Le Infezioni in Medicina, n. 3, 222-226, 2014

Articolo originale

Original article

A measles outbreak in Catania, Sicily: the importance of high vaccination coverage and early notification of cases for health and economic reasons

Un'epidemia di morbillo a Catania, Sicilia: l'importanza di un'elevata copertura vaccinale e della notifica precoce dei casi per ragioni sanitarie ed economiche

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INTRODUCTION

Measles is a contagious exanthematic viral disease, more frequent in children and usually associated with permanent immunity [1-4]. Globally, measles morbidity and mortality rates have dramatically declined since 1963, due to the availability of a safe and effective vaccine and the implementation of vaccination strategies [1-4]. Nonetheless, measles remains a leading cause of childhood mortality worldwide, with an estimated 164,000 measles deaths in 2008 (a 78% reduction compared to mortality in 2000) [2].

In Italy, despite the increased uptake of measles vaccine on the national territory (from 74% in 2000 to 90.1% in 2011), outbreaks are observed at a regional basis [5-8]. Several factors may contribute to measles outbreaks, including importation from endemic countries and suboptimal vaccination coverage (<95%), especially among young adults born in the 1980s and 1990s, when the percentage of vaccinated children in Italy was very low [6]. Measles outbreaks have been reported in other European countries: a large outbreak has recently occurred in Switzerland (January 2011). It lasted seven months and 219 cases were notified to local health authorities (47 cases per 100000 inhabitants) [9-14]. Other epidemics occurred outside of Europe, such as in the United States, where measles has been declared "not endemic" in 2000, but in 2011 two outbreaks were recorded in Utah, comprising 13 cases [13].

Our aim is to describe the epidemiological and clinical characteristics of measles cases reported to the Service of Epidemiology of the Provincial Health Office 3 of Catania from January 2009 to May 2010 and the clinical characteristics of those cases admitted to the Infectious Diseases Unit of the Garibaldi Nesima Hospital, Catania.

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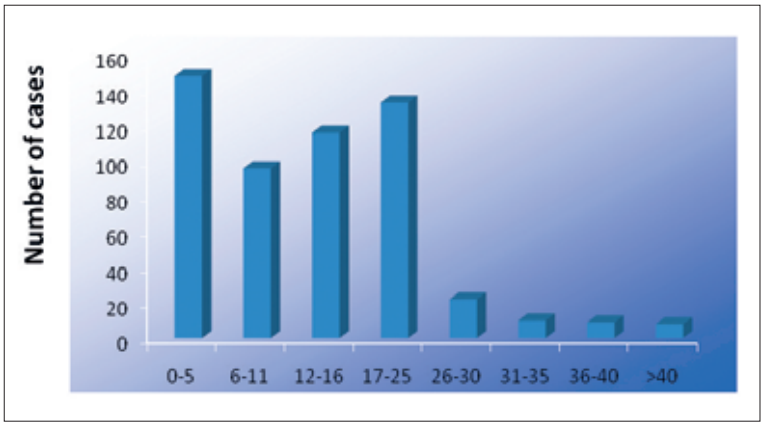

Figure 1 - Distribution of notified cases of measles by age.

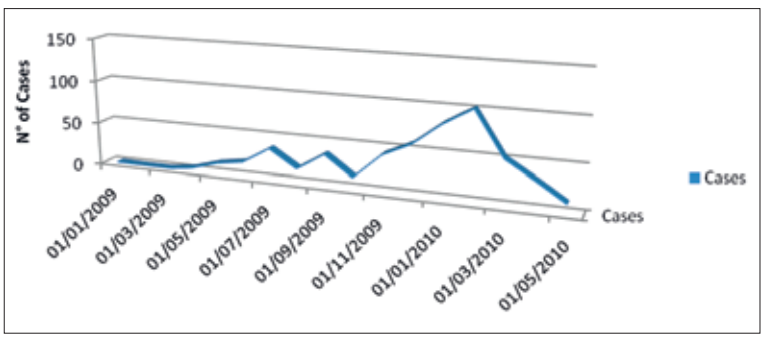

Figure 2 - Temporal trend of the measles epidemic.

