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SHORT COMMUNICATION



Did social distancing measures deployed for SARS-CoV-2/COVID-19 control have an impact on invasive meningococcal disease?

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ABSTRACT

We investigated the impact of social distancing measures, used to contain or mitigate SARS-CoV-2 spread, on the transmission of invasive meningococcal disease (IMD) in Italy. To this end, the temporal correlation between the implementation of lockdown measures in 2020 and IMD incidence was evaluated. A dramatic decline of IMD incidence was observed, suggesting that the measures applied to contain SARS-CoV-2 in Italy affected other infectious diseases transmitted through direct contact and droplets, at least in the early phase of the COVID-19 pandemic.

KEYWORDS

Lockdown; social distancing; control measures; SARS-CoV-2; invasive meningococcal disease

Introduction

In late December 2019, clusters of cases of pneumonia of unknown origin were reported in the city of Wuhan, Hubei Province, China. In a short time, several generations of cases were identified, suggesting that sustained transmission was ongoing in the community [1–3]. Soon after, cases of COVID-19 were observed in other countries and continents, leading to the WHO pandemic declaration on 11 March 2020 [4].

In Wuhan, lockdown and other social distancing measures were first implemented and demonstrated to effectively control the epidemic [5].

Italy was the first country heavily affected outside China. In the second half of February 2020 a severe case of COVID-19 a severe case of COVID-19 diagnosed in a young man in the Lombardy Region. After the diagnosis confirmation of the first case, the epidemic – initially located in the South-East of Lombardy – spread in other areas of the same Region and in other Regions [6].

Control measures were implemented by the Italian Government since 23 February [7], when a so-called ‘Red Zone’ (an area surrounded by a ‘cordon sanitaire’, with suspension of all activities and invitation to social distancing) was established in the initial epicenter of the epidemic. Then, social distancing measures with the shut-down of restaurants, bars, and other shops, football games and other recreational activities, together with human mobility restrictions, were implemented on the 11th of March 2020 with the slogan ‘I stay at home’. Lockdown measures had an impressive outcome, leading to a dramatic decline of both the R_t and the incidence of COVID-19 cases [8–10]. After that period, lockdown measures were progressively relaxed, but some measures, such as local quarantine,

ban of mass gatherings, local school closures, and recommendation to use of face masks also outdoor, were kept in place until June 2021.

Since social distancing measures may affect the transmission of other infectious diseases, in particular, those transmitted through direct contact and droplets, we evaluated whether there was an impact of such measures on the incidence of invasive meningococcal disease (IMD) cases.

Methods

The trend of IMD cases in the year 2020, before and after the implementation of the intervention, was evaluated. The number of laboratory-confirmed cases reported in 2020 was also compared with that of the previous year. The source of the data was the National Surveillance System for IMD coordinated by the Istituto Superiore di Sanità (<https://w3.iss.it/site/mabi/login/login.asp>). The statistical significance of the associations was assessed by using standardized tests for categorical variable (chi-square, with statistical significance fixed at $p < 0.05$).

Results

Overall, 190 and 69 cases of IMD were reported in Italy in 2019 and 2020 (Figure 1), corresponding to incidence rates of 0.31 and 0.12 cases/100.000 inhabitants, respectively. Interestingly, the number of cases was similar in January 2019 and 2020 (27 and 26 cases, respectively), and only slightly higher in February 2019 compared to February 2020 (20 vs. 15 cases), but then it declined dramatically by 90.4% between March 1 and June 30, from 73 cases in 2019

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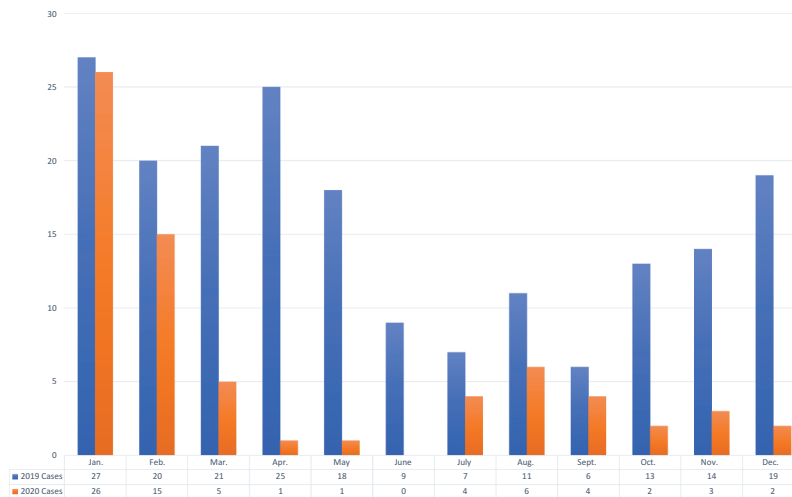


Figure 1. Number of Invasive Meningococcal Diseases reported by month in Italy in 2019 and in 2020.

to 7 cases reported in the same period of the year 2020. The difference was statistically significant ($p < 0.000001$). In particular, the case ratio between 2019 and 2020 increased from 1.04:1 in January to 25:1 in April, whereas no cases were reported in June 2020.

