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Short Communication

COVID-19 exposure risk for family members of healthcare workers: An observational study



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ABSTRACT

Background: Many publications have considered the exposure risk to COVID-19 of the general population and healthcare workers. However, no available papers have discussed the risk of exposure by family members of health care workers.

Aims: The present study collected data on SARS-COV-2 positive family members (FM) of health care workers (HW) using serological rapid IgM/IgG tests (SRT), compared to positive HWs on SRT and serological quantitative IgG tests (SQT).

Methods: The study was conducted from May 2 to 31, 2020. Thirty-eight HWs were tested by both SRT and SQT; 81 FMs were screened using SRT. Descriptive statistical analyses were used to summarize the data.

Results: Of the 38 HWs, two (5,3%) showed an IgG line on SRT, confirmed by SQT. Thirty-two HWs decided on self-isolation from the family during the SARS-COV-2 spread. Out of 81 FMs, 26 (32,1%) were found IgG positive on SRT. Eleven (42%) of them had symptoms typical for COVID-19, during the study period. In two families, the HWs were the only negative cases.

Conclusions: The general population's exposure to COVID-19 is less controlled than that of HWs. HWs experienced a lower infection rate than their families and did not represent a main transmission risk for relatives.

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Introduction

Many papers have studied COVID-19 transmission in family clusters (Lebow, 2020; Qian et al., 2020; Tang et al., 2020; Xia et al., 2020). Presymptomatic infectors have a variety of clinical presentations (Lebow, 2020) and generally, children were not infected. Based on these papers, a general concern of healthcare workers (HW) for their families came up. Many HWs decided to isolate themselves from their families to reduce the risk of transmission; however, no studies as yet focused on the families of HWs and SARS-COV-2 transmission.

Methods

This is a prospective observational study.

The key element of our study was to assess the total number of family members (FM) of HWs positive for SARS-COV-2 infection and the number of positive HWs working in a COVID-19 hospital. HWs

were tested by both quantitative IgG serological tests (SQT) during the first week of the study and IgM/IgG serological rapid tests (SRT) during the first week and the last week of the study, at a constant interval of four weeks, to calculate the total number of positive cases. SRTs were performed on FMs during the last week of the study.

The SRT studied both IgG and IgM with a declared sensitivity of 100% for IgG and 85% for IgM (PrimaLab, Balerna, Switzerland). The tests were immediately repeated in the case of no diagnostic results. If the line for positive IgG or IgM was not well evident after the two tests, we considered it a negative result.

The SQT used in our study was the ELISA test researching IgG anti-S1/anti-S2 for SARS-CoV-2, available and validated for HW screening in the region of the study, Lombardia, Italy. The study population derived from a high-volume COVID-19 hospital in Milan, Italy. The study period was from May 2 to 31, 2020, and the follow-up included the whole study period for HWs and FMs. In-hospital infection control measures and the personal protective equipment (PPE) in use were in line with national and international recommendations.

All HWs and FMs voluntarily agreed to take part in the study. FMs were first-degree relatives and/or higher degree ones living in the same house as HWs. All participants were informed about the study and signed informed consent.

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For both HWs and FM, exposure to COVID-19 cases, the onset of suspicious symptoms (also before the study period since February 1, 2020), photos of the serological tests after 10 min, serological tests' platforms, past medical history, drugs, and clinical course were recorded. All data were entered into an Excel database, all SRT platforms were collected, and SQT reports were available on our hospital system.

Descriptive statistical analyses were used to summarize the data. Continuous variables with normal distribution were defined as mean and standard deviation. The study size was determined by the number of volunteers in HW's group. All 38 HWs and 81 corresponding FMs agreed to participate and were included in the study, according to eligibility criteria.

The outcomes were: (1) calculate the number of FMs positive on SRT for SARS-COV-2 infection; (2) calculate the number of HWs positive on SRT and SQT.

