


BRIEF REPORT

Transmission of SARS-CoV-2 Infection by Children: A Study of Contacts of Index Paediatric Cases in India

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ABSTRACT

The susceptibility of children to coronavirus disease-19 (COVID-19) and transmission of COVID-19 from children to others is a relatively unexplored area. The aim of this study was to understand the transmission dynamics of Severe Acute Respiratory Syndrome Coronavirus 2 in children. This was a retrospective observational study where a total of 19 paediatric index cases (including a set of twins) with COVID-19 and 42 primary contacts (adults—36, paediatric—6) from the immediate family members were included. All the index cases and four of the five positive contacts were asymptomatic. Despite adults staying with positive children in the same vehicle, same room in the quarantine centre and the same ward, only four of the parents became positive.

KEYWORDS: asymptomatic, paediatric, SARS-CoV-2

INTRODUCTION

The number of cases of coronavirus disease-19 (COVID-19) sees an upward trend globally and in India. Similar trends have been noticed in the number of publications on COVID-19. However, most of these publications involve the adult population. Studies have

shown that the percentage of children amongst total COVID-19 positive individuals is less than 5% [1–3]. Whether this low number is due to decreased susceptibility of children to infection or decreased rates of exposure is a matter of debate. Another consistent finding in paediatric studies has been the relatively mild nature

of the disease in the paediatric population [1]. Since there is a very high percentage of asymptomatic disease in children, a question can be raised whether transmission from children, in general, will be lesser. The aim of this study was, therefore, to understand the transmission dynamics of SARS-CoV-2 in children.

METHODOLOGY

This was a retrospective observational study conducted after taking permission from the Institute's Ethics Committee. As a part of the state protocol, in the month of May, all asymptomatic travellers from states with a high incidence of COVID-19 were quarantined institutionally. During the quarantine stay, all travellers were tested, but children were given priority for testing due to resource constraints. If a paediatric case (<18 years of age) tested positive, it was designated as the index case. The immediate familial members (parents/siblings) were identified as primary contacts and were tested as per feasibility. The parents of the index cases were enquired about the details and test results of other travellers (non-familial contact) who accompanied in the same vehicle and/or stayed in the same quarantine room as the index case.

The paediatric index case was admitted in the hospital and was managed according to the institutional guidelines. One of the parents stayed with the index child (if <15 years), and the other parent and sibling (with the negative test) continued to remain in the quarantine centre. Due to resource constraints, no personal protective equipment (PPE) could be provided to the parent staying with a positive child. If the parents turned out to be positive, they were admitted and managed according to the institutional guidelines. All the paediatric index patients and their primary contacts (immediate family members) in the month of May with a history of inter-state travel were included in the study. The clinical and demographic details were recorded on a pre-defined case report form and the final analysis was done after anonymizing potential identifiers from the study.

RESULTS

A total of 19 paediatric index cases (including a set of twins) were included in the study. The median

[inter-quartile range (IQR)] age of the index children was 6 (4–9) years. All of these children remained asymptomatic throughout the hospital stay. A total of 42 primary familial contacts (adults—36, paediatric—6) with a similar history of travel were identified (Table 1 and Fig. 1). There were 80 non-familial contacts who travelled with the family of index cases. Of these 21 non-family travellers stayed in the same quarantine room/hall with the index cases. Of the non-family travellers, only two were positive. Both of them were contacts of case 16 (Table 1 and Fig. 1). The median number of individuals travelling in the same vehicle was 5 (IQR 4–9.75). The mean hours of travel in the same vehicle were 22.8 ± 9.1 h. The mean number of people staying in the same room in the quarantine centre was 4.6 ± 2 .

One parent stayed with each of the index case except in one case where the child was >15 years old. None of the index children or the contacts had a history of contact with a symptomatic patient prior to initiation of travel. Of the primary familial contacts, a total of 5 (11.9%) adult patients became positive. All except one contact remained asymptomatic throughout the course.

DISCUSSION

Similar to our series, several studies have shown that the infection course in children is milder compared to adults [4–6]. Amongst the several hypotheses put forward to explain this phenomenon, most common ones are decreased expression of Angiotensin converting enzyme-2 receptor in children, decreased immune response and interference by other coinfecting viruses [7]. Initial reports have also suggested that children are less likely to be infected compared to adults [8–11]. However, in a large study of close contacts of 391 confirmed cases, similar infection rates were observed in both children and adults [12]. With regards to transmission, several studies have concluded that children transmit less compared to adults [13–15].

