ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Infectious Diseases and Migration: Measles Cases in a Province, Turkey Before and After the Pandemic

Bulaşıcı Hastalıklar ve Göç: Türkiye'de Bir İlde Pandemi Öncesi ve Sonrası Kızamık Olguları

Tuba Duygu Yılmaz (0000-0002-0229-7659), Leyla Üçeş Harmanoğulları (0000-0002-6653-6065)

Mersin Provincial Health Directorate, Mersin, Turkey

Abstract

Introduction: The present study aimed to evaluate the suspected measles cases reported in Mersin, Turkey between 2017 and 2020.

Materials and Methods: This cross-sectional study was conducted in Mersin, Turkey between January 2020 and November 2021. The population of the study consisted of suspected measles cases reported in Mersin between 2017 and 2020. The dependent variable of the study was measles IgM antibody positivity, the independent variables included age, gender, nationality, city of residence, year and season of notification, presence of fever, and upper respiratory tract infection symptoms. Descriptive statistics were used to interpret the data while the chi-square and Mann-Whitney U tests were used for data analysis.

Results: A total of 1205 suspected measles cases were reported in Mersin in the years 2017, 2018, 2019, and 2020. Six hundred twenty three (51.7%) of the cases were female, 582 (48.3%) were male. Of the cases, 725 (60.2%) were from Turkey, 480 (39.8%) were from Syria. 724 of the cases (60.1%) were in Tarsus. Measles IgM was positive in 661 (54.9%) cases, while it was negative in 544 (45.1%) cases. Rate of measles IgM positivity was significantly higher among Syrian citizens (71.5%) ($p<0.001$). The incidence of measles IgM positivity in the Tarsus region was significantly higher (63.5%) than in other districts ($p<0.001$).

Conclusion: A high rate of measles IgM positivity was detected in Syrian citizens and in the Tarsus region. It is recommended to increase vaccination among risk groups and to provide more training on protection from infectious diseases.

Keywords
Measles, infectious diseases, Immunoglobulin M, measles elimination

Anahtar kelimeler
Kızamık, bulaşıcı hastalıklar, immünoglobulin M, kızamık eliminasyonu

Received/Geliş Tarihi : 27.05.2022
Accepted/Kabul Tarihi : 31.10.2022

DOI:10.4274/jcp.2022.82246

Address for Correspondence/Yazışma Adresi: Tuba Duygu Yılmaz MD, Mersin Provincial Health Directorate, Mersin, Turkey
Phone: +90 532 663 54 74
E-mail: tubady@yahoo.com

Öz

Giriş: Bu çalışmada 2017 ve 2020 yılları arasında Türkiye'de Mersin ilinde bildirimi yapılan şüpheli kızamık olgularının değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Kesitsel tipte olan bu çalışma, Ocak 2020 ile Kasım 2021 tarihleri arasında Türkiye'nin Mersin ilinde yapıldı. Araştırmanın evrenini 2017-2020 yılları arasında Mersin'de bildirimi yapılan kızamık şüpheli olgular oluşturdu. Çalışmanın bağımlı değişkeni kızamık IgM antikor pozitifliği; bağımsız değişkenler yaş, cinsiyet, uyruk, ikamet edilen şehir, bildirim yılı ve mevsimi, ateş ve üst solunum yolu enfeksiyonu semptomları varlığıdır. Verilerin özetlemesinde tanımlayıcı istatistikler, analizinde ki-kare ve Mann-Whitney U testleri kullanıldı.

Bulgular: Mersin'de 2017, 2018, 2019 ve 2020 yıllarında toplam 1205 şüpheli kızamık olgusu bildirilmiştir. Olguların 623'ü (%51,7) kadın, 582'si (%48,3) erkektir. Olguların 725'i (%60,2) Türkiye, 480'i (%39,8) Suriye uyrukluydu. Olguların 724'ü (%60,1) Tarsus'taydı. Kızamık IgM 661 (%54,9) olguda pozitif, 544 (%45,1) olguda negatifti. Kızamık IgM pozitifliği sıklığı Suriye uyruklu olgular arasında anlamlı şekilde yüksekti (%71,5) ($p<0,001$). Tarsus bölgesinde kızamık IgM pozitifliği sıklığı diğer ilçelere göre (%63,5) anlamlı olarak yüksekti ($p<0,001$).

