

Fewer non-COVID-19 respiratory tract infections and gastrointestinal infections during the COVID-19 pandemic

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Abstract

For preventing the spread of the coronavirus disease 2019 (COVID-19) pandemic, measures like wearing masks, social distancing, and hand hygiene played crucial roles. These measures may also have affected the expansion of other infectious diseases like respiratory tract infections (RTI) and gastro-intestinal infections (GII). Therefore, we aimed to investigate non-COVID-19 related RTI and GII during the COVID-19 pandemic. Patients with a diagnosis of an acute RTI (different locations) or acute GII documented anonymously in 994 general practitioner (GP) or 192 pediatrician practices in Germany were included. We compared the prevalence of acute RTI and GII between April 2019–March 2020 and April 2020–March 2021. In GP practices, 715,440 patients were diagnosed with RTI or GII in the nonpandemic period versus 468,753 in the pandemic period; the same trend was observed by pediatricians (275,033 vs. 165,127). By GPs, the strongest decrease was observed for the diagnosis of influenza (−71%, $p < 0.001$), followed by acute laryngitis (−64%, $p < 0.001$), acute lower respiratory infections (bronchitis) (−62%, $p < 0.001$), and intestinal infections (−40%, $p < 0.001$). In contrast, the relatively rare viral pneumonia strongly increased by 229% ($p < 0.001$). In pediatrician practices, there was a strong decrease in infection diagnoses, especially influenza (−90%, $p < 0.001$), pneumonia (−73%, $p < 0.001$ viral; −76%, $p < 0.001$ other pneumonias), and acute sinusitis (−66%, $p < 0.001$). No increase was observed for viral pneumonia in children. The considerable limitations concerning social life implemented during the COVID-19 pandemic to combat the spread of SARS-CoV-2 also resulted in an inadvertent but welcome reduction in other non-Covid-19 respiratory tract and gastro-intestinal infections.

KEYWORDS

common cold, COVID-19, pandemic, respiratory tract infections

1 | INTRODUCTION

The implementation of strict rules worldwide to mitigate the impact of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic has had dramatic consequences on social life. Measures such as the reduction of seats in indoor spaces, social distancing, the mandatory utilization of masks, and “stay at home” campaigns have

dramatically reduced interactions between people. These measures proved effective in lowering SARS-CoV-2 infection rates and thereby impeding the spread of the virus.^{1,2} However, various other pathogens, viruses, and bacteria are transmitted from one individual to another in a similar manner.^{3,4} This applies, for example, to many pathogens that cause respiratory tract infections and intestinal infections.⁵ Although incidence rates for various noninfectious acute

medical conditions and disorders such as stroke and myocardial infection decreased during the coronavirus disease 2019 (COVID-19) pandemic, the behavior change resulting from the implementation of strict hygiene rules may also have caused a “real” decrease in rates of non-COVID-19 infectious diseases.^{5,6} In other words, measures implemented to combat COVID-19 pandemic may also have influenced the spread of other germs causing respiratory tract infections (RTI) and gastro-intestinal infections (GII). For this reason, we aimed at investigating the incidence of non-COVID-19 RTIs and GIIs during the COVID-19 pandemic in the present study using data from a large database supplied with data by general practitioners and pediatricians in Germany.

2 | MATERIAL AND METHODS

2.1 | Database

This cross-sectional study was based on electronic medical record data from the Disease Analyzer database (IQVIA), which compiles drug prescriptions, diagnoses, and general medical and demographic data obtained directly in anonymous format from computer systems used in the practices of GPs and specialists.⁷ Diagnoses, prescriptions, and the quality of reported data are monitored by IQVIA based on an array of criteria. The coverage of this database is around 3% of all private practices in Germany. In Germany, the sampling methods used to select physicians' practices have been shown to be appropriate for obtaining a population-representative database of primary and specialized care.⁷ The study was carried out in compliance with the latest version of the Declaration of Helsinki.