In our series, it appeared that amongst the members of a family with a similar history of exposure, children were more commonly positive. Also, despite adults staying with positive children in the same vehicle, same room in the quarantine centre and the

TABLE 1. Summary of familial clusters after inter-state travel

| S.n | No. per vehicle | Duration of travel (h) | No. per room | Course in days starting from the day of initiation of travel | | | | | | | | | | | | | |
|-----|-----------------|------------------------|--------------|--|---|------------------------|---|---|---|---|---|------------------------|----|--------|----|--------|-------------------------|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14–21 |
| 1 | 6 | 18 | 6 | | | C (4) | | | | | | M | | | | | F |
| 2 | 5 | 18 | 5 | | | | | | | | | C1(6) C2(6) | | | | | F M |
| 3 | 5 | 24 | 5 | | | | | | | | | C (12) M | | | | | F M |
| 4 | 9 | 10 | 9 | | | C1 (10) C2 | | | | | | | | F M | | | |
| 5 | 3 | 12 | 3 | | | | | | | | | C1 (6) C2 F M | | | | | F |
| 6 | 5 | 11 | 3 | | | | | | | | | C (7) F M | | | | | F M |
| 7 | 10 | 32 | 10 | | | | | | | | | | | F M | | | |
| 8 | 10 | 30 | 3 | | | | | | | | | | | | F | | M |
| 9 | 4 | 48 | 4 | | | | | | | | | | | | | F M | |
| 10 | 6 | 18 | 3 | | | | | | | | | | | | | | F M |
| 11 | 4 | 18 | 3 | | | C (4) | | | | | | | | F M | | | |
| 12 | 4 | 20 | 4 | | | C (9) M | | | | | | | | F M | | | |
| 13 | 4 | 24 | 4 | | | C1 (5) C2 | | | | | | | | M F | | | |
| 14 | 6 | 24 | 6 | | | C (4) M F | | | | | | | | | | | |
| 15 | 3 | 36 | 3 | | | C (2) M | | | | | | | | | | | F |
| 16 | 33 | 24 | 5 | | | C1 (9) C2 F M | | | | | | | | | | | |
| 17 | 12 | 24 | 3 | | | | | | | | | | | | | | C1 (15) C2 F M |
| 18 | 12 | 24 | 3 | | | C (4) M | | | | | | | | | | | F |

Note: Red colour denotes positive; green colour denotes negative.

C/C1, index child with age in years in brackets; C2, sibling of the index child; F, father of the index child; M, mother of the index child; No., number; S.n, serial number.

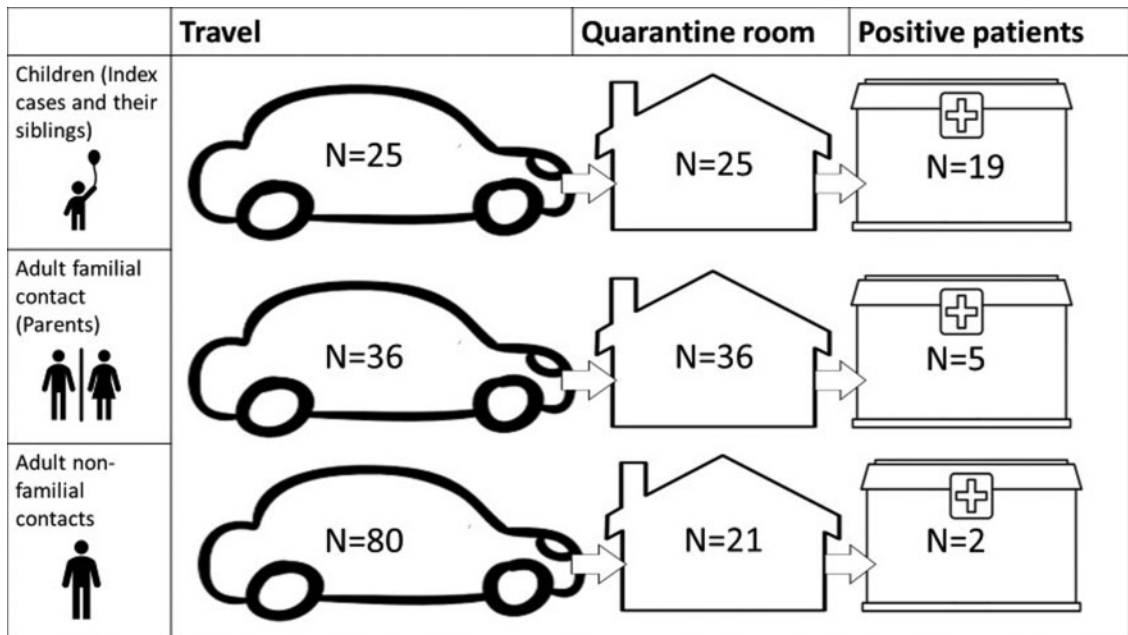


Fig. 1. Pictorial representation of number of index cases along with the familial and non-familial contacts who travelled in the same vehicle, stayed in the same quarantine room and eventually turned out to be positive.

same ward (without adequate PPE), most of the parents remained negative. It is possible that some of the adult patients may have been infected and became negative by the time testing was done. However, since there was no significant history of exposure with a positive case and no prior symptoms, exposure was assumed to be during prolonged travel or stay at the quarantine centre. Although only two non-familial contacts were positive, it is possible that some of the primary familial contacts may have acquired the infection from the non-family travellers.

Limitations of the study

Apart from the retrospective nature of the study, multiple testing could not be done in the primary contacts (familial) to establish temporality due to resource constraints.

In conclusion, despite the limited sample size, this study indicates children are commonly asymptomatic. Despite the lower rate of transmission, the susceptibility in children and the potential for increased transmission in large groups in enclosed areas, no

recommendations on school reopening can be made. We report this study to highlight the need to explore the transmission dynamics in paediatric individuals in more extensive prospective studies.

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