Sonuç: Çalışmada Suriye uyruklu olgularda ve Tarsus bölgesinde yüksek oranda kızamık IgM pozitifliği tespit edildi. Risk grupları arasında aşılamanın artırılması ve bulaşıcı hastalıklardan korunma konusunda daha fazla eğitim verilmesi önerilmektedir.

Introduction

Measles is an exanthematous, highly contagious viral disease experienced during childhood (1-3). Before its vaccine was developed in 1963, major epidemics occurred approximately every 2-3 years and measles caused an estimated 2.6 million deaths each year (4). Despite the development of a safe and effective vaccine, approximately 140000 people, mostly children, died from measles in 2018 and 2019 (4). While many children died due to complications in the past, its frequency has decreased with vaccination efforts, but it has not been eradicated yet (2,5-7). Measles is still common in developing countries, especially in certain parts of Africa and Asia (4).

Measles is primarily transmitted by droplet exposure mostly occurring in late winter and spring (2,8). The symptoms of fever, cough, flu, conjunctivitis, and photophobia are observed in the prodromal period following the incubation phase (1,2,7). Maculopapular rash appears as the symptoms exacerbate. The initial symptoms begin to subside after the first 2 days of the rash. A rise in measles-specific immunoglobulin M can be detected in the first 1-2 days of the rash which continues for 30-60 days (1,2,5). In addition to isolation, quarantine, vaccination, surveillance studies; laboratory services adequacy and measles IgM and PCR analyzes for diagnosis are important in ensuring measles elimination (9-12).

Mortality and morbidity are higher in those younger than 5 years of age, especially those younger than 1 and older than 20 years (2). Complications such as otitis media, pneumonia, postinfectious encephalitis, laryngitis, hepatitis, pericarditis, myocarditis, glomerulonephritis may occur (1,5,8). Pneumonia is the most common complication of measles, which can lead to death (7,8).

Vaccination bears significant importance in preventing measles (8,13,14). In 2018, 86% of the children worldwide received 1 dose of measles vaccine by the age of 1 (4). Measles vaccination resulted in a 73% reduction in measles deaths worldwide between 2000 and 2018 (4). Between 2000 and 2018, measles vaccination prevented 23.2 million deaths (4). It is proven that some children receiving the measles vaccine may show mild symptoms when exposed to the virus a few years later (7,8).

The social and economic challenges brought on by the COVID-19 pandemic are adversely affecting the measles elimination program (15). It is important that countries that go backwards with the pandemic should strengthen their vaccination studies and surveillance services, as they should have been before the pandemic (16-19).

The present study aimed to evaluate the suspected measles cases reported in Mersin, southern Turkey between 2017 and 2020.

Materials and Methods

This cross-sectional study was conducted between January 2020 and November 2021 in Mersin, southern Turkey. Data was collected between 15.10.2021-31.10.2021 and records of the suspected measles cases were obtained from Mersin Provincial Health Directorate for the years of 2017, 2018, 2019, and 2020. Records were obtained from the communicable diseases surveillance system.

Within the scope of the measles elimination program, it is aimed to detect at least 2 suspected cases per hundred thousand population annually, with an annual target to detect at least 36 suspected cases for Mersin. The program aims to detect at least 144 suspected cases within 4 years. The study universe consisted of patients with suspected measles in Mersin between 2017 and 2020. In the study, sampling process was not conducted as it was aimed to reach the whole population.

The dependent variable of the study was measles IgM antibody positivity; the independent variables included age, gender, nationality, city of residence, year and season of notification, presence of fever, and upper respiratory tract infection symptoms.

Hypotheses: Measles cases decreased in 2017 and 2020. Public health measures during the pandemic had a positive impact by resulting in a decrease in measles cases in 2020.