2.2 | Study population

The analysis included patients who received at least one diagnosis of acute respiratory tract infection or acute gastro-intestinal infection (ICD-10: A08, A09) between April 2019 and March 2021 from one of 994 general practitioner (GP) or 192 pediatrician practices that routinely send data to the Disease Analyzer database (IQVIA). Acute respiratory tract infections included nasopharyngitis (ICD-10: J00), sinusitis (ICD-10: J01), tonsillitis (ICD-10: J02), pharyngitis (ICD-10: J03), laryngitis (ICD-10: J04, J05), upper respiratory infections of multiple and unspecified locations (ICD-10: J06), influenza (ICD-10: J09–J11), viral pneumonia (J12), other types of pneumonia (J13–J18), and acute lower respiratory infections such as bronchitis (J20–J22). A total 1,367,298 individuals were included in the study.

2.3 | Study outcomes

This study's primary outcomes were the number of respiratory tract infection and gastro-intestinal infection diagnoses documented by

GPs and pediatricians in April 2019–March 2020 (nonpandemic period) compared to April 2020–March 2021 (pandemic period).

2.4 | Statistical analyses

To assess changes in the detection of infection diseases, we compared the results for April 2020–March 2021 with those for April 2019–March 2020 and calculated the percentage change between both periods. We also used the mean number of documented infection diagnoses per practice to demonstrate practitioners' perceived changes. The one-sample Kolmogorov–Smirnov test was used to check whether the data (patient number per practice) were distributed normally. As there was evidence that the data were not normally distributed, the number of patients with diagnoses per practice was compared for the two periods using a nonparametric Wilcoxon signed-rank test. This test was also used to compare the average ages of patients diagnosed in nonpandemic and pandemic periods. Proportions of women and men, patients in GP and pediatrician practices and age groups were compared using Chi² tests. A value of $p < 0.05$ were considered statistically significant. Analyses were carried out using SAS version 9.4 (SAS Institute Inc).

3 | RESULTS

3.1 | Patient characteristics

In GP practices, 715,440 patients were diagnosed with RTI or GII in the nonpandemic period versus 468,753 in the pandemic period; the same trend was observed by pediatricians (275,033 vs. 165,127). Patient characteristics are presented in Table 1. There were no significant or large age- or sex-related differences between patients diagnosed in nonpandemic periods and those diagnosed in pandemic periods.

3.2 | Documented infection diagnoses during the pandemic period compared to the nonpandemic period in GP practices

Table 2 shows the differences in the number of patients with infection diagnoses between nonpandemic and pandemic periods. The number of patients per GP practice with the most diagnoses decreased significantly over the period from April 2020–March 2021 compared to April 2019–March 2020. The greatest decrease was observed for influenza (–71%, $p < 0.001$), followed by acute laryngitis (–64%, $p < 0.001$), acute lower respiratory infections (bronchitis) (–62%, $p < 0.001$), and GIIs (–40%, $p < 0.001$). Conversely, the relatively rare viral pneumonia increased dramatically by 229% ($p < 0.001$). Only, 12% of patients diagnosed with pneumonia in pandemic time, had a Covid-19 diagnosis.

TABLE 1 Sociodemographic characteristics of patients diagnosed with at least one upper respiratory tract or intestinal infection diagnosis in April 2019–March 2020 and April 2020–March 2021

	General practitioners			Pediatricians		
	April 2019–March 2020 (n = 715,440)	April 2020–March 2021 (n = 468,753)	p value	April 2019–March 2020 (n = 275,033)	April 2020–March 2021 (n = 165,127)	p value
Age in years, mean (SD)	41.4 (20.0)	41.4 (20.0)	0.683	5.7 (4.5)	5.8 (4.6)	0.018
<6	2.2	2.0	<0.001	56.2	54.9	<0.001
7–12	3.0	3.1		33.5	34.3	
13–17	5.7	5.7		10.3	10.8	
18–30	23.3	23.2				
31–50	32.4	33.0				
51–65	21.3	21.1				
66–80	7.9	7.6				
>80	4.2	4.4				
Sex						
Male	48.1	48.4	0.001	52.1	52.5	0.027
Female	51.9	51.6		47.9	47.5	

Note: Data are percentages unless otherwise specified.