These findings are confirmed after considering the trend observed in the last 5 years before 2020 (Figure 2). The mean number of cases reported during the period 2015–2019 was 195 per year, ranging from 170 to 227 *National Surveillance System for IMD, ISS*, <https://w3.iss.it/site/mabi/login/login.asp>.

In Italy, IMD surveillance is laboratory-based and, therefore, the laboratory-confirmed cases could not be used as a comparator against the surveillance cases and overall performs well, with both completeness and timeliness improving in time [11].

The decreasing trend regarded all the meningococcal serogroups (Table 1) and tended to persist up to the end of 2020 (Figure 1). Noteworthy, only four cases

of IMD were reported in the first five months of the year 2021, confirming the decreasing trend (data not shown).

Discussion and conclusions

The impact of lockdown and other social distancing measures on viral respiratory diseases like influenza has already been described. For this purpose, a low activity was reported by the influenza-like illness sentinel surveillance system in Italy (<https://w3.iss.it/site/rmi/influnet/pagine/rapportoinflunet.aspx>) during the whole winter season 2020/2021.

Our data now strongly suggest that social distancing measures had a tremendous impact on the incidence of other infectious diseases, including invasive bacterial infections, which are transmitted by close contact, as suggested by the dramatic decrease of IMD cases observed in Italy during the 2020 'lockdown period'. This

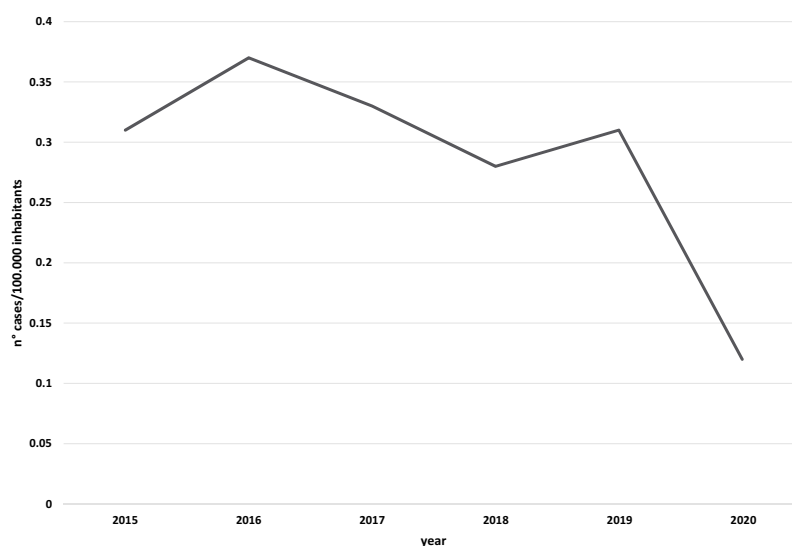


Figure 2. Incidence of Invasive Meningococcal Diseases by year, 2015–2020.

Table 1. Total number of Invasive Meningococcal Disease cases in Italy by year and serogroups, 2019 and 2020.

	2019	2020	Total
B	83 (43.7%)	34 (49.3%)	117
C	45 (23.7%)	11 (15.9%)	56
W	8 (4.2%)	1 (1.4%)	9
Y	26 (13.7%)	5 (7.2%)	31
nd [^]	27 (14.2%)	18 (26.1%)	45
cnl	1 (0.5%)	0	1
Total	190	69	259

[^]nd: not-determined serogroup.

is not unexpected, considering that close contact is required for transmission of both pathogens. However, different levels of proximity are needed for the transmission of the two agents, and this may influence, at least in part, estimates of the basic reproductive number (R_0 , which is lower for *N. meningitidis* (R_0 about 1.36, ref [12, 13]) than for SARS-CoV-2, with an estimated R_0 which approximates 3 for the original Wuhan strain [14]. Furthermore, the population immunity level may also differ. These factors may explain the persistence of a decreasing trend after lifting the most restrictive measures.

We cannot rule out that also other factors might have contributed to the decline in IMD incidence. For example, behavioral change due to fear of contagion after the detection of the first autochthonous confirmed COVID-19 case on February 2020, before the national lockdown was implemented, might have played a role in the initial IMD decline, determining a decrease of the SARS-CoV-2 R_t and incidence rates. However, the incidence of IMD declined dramatically in the following months, after the deployment of nationwide control measures. Secondly, the introduction in 2017 of the meningococcal B (MenB) immunization among less than 1-year-old children (vaccine coverage increased from 46% in 2018 to 69% in 2019) (Source: http://www.salute.gov.it/imgs/C_17_tavole_20_allegati_itemAllegati_0_fileAllegati_itemFile_7_file.pdf) might have contributed, at least in part, to the decline of IMD. However, the decrease was observed for all the meningococcal serogroups, suggesting that the decline was not attributable to specific interventions that could affect only one of them. Finally, since many people may not seek medical care or refuse hospitalization during the lockdown, this could affect the trend of diseases other than COVID-19. However, such factor is unlikely having influenced diagnosis and reporting of IMD due to the severity of the clinical picture, which usually requires hospital and/or critical care.

In conclusion, lockdown and other social distancing measures implemented to control the spread of SARS-CoV-2 were strongly associated with a dramatic decline of IMD cases in Italy. The rare cases reported in the first part of the year 2021 provide further evidence on a long-term effect of such measures.

Disclosure statement

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