The ethics committee approval was obtained from the Scientific Research and Publication Ethics Committee of Toros University. Additionally,

institutional permission was obtained from the Mersin Provincial Health Directorate Research Applications Review and Evaluation Commission.

Statistical Analysis

Statistical package for the social sciences (SPSS) program was used for obtaining descriptive statistics and analyzing the data. Descriptive statistics was employed for data abstraction. Chi-square test was used to compare the dependent and independent variables. The Mann-Whitney U test was used to compare the continuous dependent variable of age and the independent variable of measles IgM, since they did not fit into the normal distribution.

Results

A total of 1205 suspected measles cases were reported between 2017 and 2020 in Mersin. Of 1205 cases included in the study, the mean age was 12.52±13.6 years (minimum 1, maximum 79), and the median age was 6 years.

Six hundred twenty-three (51.7%) of the cases were female, 582 (48.3%) were male; while 725 cases (60.2%) were from Turkey, and 480 cases (39.8%) were from Syria. 724 of the cases (60.1%) were in Tarsus, and 782 cases (64.9%) were seen in 2019. 552 (45.8%) of the cases were reported in the spring season. 1151 cases (95.5%) had the symptom of fever and 371 cases (30.8%) had upper respiratory tract infection symptoms. The prognosis resulted in death in 1 (0.1%) of 1205 cases (Table 1).

Measles IgM was positive in 661 (54.9%) of 1205 suspected measles cases, while measles IgM was negative in 544 (45.1%) cases (Table 1).

Of the 1205 suspected measles cases, 960 (79.7%) had been unvaccinated against measles, 141 (11.7%) had been vaccinated with a single dose, and 34 (2.8%) with two doses. Vaccination status of 70 (5.8%) cases was unknown (Graphic 1).

No significant relationship was found between the rate of measles IgM positivity and gender. The rate of measles IgM positivity in the Tarsus region was significantly higher (63.5%) than in other districts ($p<0.001$) (Graphic 2). The rate of measles IgM positivity was significantly higher among Syrian citizens ($p<0.001$) (Graphic 3).

The rate of measles IgM positivity was significantly higher in cases reported in 2020. The rate of measles IgM positivity was significantly higher in cases reported in the winter season ($p<0.001$). No significant relationship was found between the rate of measles IgM positivity in cases with fever and those without fever. The rate of measles positivity was significantly higher in those

Table 1. Sociodemographic and other characteristics of the cases

Property	Number (n)	Percent (%)
Gender		
Female	623	51.7
Male	582	48.3
Nationality		
Turkey	725	60.2
Syria	480	39.8
District		
Tarsus	724	60.1
Out of Tarsus	481	39.9
Case year		
2017	34	2.8
2018	40	3.3
2019	782	64.9
2020	349	29.0
Case season		
Spring	552	45.8
Summer	172	28.3
Autumn	140	11.6
Winter	341	14.3
Case pregnancy status		
Not pregnant	1204	99.9
Pregnant	1	0.1
Case fever status		
Yes	1151	95.5
No	54	4.5
Case respiratory tract infection status		
Yes	371	30.8
No	834	69.2
Prognosis		
In life	1204	99.9
Dead	1	0.1
Measles IGM		
Positive	661	54.9
Negative	544	45.1
Total	1205	100.0

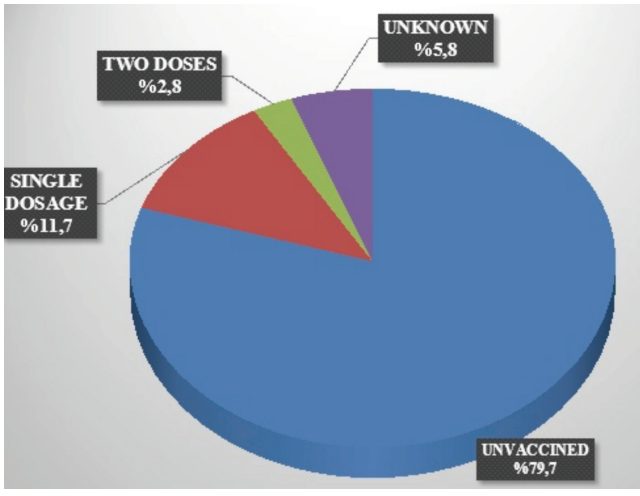
with upper respiratory tract infection symptoms than in those without upper respiratory tract infection symptoms (p<0.001) (Table 2).