The study's bias included an incorrect performance of the SRT, the low sensitivity of SRT, confounding factors (drugs, comorbidities, early exposure), use of qualitative tests, and interpersonal variability. Performance on both tests by HWs, and the inclusion of data on drugs and past medical history of both groups, aimed to identify any confounding factors. No subgroup was considered in the present study.

Results

The study period lasted 29 days (May 2–31, 2020).

Thirty-eight HWs agreed to participate in the study and were included based on eligibility criteria (M 10, F 28, mean age: 47 ± 18 y. o.; nine physicians, 22 nurses, and seven social health professionals). Exposure to 22 COVID-19 patients by the 38 HWs was reported during the study period. Of the 38 HWs, two (5,3%) showed a well-demarcated line of IgG on the SRT and the SQT confirmed high levels of IgG for SARS-COV-2. Another seven (18,4%) HWs showed a not-well-defined line for IgG on SRT, and the SQT confirmed these results as negative. SQT results were in line with SRT.

The two positive cases were asymptomatic and did not have any indicative symptoms from February 2020 to the end of the study period. No statistical interactions with drugs and/or present comorbidities were found.

Eighty-one volunteers from the families of HWs were tested. All tested relatives lived in the same house as their family-related HWs; thirty-two (84,2%) HWs decided to self-isolate themselves to reduce direct contact with their partners and/or children, by sleeping in different rooms and using separate bathrooms, whenever possible. However, they all lived in the same family house. The two positive HWs were self-isolated during the study period. None of the FMs worked at nor was admitted to any hospital during the study period. Two FMs did psychiatry rehabilitation at extended care units during February–March 2020.

An age stratification of FMs was performed: 33 (41%) were middle-aged (M 27, F 6, mean age: 42 ± 12 y.o.), 45 (55,6%) were young and infant (M 16, F 29, mean age: 11 ± 7 y.o.) and three (3,7%) were old (M 1, F 2, mean age: 79 ± 6 y.o.). Exposure to confirmed COVID-19 cases had not been recorded. Twenty-six (32,1%) people in the FM group tested IgG positive on SRT, the three old and 23 middle-age FMs. Two of the three old FMs did psychiatry rehabilitation at extended care units. In two families, the HW was the only negative member of the family. Young ones and infants were found all negative in the present study.

Eleven (42%) out of twenty-six cases of IgG positive serologically tested relatives had respiratory symptoms, fever, and/or diarrhea. In all the reported cases, the symptoms did not require hospitalization.

We identified as potential confounding factors, a dubious and not well-demarcated IgG line in the SRT. However, SQT confirmed

the negative results in these cases. This study's primary limits were the FM group's heterogeneity and the lack of comparison between the SRT and the SQT in the group of relatives.

Discussion

This study presented the data of COVID-19 spreading in HWs and their families. A first interesting finding is the high number of relatives positive for SARS-COV-2 infection and the lack of correlation between this data and the infected HWs. The only two IgG positive HWs self-isolated, having no contact with their family members during the study period.

One possible explanation may be that many HWs were false-negative on SRT and SQT, but this is an unlikely hypothesis because similar results were obtained by both tests and were confirmed at different times.

Another explanation could be that FMs had reduced access to PPE and were exposed to many undiagnosed cases, especially before the lock-down in Italy.

Our study reported all negative young and infant relatives, also in the presence of strict and direct contacts to positive parents. This data is in line with the low infection rate of children evident in the available literature (Xia et al., 2020). Furthermore, our study also confirmed the high rate of asymptomatic cases, in line with the data in the published literature (Xia et al., 2020). On the other hand, we cannot conclude that asymptomatic cases were also infective in the present study.

In two families with positive old members, the time spent in extended care units should be considered a risk factor. The SRT results must be read prudently based on past experience with other viral infections (Tang et al., 2020). An SQT was not provided for FMs because it was available only for HWs, at the time and in the country of the study. Our study would benefit by comparison of the results of similar studies, to confirm external validity.

In conclusion, our study challenges the notion that HWs spread SARS-COV-2 infection; according to our data, HWs experienced a lower infection rate than their families and did not represent a major risk of transmission for relatives.

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Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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