TABLE 2 Total annual change in infection diagnoses (per practice) in general and pediatrician practices (April 2019–March 2020 compared to April 2020–March 2021)

Diagnosis	General practitioners			Pediatricians		
	April 2019–March 2020 mean (SD)	April 2020–March 2021 mean (SD)	Change in %	April 2019–March 2020 mean (SD)	April 2020–March 2021 mean (SD)	Change in %
Viral or unspecified gastro-intestinal infections	192.4 (161.0)	116.2 (102.5)	−40***	321.8 (192.4)	138.3 (96.9)	−57***
Respiratory tract infections						
Acute nasopharyngitis	52.2 (122.6)	33.2 (72.1)	−36	188.5 (326.3)	133.9 (237.1)	−29
Acute sinusitis	40.3 (66.6)	16.9 (27.5)	−58***	12.8 (25.9)	4.5 (9.8)	−66***
Acute pharyngitis	62.5 (103.2)	31.5 (86.9)	−50***	173.1 (228.8)	87.2 (137.1)	−50***
Acute tonsillitis	57.5 (60.5)	24.3 (26.4)	−58***	250.9 (226)	87.9 (120.3)	−65***
Acute laryngitis	27.0 (50.7)	9.7 (24.3)	−64***	96.4 (169.8)	36.0 (100.2)	−63***
Acute upper respiratory infections of multiple and unspecified sites	326.7 (283.3)	260.8 (346.3)	−20***	798.6 (606.9)	517.5 (484)	−35***
Influenza	23.7 (72.7)	6.7 (27.2)	−71***	54.2 (76.7)	5.2 (22.6)	−90***
Viral pneumonia	0.3 (2.8)	1.0 (4.4)	+229***	1.4 (4.0)	0.4 (1.2)	−73***
Other pneumonia	28 (28.5)	14.3 (13.6)	−49***	71.2 (77.9)	16.9 (25.2)	−76***
Acute lower respiratory infections	143 (176.2)	54.5 (132.4)	−62***	233.4 (257.9)	88.8 (149.5)	−62***

***<0.001.

3.3 | Documented infection diagnoses during the pandemic period compared to the nonpandemic period in pediatrician practices

There was a strong decrease in infection diagnoses in pediatrician practices, especially influenza (−90%, $p < 0.001$), pneumonia (−73%, $p < 0.001$ viral; −76%, $p < 0.001$ other pneumonias), and acute sinusitis (−66%, $p < 0.001$). No increase in viral pneumonia was observed in children (Table 2). However, a decrease of 57% ($p < 0.001$) for GIs was detected in children.

4 | DISCUSSION

We observed a remarkable decrease in non-SARS-CoV-2-related infections of the respiratory tract in adults as well as children during the COVID-19 pandemic, with both general practitioners and pediatricians treating fewer patients with infections of the lower and upper respiratory tract. An average of 23.7 adult patients per practice were diagnosed with influenza during the prepandemic period compared to 6.7 adults during the COVID-19 pandemic (−71%); this decrease was even more pronounced in children (mean 54.2 to mean 5.2 diagnoses per practice, decrease of 90%). A similar trend was observed for gastrointestinal infections (decrease of 40% in adults; decrease of 57% in children). By contrast, the less common viral pneumonia, which typically occurs in patients with COVID-19, was diagnosed disproportionately more often during the pandemic than during the reference period in 2019–2020 (increase of 229%).

It can be speculated that the reduction in infection diagnoses established in general practitioner and pediatrician practices followed the general trend observed for many diseases during the pandemic period.^{5,8,9} Indeed, given the circumstances, many patients would have feared being infected with SARS-CoV-2 and adapted their behavior accordingly. Nevertheless, this seems an unlikely explanation for the results we have reported for two reasons. The vast majority of patients in our study group are of working age, so in many cases, individuals may need a sick certificate from their general practitioner for their employer when suffering from a common cold. In addition, these individuals would be required to be tested for SARS-CoV-2, which also would make it necessary for them to consult their general practitioner. However, the extent to which subjects refrained from seeking medical help and any resultant underreporting affected our results remains unclear. Taking into account the fact that general hygiene rules and contact limitation measures implemented during the pandemic have restricted the spread of many other germs, it appears more likely that the decline in non-COVID-19 infections observed in our study is a result of these measures and of increased hygiene awareness rather than a reluctance on the part of patients to seek medical help. Previous studies have found a decrease in cases for various entities of RTIs in both adults and children during the pandemic.^{10,11} A number of authors have discussed the fact that the current COVID-19 pandemic provided a good opportunity for effective education in good hygiene practice, speculating that this

