SARS-CoV-2 Infection and Hospitalization in Immunocompromised Children: A Population-Based Study

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INTRODUCTION

The burden of SARS-COV-2 infection in immunocompromised children remains unclear due to limited population-based studies.

OBJECTIVES

To assess the risk of primary SARS-CoV-2 infection, hospitalization, and severe COVID-19 outcomes in children with and without immunocompromising conditions.

METHODS

- Population-based cohort study on children aged 0-14 years in the Veneto region, Italy, from February 2020 to February 2022
- Data were obtained from an Italian pediatric primary-care database (Pedianet) , covering ~12% of the Veneto region pediatric population <15 years of age, also including data from the COVID-19 nasopharyngeal swab (NPS) and hospitalization registries of the Veneto region
- SARS-CoV-2 infection was diagnosed by positive COVID-19 NPS
- Hospitalization was defined as hospital admission within ten days from the first positive NPS
- Severe COVID-19 was defined as intensive care unit (ICU) admission, and/ or ventilation or hemodinamic support need, and/or death.

IC	non-IC
Humoral, cellular, and combined immunity deficiencies, including HIV	Cardiovascular conditions, (i.e., chronic, congenital cardiac diseases, and arrhythmias)
Active haematological malignancy	Cerebrovascular conditions
Neoplasm	Respiratory conditions (i.e., chronic obstructive pulmonary disease, cystic fibrosis, diseases of pulmonary circulation, and pulmonary TB)
Disorders of blood and blood-forming organs, including spleen disorders	Neurocognitive conditions
Bone marrow or hematopoietic stem cell transplant	Metabolic conditions (i.e., diabetes, obesity and metabolic syndrome)
Solid Organ Transplant	Other conditions (i.e., chronic kidney disease and renal failure, liver cirrhosis, autoimmune hepatitis)
Chemotherapy	

- Participants were classified into three groups:
  1) immunocompromised children (IC), 2) children with specific non-immunocompromising underlying conditions recognized as risk factors for severe pediatric COVID-19 (non-IC), and 3) reference children (RC) (i.e., those children not included in IC and non-IC) (Tab.1).

Tab.1 shows the IC and non-IC population subgroups definition.

- Cox proportional hazard models were employed to estimate adjusted hazard ratios (aHR) with their corresponding 95% confidence intervals (95% CI), for the risk of SARS-CoV-2 infection among IC, non-IC, and RC; COVID-19 vaccination was considered as a competing event in our analysis.
- We analyzed the distribution of COVID-19-related hospitalization and severe cases among IC, non-IC, and RC cases with SARS-CoV-2 infection.

RESULTS

A total of 27,957 children (RC=22,964, non-IC=4810, IC=183) were included. IC and non-IC were older than RC (median age [IQR]: 7 [4-10], 8 [6-10], and 6 [4-9] years, p<.0001) (Fig.1).

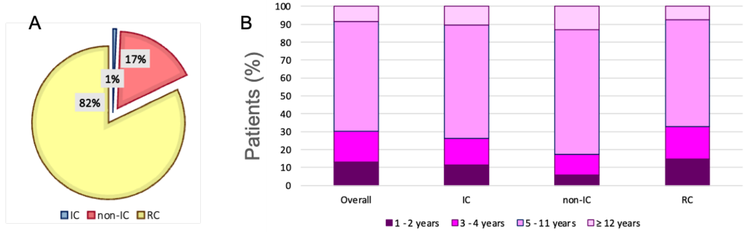

Fig.1

Fig.1 shows the frequencies of IC, non-IC, and RC children (A) and their age distribution across thepopulation subgroups (p<.0001) (B).

- **Immunocompromised children exhibit a comparable risk of SARS-CoV-2 infection to immunocompetent children.**
- **Immunocompromised children appear to have a higher likelihood of hospitalization compared to immunocompetent children, regardless of infection severity.**

Compared to RC, both IC and non-IC exhibited similar risks of SARS-CoV-2 primary infection (Fig.2).
Among 10,015 children with laboratory-confirmed COVID-19, IC were more likely to be hospitalized (1.6%) compared to non-IC (1.1%) and RC (0.9%) (Fig.2).
Zero severe cases were recorded among IC, non-IC; and RC.

Fig.2 **Risk of SARS-CoV-2 primary infection**

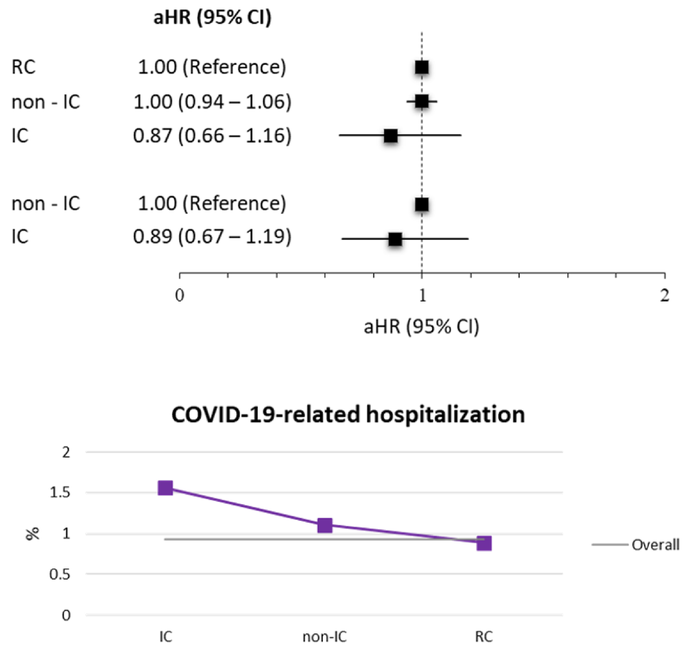

Fig.2 shows the risk for primary SARS-CoV-2 infection and hospitalization among IC, non-IC and RC. Models were adjusted for several potential confounders (age, gender, deprivation index, number of visits and antibiotic prescriptions).

CONCLUSION

IC demonstrated a comparable likelihood of SARS-CoV-2 primary infection but a higher risk of hospitalization to both RC and non-IC. Notably, no severe COVID-19 cases were reported among this cohort. These findings suggest a potentially elevated hospitalization rate in IC, possibly attributed to higher admission thresholds for these children. Further surveillance studies in hospital settings are warranted to validate our findings.

ADDITIONAL KEY INFORMATION

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