A negative correlation was found between measles IgM levels and age, in that as the age increased the rate of measles IgM positivity decreased (p<0.001).

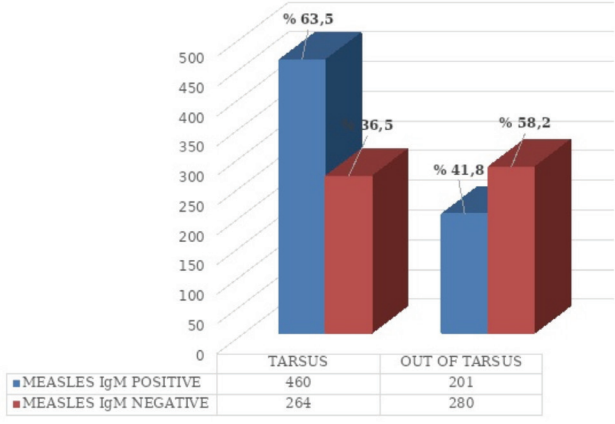
Discussion

A total of 1205 suspected measles cases were reported in Mersin between 2017 and 2020, all of which were included in the study.

A significant negative correlation was found between age and measles IgM positivity in that the rate of measles IgM positivity was found to decrease with age. This is due to the fact that measles is a childhood disease. No significant relationship was found between the rate of measles IgM positivity and gender.



Graphic 1. Vaccination status of suspected measles cases.

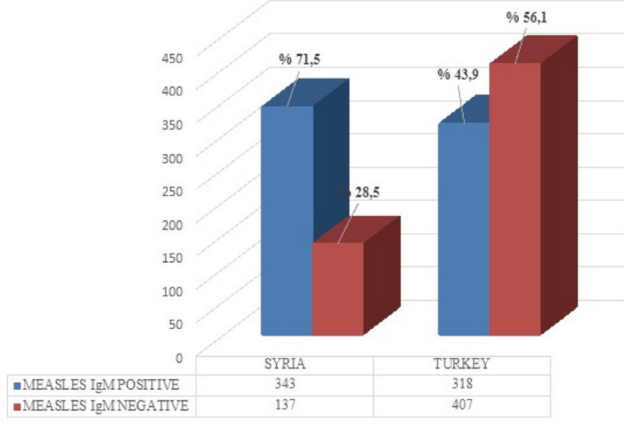


Graphic 2. Distribution of measles cases according to the districts.

The rate of measles IgM positivity among Syrian citizens was significantly higher than it was among Turkish citizens. This may be due to the low vaccination rate among Syrian citizens as well as low socioeconomic and sociocultural levels. The rate of measles IgM positivity was significantly higher in cases reported in the Tarsus district compared to other districts. This may be due to the low vaccination rate in Tarsus, as well as the high rate of anti-vaccination ideas and hesitancy in the region. In the study of King et al. (20) in Canada, it was stated that transmission is high in religious communities due to vaccine rejection.

The rate of measles IgM positivity was significantly higher in cases reported in 2020 compared to previous years. This may be due to efforts to raise public awareness in an effort to cause people to avoid applying to hospitals, except for emergencies, due to the emergence of the pandemic in 2020. The rate of measles IgM positivity was significantly higher in cases reported in the winter season. This is consistent with the fact that measles is common in spring and winter due to its epidemiological characteristics.

In our study, no significant relationship was found in measles IgM positivity between the cases with fever and those without fever. This may be associated with the fact that fever is seen as a symptom in many other communicable and non-communicable diseases. The rate of measles IgM positivity was higher in those showing symptoms of upper respiratory tract infection compared to those who did not. This may be due to the fact that the diagnostic symptoms of measles are overlapping with the symptoms of upper respiratory tract infection.



