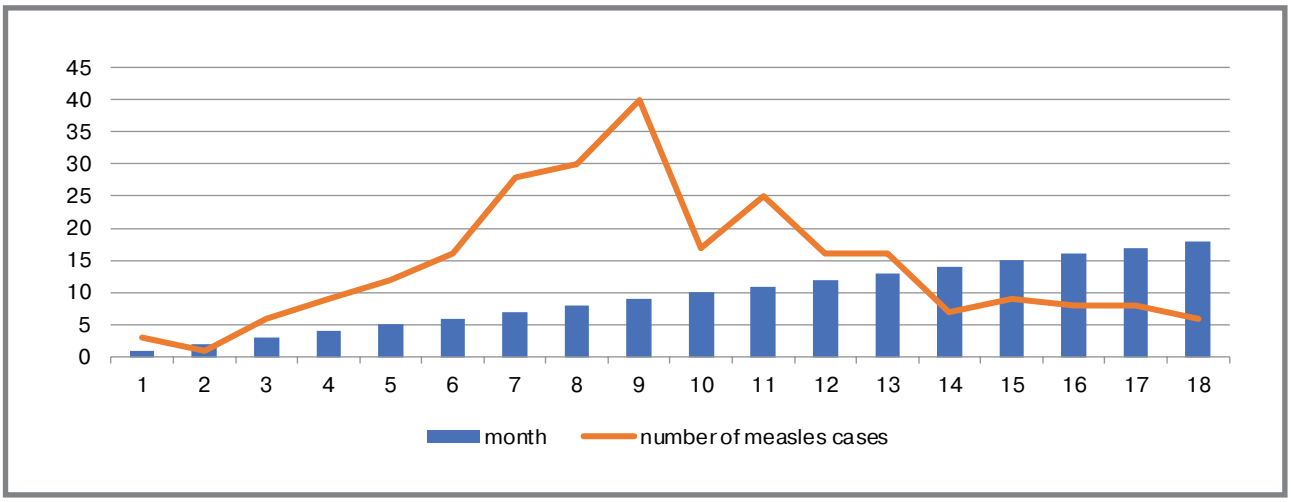
strongly anticipated the surge of measles outbreaks in the next few years [11]. Collective data from recent decades have shown that vaccines are our powerful weapon in the combat against the measles pandemic. Thus, the delay of the vaccination program is predicted to affect over 117 million children around the world [16]. Notably, this number does not include the infants who are expected to receive their first dose of measles vaccine in this period. Although the COVID-19 pandemic is taking the world's attention, we should not neglect the looming danger of this ancient killer.

Vietnam is a country with a high level of circulating measles. We have been running a routine vaccination program for children up to 18 months and several additional campaigns for an adolescent to decrease our number of patients [17,18]. Those attempts were rewarded with a high coverage rate of measles vaccine around 90%–95% between 2014 and 2018. However, our population was still hit by a large-scale measles scourge [19], which underlines much works remain to be done in achieving the goal of measles elimination in Vietnam.

In this work, we present for the first time the data of measles morbidity detected in 18 provinces of Southern Vietnam in 2020. The average measles incidence rate per 100,000 population was 1.27 (1.15–1.38), quite similar to the data reported by Do and colleagues [20]. We also found a higher percentage of male than female patients (56.08% versus 43.92%), which seemed a bit greater than was mentioned in other works [13,21]. In a study throughout the country during 2005 – 2009, Nmor's group demonstrated that the unvaccinated subjects have accounted for 63.4% of all measles cases while its number exceeded 71% in our study [21]. Besides, Can Tho province was likely more affected by measles infection than other investigated regions. Finally, our results have shown a drastic decrease in measles cases from April 2020, coincidentally with the COVID-19 pandemic started waving globally.

As mentioned above, several researchers have reported that the epidemiology of measles was influenced by the COVID-19 pandemic [9]. Particularly, in Japan and Europe, a remarkable reduction of the number of infected patients was observed, the first time in a decade for Europe, in the normal season of measles [1,22]. On the contrary, Rana and colleagues described a 3-fold increase of confirmed measles cases within the first four months of 2020 in Pakistan, highlighing an emergency state of measles outbreak in the entire country [9]. Some factors have been associated with the discrepancy of these data, with the following reasons that may explain the decrease of measles cases number. First, MeV and SARS-CoV-2 viruses are transmitted in a similar route [23]; thus any actions to prevent the spreading of the COVID-19 pandemic may also influence the incidence of measles. For instance, wearing the mask was reported to reduce significantly the transmission of positive droplets from symptomatic individuals who are infected with various respiratory

Figure 3. Measles cases increase in infants aged from 1 to 9 months in 2020.
Рисунок 3. Рост заболеваемости корью среди младенцев в возрасте от 1 до 9 месяцев в 2020 году



viruses [24]. Enhanced hygiene, such as handwashing, is also believed to inhibit viral infection. Second, social-distancing and stay-at-home orders have made an enormous impact on diminishing the direct contact among the population that consequently minimize the transmission of measles through its shedding droplets. Indeed, intensive interaction at schools and resident in metropolitan areas are the factors correlated to a higher risk of measles infection [25]. Close-contact avoidance of both children from school and their parents from the workplace obviously results in a smaller number of affected patients. Also, the travel ban has aided the prevention of imported measles cases from foreign visitors. Finally, we can not exclude misdiagnosed and underreported patients as it was mentioned before in some particular contexts [26]. The overburden of healthcare system brought by COVID-19 pandemic has widened the gap of loss information from traditional surveillance networks.

Conclusions

The article presents data from a study of the spread of measles in Vietnam during the circulation of the new SARS-CoV2 virus. Restrictive measures against COVID-19 have also limited the spread of measles. In 2020, the incidence of measles decreased. However, a vaccination violation associated with the COVID-19 pandemic may lead to the development of measles outbreaks in the future. Consequently, a deeper understanding of the transmission of the virus and the epidemiology of measles is required to prevent future outbreaks.

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