METHODS

Demographic data and vaccination status of the patients were obtained from the database of the Provincial Health Office 3 of Catania. The clinical features and laboratory data were extracted from medical records of cases admitted to the Division of Infectious Diseases of the Garibaldi Nesima Hospital of Catania.

RESULTS

522 cases of measles were notified from January 2008 to May 2010: 286 males (54%), median age 12 years (interquartile range (IQR) 4-18 years). The majority of cases were observed in the age groups between 0-5 years (28%), 12-16 years (22%) and 17-25 years (25%) (Figure 1). 201 (38%) were students. 401 cases (77%) were notified by hospital physicians, 121 (23%) by general practitioners.

All patients but one had not been vaccinated; this patient had received a complete vaccination course. 102 cases (19%) were notified in February 2010 (Figure 2). 52 cases of measles were admitted to the Division of Infectious Diseases (44% male), median age 18 years (IQR 17-23 years). The most frequent laboratory abnormalities were elevated aminotransferase levels in 20 patients (38%), thrombocytopenia (22 pa-

Table 1 - Main laboratory abnormalities and complications occurred in 52 hospitalized patients.

	N (%)
Leukopenia	17/52(32)
Thrombocytopenia	22/52(42)
Hyper-ALT	20/52(38)
Hyper-CPK	19/52(36)
Conjunctivitis	2/52(3)
Bronchospasm	1/52(2)
Acute Hepatitis	2/52(3)
Cystitis	3/52(5)
Otitis	1/52(2)
Pneumonia	1/52(2)
Epistaxis	1/52(2)

ALT: alanine aminotransferase, CPK: creatine phosphokinase.

tients, 42%) and increased creatine phosphokinase (19 patients (36%)). Complications, such as pneumonia, haemorrhagic cystitis and acute hepatitis, were observed in 10 patients (19%), all older than 18 years.
Total days of hospitalization were 248 (mean 5.27) (Table 1).

DISCUSSION

Despite the increase in vaccination coverage, the recent outbreaks of measles show that immunization practice is still insufficient [1-14]. As observed in other epidemics in Italy, in Europe and in the United States, most of our cases were recorded in unvaccinated adolescents and young adults; in fact, the greater vaccination coverage of children has significantly limited the circulation of the virus in childhood, but it cannot stop the transmission of infection to older individuals [1-4].
In Italy, monovalent measles vaccine was introduced in 1976 and replaced in the early 1990s by the combined measles-mumps-rubella (MMR) vaccine.
However, the percentage of vaccinated children was as low as 50% in the 1990s and only one dose of MMR was offered until 2003. In 2003, with the first national plan for the elimination of measles, a two-dose schedule was introduced and vaccination coverage increased up to 90.1% in 2011 [6].
Unfortunately, a large amount of young adults have not been vaccinated and therefore are susceptible to measles infection. In addition, it has been shown that >95% of a population is needed to be immune in order to achieve "herd immunity", stopping measles endemic transmission and protecting those subjects who cannot be vaccinated, such as severe immunocompromised ones [15].
Nosocomial transmission of measles is of great concern because of possible serious complications in infants and adults, particularly in immunodeficient patients, who cluster in hospitals.
In addition, it is crucial for hospitals to have infection control guidelines on the prevention and control of measles, in order to ensure that healthcare workers, who have not acquired natural immunity and have not been vaccinated, may be adequately protected.
Offering MMR vaccination to all healthcare workers who lack immunity to measles may represent a cost-effective strategy, not only to reduce the morbidity and mortality attributable to the disease, but also to limit the costs of evaluating and containing an outbreak [16].
In Italy, hospitalizations have been estimated to account for 40-50% of direct costs of measles cases [17].
In 2002-2003 total direct measles costs have been between € 17.6-22 million. Considering that the mean cost of one dose of vaccine in 2002 was € 11.5, with the direct measles costs incurred by the Italian Nation Health System in 2002-2003 approximately 1.5 to 1.9 million children could have been vaccinated with one dose of MMR vaccine, thus avoiding many measles cases and hospitalizations [18].
The observation that notifications were made mainly by hospital physicians would also suggest a marked underestimate of the phenomenon.
For the purposes of disease control, to limit epidemics and avoid complications, most frequently observed in adult patients, the rapid and complete notification of cases and the increase in vaccination coverage for adolescents, young adults and contacts appear essential.
Healthcare providers should remind their patients of the importance of being current with measles, mumps and rubella vaccination, especially before international travels [4].
Recognition of suspected measles cases by healthcare providers and immediate reporting to public health officials can help preventing illness and associated costs [4].
Sustained high vaccination coverage, effective surveillance and early control measures including quarantine of unvaccinated exposed persons should be implemented in order to interrupt virus circulation and prevent measles outbreaks [4].