Graphic 3. Distribution of measles cases by nationality.

In our study, measles IgM was positive in 661 (54.9%) of 1205 suspected measles cases, while measles IgM was negative in 544 (45.1%). The study conducted by Eskiocak et al. (21) in Edirne reported that measles IgM was positive in 29 (67%) of 43 cases who had been clinically diagnosed with the disease. In the study of Bose et al. (22), in 76% of 1011 suspected cases reported to the system measles IgM was detected positive. The lower rate of measles IgM positivity in our study may be attributed to the fact that the study of Eskiocak et al. (21) was conducted during the pandemic.

In our study, 39.8% of the reported cases consisted of Syrian citizens. In addition, it was determined that 95.5% of the cases had fever symptoms and 79.7% had not been vaccinated. In a study in China, Li et al. (23) determined that 69.8% of the cases were immigrants, 97.7% of the cases had fever symptoms and 34.9% of the cases had not been vaccinated. In the study of Werber et al. (24), it was reported that 11% of the cases consisted of asylum seekers. This was due to the different sociodemographic characteristics of the regions.

In our study, the median age of 1205 suspected measles cases was determined as 6. Contrary to our study, in the study conducted by Komobayashi et al. (25) in Japan, 39 (65%) of 60 measles cases were between the ages of 20-39. In our study, 661 cases (54.9%) were measles IgM positive. Of the cases, 960 (79.7%) were unvaccinated against measles, 141 (11.7%) had been vaccinated with a single dose, and 34 (2.8%) had been vaccinated with two doses. Vaccination status of 70 (5.8%) cases was unknown. In the study of Kuroiwa et al. (26), it was stated that 110 (59.5%) of 185 cases were unvaccinated. In the study of Bose et al. (22), it was reported that 39% of measles Igm positive cases were vaccinated with a single dose. In the study conducted by Werber et al. (24) in Germany, the median age of 1359 cases was reported to be 17, whereas 1,344 outbreak cases were ascertained, of which 943 (70%) were laboratory-confirmed (70%). Werber et al. (24) determined that 86% (1086) were not vaccinated against measles, 8% had been vaccinated once, 3% twice, 0.2% three times, whereas the vaccination status of 2% was unknown. In the study of Grammens et al. (27) in Belgium, 35% of 177 cases were unvaccinated, 8% had been vaccinated once, 3% twice, whereas the vaccination status of 54% was unknown. In a study from Italy, Palamara et al. (28) determined that 95% of 57 measles cases had not

Table 2. The relationship of the characteristics of the cases with Measles IgM positivity

Property	Measles IgM positive	Measles IgM negative	Chisquare	p
Gender				
Female	350 (56.2%)	273 (43.8%)	0.914	0.339
Male	311 (53.4%)	271 (46.6%)	-	-
Nationality				
Turkey	318 (43.9%)	407 (56.1%)	88.811	p<0.001
Syria	343 (71.5%)	137 (28.5%)	-	-
District				
Tarsus	460 (63.5%)	264 (36.5%)	55.196	p<0.001
Out of Tarsus	201 (41.8%)	280 (58.2%)	-	-
Case year				
2020	228 (63.5%)	121 (36.5%)	21.767	p<0.001
Out of 2020	433 (50.6%)	423 (49.4%)	-	-
Case season				
Winter	236 (69.2%)	105 (30.8%)	39.565	p<0.001
Out of winter	425 (49.2%)	439 (50.8%)	-	-
Fever				
Yes	637 (55.3%)	264 (44.7%)	2.474	0.116
No	24 (44.4%)	280 (55.6%)	-	-

been vaccinated. The study conducted by Nimpa et al. (29) on 112693 cases reported that 67.2% (75721) were unvaccinated. On the other hand, a study conducted in Ireland by Barrett et al. (30) reported that 31 of 40 confirmed cases were unvaccinated.

Study Limitations

Since the study data were obtained from the infectious disease reporting system, the status of measles vaccination for some cases had to be reported as "unknown". As the study was conducted in Mersin, the results obtained can only be generalized to Mersin.