could have a lasting impact in terms of controlling the spread of infectious diseases.¹¹ In this regard, the decline detected for influenza is of particular interest, as the global seasonal spread for this disease is comparable to the COVID-19 pandemic we are currently experiencing.¹² As demonstrated in previous studies, we also noticed a decline in influenza cases in both adults and children; some reports even indicate the complete collapse of influenza epidemics during 2020–2021 season.^{13,14} In the context of in part limited resources for the medical care, this observation represents a welcome effect; less cases of seasonal influenza preserve medical care systems in critical phases of the COVID-19 pandemic.^{13,14}

One result, observed in our study, followed an opposite trend. The less common finding of viral pneumonia increased by 229% in the pandemic period. This may be due to a bias determined by the pandemic environment, as viral pneumonia is a landmark of COVID-19.¹⁵ This observation could also be a result of a reporting bias in cases where the initial diagnosis of viral pneumonia in association with a suspected COVID-19 infection was established, but not revised promptly after ruling out SARS-CoV-2 by means of polymerase chain reaction testing.¹⁶

One previous investigation reports that the number of consultations in gastroenterological practices and corresponding diagnoses related to gastroenterological illness decreased gradually during the COVID-19 pandemic.¹⁷ Jördens and colleagues reported a reduction of 19% in the rate of gastro-intestinal infections.¹⁷ The authors discussed this finding in the context of restrictions affecting social life, such as the closure of bars and restaurants and travel restrictions as well as changes in patient behavior leading to a preference to treat their symptoms without medical consultation.¹⁷ In contrast to these reported results, we noticed a more pronounced decline in GIs in children (−57%) and adults (−40%) in our study. One explanation for this difference could be the fact that we investigated diagnosis rates in general practitioner and pediatrician practices while Jördens and colleagues investigated data derived from gastroenterology practices. It is possible that patients with a simple GI would choose to attend the general practitioner first rather than consulting a specialized gastroenterologist. With respect to the decrease in GIs during the pandemic detected in both investigations, we would also add that the decline could also be the result of increased awareness regarding hygiene and the transmission of infection.

Our study is subject to several limitations, which need to be acknowledged at this point. First, no information was available on any other potential reasons for the decrease in the number of medical consultations. Second, medical services may only have been able to accommodate a reduced number of non-COVID-19 consultations during the pandemic. Third, RTI and GI diagnosis data relied solely on ICD-10 codes, and no data was available on the diagnosis process or the severity/activity of the disease. Fourth, no information was available on behavioral factors (e.g., alcohol use, smoking, and sedentary lifestyle) and the role played by these factors therefore could not be examined. Fifth, no hospital data was available, and only outpatients were analyzed.

The two major strengths of this study are the number of patients available for analysis and the detailed analyses using real-world data. The latter is particularly relevant, as the main medical point of contact for the diseases we analyzed is indeed the general practitioner for adults and the outpatient pediatrician for children.

5 | CONCLUSION

The restrictions implemented during the COVID-19 pandemic were aimed at reducing SARS-CoV-infections, but obviously also decreased cases of other infectious diseases such as non-COVID-19 RTIs and GIs. The gradual increase in hygiene awareness brought about as a result of the COVID-19 pandemic would also have influenced the reduced rates detected for non-COVID-19 RTIs and GIs, respectively. It can be speculated that the educational benefit gained in the COVID-19 pandemic could contribute to controlling the spread of infectious diseases in the future.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Christian Tanislav contributed to the design of the study, managed the literature searches, wrote the first draft of the manuscript. Karel Kostev contributed to the design of the study, performed the statistical analyses, and corrected the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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