Conflict of interest: None

Funding sources: None

Keywords: measles, outbreak, notification, vaccination.

SUMMARY

Measles is a paediatric exanthematous disease. Even though vaccination has dramatically reduced measles morbidity and mortality, outbreaks still occur due to insufficient vaccination coverage and importation of the virus from endemic regions. Although child vaccination coverage in Italy has been broadened (from 74% in 2000 to 90.1% in 2011), outbreaks are still observed at a regional level. We describe epidemiological and clinical characteristics of cases reported from January 2009 to May 2010 to the Epidemiology Service of the Provincial Health Authority of Catania. We obtained demographic data and vaccination status from the database of the Epidemiology Service and clinical features and laboratory data from medical records. In all, 522 cases were notified: 286 males (54%), median age 12 years (interquartile range(IQR) 4-18); 401 cases (77%) were notified by the hospital, and 121 (23%) by general practitioners. Only one patient had been previously vaccinated. 52 cases were hospitalized, median age 18 years (IQR 17-23). We observed hypertransaminasaemia in 20 patients (38%), thrombocytopenia in 22 patients (42%) and a creatine phosphokinase increase in 16 (30%). Complications (pneumonia, haemorrhagic cystitis, acute hepatitis) occurred in 10 patients (19%), all older than 18. Recent outbreaks show that immunization practices are still insufficient. Most cases were recorded in adolescents and young adults; even if the vaccine has limited virus circulation in childhood, it did not prevent the infection of other age groups. The number of notifications also suggests that the phenomenon is underestimated. In order to monitor the disease we need early notification of cases and increased vaccination coverage.

RIASSUNTO

Il morbillo è una malattia esantematica virale. Sebbene la vaccinazione ne abbia significativamente ridotto mortalità e morbilità, delle epidemie di morbillo continuano a verificarsi a causa dell'insufficiente copertura vaccinale e dell'importazione del virus da regioni in cui è endemico. In Italia, nonostante la vaccinazione infantile sia stata potenziata a livello nazionale (dal 74% nel 2000 al 90,1% nel 2011), delle epidemie continuano a verificarsi a livello regionale. Nel nostro studio descriviamo le caratteristiche epidemiologiche e cliniche dei casi notificati dal gennaio 2009 al maggio 2010 al Servizio di Epidemiologia Provinciale di Catania. I dati demografici e vaccinali sono stati estratti dal database del Servizio di Epidemiologia, i dati clinici e laboratoristici dalle cartelle cliniche. 522 casi di morbillo sono stati notificati: 286 maschi (54%), età mediana 12 anni (range interquartile (RIQ) 4-18). 401 casi (77%) sono stati notificati in ospedale, 121 (23%) dai medici di base. Solo un paziente era stato precedentemente vaccinato. Tra i casi notificati, 52 pazienti sono stati ospedalizzati, età mediana 18 anni (RIQ 17-23). In 20 pazienti (38%) è stata osservata ipertransaminasemia, in 22 (42%) trombocitopenia e in 16 (30%) aumento della creatinfosfochinasi. Talune complicanze (polmonite, cistite emorragica, epatite acuta) sono state osservate in 10 pazienti (19%). I focolai epidemici di morbillo recentemente osservati mostrano che la copertura vaccinale è inadeguata. La maggior parte dei casi è stata osservata tra adolescenti e giovani adulti, i quali non sono stati vaccinati e risultano pertanto esposti al rischio di contrarre l'infezione. Il numero dei casi notificati suggerisce inoltre una sottostima del fenomeno. Per un monitoraggio appropriato della malattia appare cruciale la notifica precoce dei casi e l'aumento della copertura vaccinale.