Conclusion

In conclusion, a substantial portion of the cases reported in our study consisted of Tarsus residents and Syrian citizens. In addition, the rate of measles IgM positivity was found to be high among cases of Syrian citizens and those residing in the Tarsus region. It is recommended that vaccination rates for Syrian citizens and risk groups in the Tarsus region be increased and more training on protection from infectious diseases be provided. Before coming up to the winter season where the positivity rate is significantly high, increasing in-service training for health workers and providing public education bear significant importance to reduce the contagiousness of the disease. It is also important to consider measles among the preliminary diagnoses in patients with upper respiratory tract infections and conduct diagnostic tests for patients who are clinically compatible in terms of isolating measles patients and preventing the spread of the disease.

Ethics

Ethics Committee Approval: The ethics committee approval was obtained from the Scientific Research and Publication Ethics Committee of Toros University (decision number: 104, date: 15.10.2021).

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Mason WH. Çeviri: Baysal B. Enfeksiyon Hastalıkları Viral Enfeksiyonlar İçinde: Kliegman, Stanton, St. Geme, Schor, Behrman. Çeviri Editorü: Akçay T. Nelson Pediatri Cilt. 1. İstanbul: Nobel Tıp Kitabevleri; 2015. p.1069-75.
2. Doğru Ü, Hasanoğlu E. Enfeksiyon Hastalıkları Viral Enfeksiyonlar İçinde: Düşünsel R. Bideci A. Temel Pediatri. Ankara: Güneş Tıp Kitabevleri; 2010. p.354-5.
3. Kale G, Coşkun T, Yurdakök M. Pediatride Tanı ve Tedavi Hacettepe Uygulamaları. İstanbul: Güneş Tıp Kitabevleri; 2009. p.319-22.
4. World Health Organization (WHO). Measles. 2019. Available from: https://www.who.int/news-room/fact-sheets/detail/measles
5. Yalçın I, Salman N, Somer A. Virüs Enfeksiyonları İçinde: Neyzi O, Ertuğrul T. Pediyatri 4. Baskı Cilt 1. İstanbul: Nobel Tıp Kitabevleri; 2010. p.637-40.
6. Öztek Z. Halk Sağlığı Kuramlar ve Uygulamalar. Ankara: Bireklam Arısı; 2020.p.140.
7. Aksakoğlu G. Bulaşıcı Hastalıklarla Savaşım. İzmir: DEÜ Rektörlük Basımevi; 2008.p.72.
8. Güler Ç, Akın L. Halk Sağlığı Temel Bilgiler Cilt 1. Ankara: Hacettepe Üniversitesi Yayınları; 2012.p.421-4.
9. Bolotin S, Lim G, Dang V, Crowcroft N, Gubbay J, Mazzulli T, et al. The utility of measles and rubella IgM serology in an elimination setting, Ontario, Canada, 2009-2014. PLoS One 2017;12:e0181172.
10. Dietz V, Rota J, Izurieta H, Carrasco P, Bellini W. The laboratory confirmation of suspected measles cases in settings of low measles transmission: conclusions from the experience in the Americas. Bull World Health Organ 2004;82:852-7.
11. Mosquera MM, de Ory F, Gallardo V, Cuenca L, Morales M, Sa´nchez-Yedra W, et al. Evaluation of diagnostic markers for measles virus infection in the context of an outbreak in Spain. J Clin Microbiol 2005;43:5117-21.
12. Ratnam S, Tipples G, Head C, Fauvel M, Fearon M, Ward BJ. Performance of indirect immunoglobulin M (IgM) serology tests and IgM capture assays for laboratory diagnosis of measles. J Clin Microbiol 2000;38:99-104.
13. Gastañaduy PA, Banerjee E, DeBolt C, Bravo-Alcántara P, Samad SA, Pastor D, et al. Public health responses during measles outbreaks in elimination settings: Strategies and challenges. Hum Vaccin Immunother 2018;14:2222-38.
14. Orenstein WA, Strebel PM, Papania M, Sutter RW, Bellini WJ, Cochi SL. Measles eradication: is it in our future? Am J Public Health 2000;90:1521-5.
15. World Health Organization (WHO). UNICEF and WHO warn of perfect storm of conditions for measles outbreaks, affecting children. 2022. Available from: https://www.who.int/news/item/27-04-2022-unicef-and-who-warn-of--perfect-storm--of-conditions-for-measles-outbreaks--affecting-children
16. Hübschen JM, Bork SM, Brown KE, Mankertz A, Santibanez S, Mamou MB, et al. Challenges of measles and rubella laboratory diagnostic in the era of elimination. Clin Microbiol Infect 2017;23:511-5.
17. Moss W. Measles in Vaccinated Individuals and the Future of Measles Elimination. Clin Infect Dis 2018;67:1320-1.
18. Moss WJ, Strebel P. Biological feasibility of measles eradication. J Infect Dis 2011;204(Suppl 1):S47-53.
19. Saraswathy TS, Zahrin HN, Norhashmimi H, Az-Ulhusna A, Zainah S, Rohani J. impact of a measles elimination strategy on measles incidence in Malaysia. Southeast Asian J Trop Med Public Health 2009;40:742-7.
20. King A, Varughese P, De Serres G, Tipples GA, Waters J; Members of the Working Group on Measles Elimination. Measles elimination in Canada. J Infect Dis 2004;189(Suppl 1):S236-42.

21. Eskiocak M, Ekuklu G, Doğaner E, Yılmaz N, Saltık A. Short communication: the sensitivity of meales diagnosis by physicians and families during an intraepidemic period in Edirne: implications for measles surveillance. Bulletin of Microbiology 2008;42:143-8.
22. Bose AS, Jafari H, Sosler S, Narula APS, Kulkarni VM, Ramamurty N, et al. Case based measles surveillance in Pune: evidence to guide current and future measles control and elimination efforts in India. PLoS One 2014;9:e108786.
23. Li Z, Zhang Z, Wang F, Wei R, Zhao J, Liu F. measles outbreak in an office building in the crowded Metropolis of Beijing, China. BMC Infect Dis 2019;19:771.
24. Werber D, Hoffmann A, Santibanez S, Mankertz A, Sagabiel D. Large measles outbreak introduced by asylum seekers and spread among the insufficiently vaccinated resident population, Berlin, October 2014 to August 2015. Euro Surveill 2017;22:30599.
25. Komabayashi K, Seto J, Tanaka S, Suzuki Y, Ikeda T, Onuki N, et al. The Largest Measles Outbreak, Including 38 Modified Measles and 22 Typical Measles Cases in Its Elimination Era in Yamagata, Japan, 2017. Jpn J Infect Dis 2018;71:413-8.
26. Kuroiwa C, Vongphrachanh P, Xayyavong P, Southalack K, Hashizume M, Nakamura S. Measles Epidemiology and Outbreak Investigation Using IgM Test in Laos. J Epidemiol 2001;11:255-62.
27. Grammens T, Schirvel C, Leenen S, Shodu N, Hutze V, Mendes da Costa E, et al. Ongoing measles outbreak in Wallonia, Belgium, December 2016 to March 2017: characteristics and challenges. Euro Surveill 2017;22:30524.
28. Palamara MA, Visalli G, Picerno I, Di Pietro A, Puglisi G, Marano F, et al. Measles outbreak from February to August 2017 in Messina, Italy. J Prev Med Hyg 2018;59:E8-13.
29. Nimpa MM, Andrianirinarison JC, Sodjinou VD, Douba A, Masembe YV, Randriatsarafara F, et al. Measles outbreak in 2018-2019, Madagascar: epidemiology and public health implications. Pan Afr Med J 2020;35:84.
30. Barrett P, Cotter S, Ryan F, Connell J, Cronin A, Ward M, et al. A National Meassles Outbreak In Ireland Linked To A Single Imported Case, April To September, 2016. Euro Surveill 2018;23:1700655.