REFERENCES

[1] Spika J. Measles elimination 2010 target: the need to meet the specific risk group. *Euro. Surveill.* 11, 10, pi 648, 2006.
[2] Moss W.J., Griffin D.E. Measles. *Lancet*. 379, 9811, 153-164, 2012.
[3] Carrillo-Santisteve P., Lopalco P.L. Measles still spreads in Europe: who is responsible for the failure to vaccinate? *Clin. Microbiol. Infect*. 18, S5, 50-56, 2012.
[4] Muscat M. Who gets measles in Europe? *J. Infect. Dis.* 204, S1, 353-365, 2011.
[5] Magurano F., Fortuna C., Baggieri M. et al. Molecular epidemiology of measles virus in Italy during 2008. *Ann. Ist. Super. Sanità.* 49, 1, 50-55, 2013.
[6] Filia A., Bella A., Rota M.C., et al. Analysis of na-

tional measles surveillance data in Italy from October 2010 to December 2011 and priorities for reaching the 2015 measles elimination goal. *Euro. Surveill.* 18, 20, pii 20480, 2013.
[7] D'Agaro P., Molin G.D., Gallo T., et al. Epidemiological and molecular assessment of a measles outbreak in a highly vaccinated population of northeast Italy. *Epidemiol. Infect*. 139, 11, 1727-1733, 2011.
[8] Bassetti M., Schenone E., Calzi A., et al. Measles outbreak in adults in Italy. *Infez. Med.* 19, 1, 16-19, 2011.
[9] Kasper S., Holzmann H., Aberle S.W., et al. Measles outbreak in Styria, Austria, March-May 2009. *Euro. Surveill.* 14, 40, pii 19347, 2009.
[10] Parent du Châtelet I., Floret D., Antona D., Lévy-Bruhl D. Measles resurgence in France in 2008, a preliminary report. *Euro. Surveill*. 14, 6, pii 19118, 2009.
[11] Marinova L., Kojouharova M., Mihneva Z. An ongoing measles outbreak in Bulgaria, 2009. *Euro. Surveill*. 14, 26, pii 19259, 2009.
[12v Delaporte E., Wyler Lazarevic C.A., Iten A., Sudre P. Large measles outbreak in Geneva, Switzerland, January to August 2011: descriptive epidemiology and demonstration of quarantine effectiveness. *Euro. Surveill*. 18, 6, pii 20395, 2013.
[13] Centers for Disease Control and Prevention. Two Measles Outbreaks After Importation-Utah, Marc-June 2011. *MMWR. Morb. Mortal. Wkly. Rep.* 62, 12, 222-225, 2013.
[14] Richard J. L., Masserey Spicher V. Large measles epidemic in Switzerland from 2006 to 2009: consequences for the elimination of measles in Europe. *Euro. Surveill.* 14, 50, pii 19443, 2009.
[15] Griffin D. E., Pan C.H., Moss W.J. Measles vaccines. *Front. Biosci*. 13, 1352-1370, 2008.
[16] Krause P.J., Gross P.A., Barrett T.L., et al. Quality standard for assurance of measles immunity among healthcare workers, Infectious Diseases Society of America. *Clin. Infect. Dis.* 18, 3, 431-436, 1994.
[17] Filia A., Brenna A., Panà A., Maggio Cavallaro G., Massari M., Ciofi degli Atti M.L. Health burden and economic impact of measles-related hospitalizations in Italy in 2002-2003. *BMC. Public. Health.* 7, 169, 2007.