Longitudinal study of anti-Spike antibodies in children after SARS-CoV-2 infection

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BACKGROUND

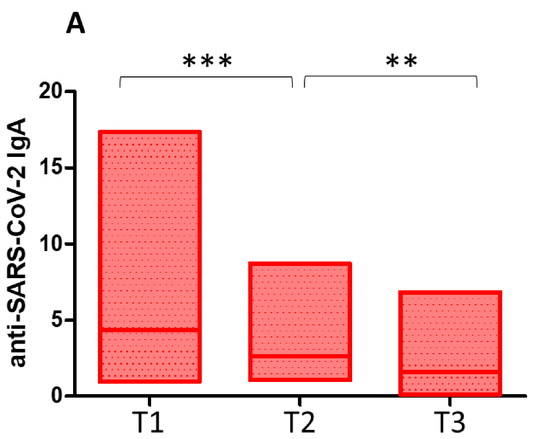
Children generally develop asymptomatic or mild COVID-19 disease, despite the exact mechanisms that protect them from severity are yet to be defined. Since humoral response to SARS-CoV-2 infection in children is still poorly investigated, we aimed to analyze circulating levels of anti-Spike IgA and IgG in pediatric population up to 8 months after SARS-CoV-2 infection, to delineate whether COVID-19 outcomes could impact on Antibody (Ab) levels.

METHODS

A total of 115 COVID-19 young patients (mean age: 11,5 years, range 1-19 years) were enrolled between October 2020 and March 2021. All cases were confirmed SARS-CoV-2 infection by use of a diagnostic molecular assay on nasopharyngeal swabs. Circulating anti-SARS-CoV-2 IgG and IgA were measured using ELISA assays at one-month (T1), two-month (T2) and eight-month (T3) follow-up blood samples of young partecipants.

RESULTS

Longitudinal observation of COVID-19 children showed a decreased circulating level of IgA at T2 and T3, respectively, compared to T1 ($p<0.001$) (Fig. 1, Panel A). Persistent levels of anti-spike IgG were observed at least two-month post-infection but they significantly decreased at T3 ($p<0.001$) (Fig. 2, Panel B). Stratifying children in two age-classes (1-9 and 10-19 years old) we found significantly higher levels of IgA in younger children at T1, T2 and T3 than in children older than 10 years old ($p=0.012$; $p=0.041$; $p=0.036$, respectively) (Fig. 2). Differently, younger children had a significantly higher level of IgG at T2 ($p=0.029$) and at T3 ($p=0.026$), but not at T1 (Fig. 3). Stratifying children based on the presence or absence of SARS-CoV-2 correlated symptoms or on the basis of underlying diseases, we did not observe differences in blood levels of IgA and IgG in all time points analyzed.



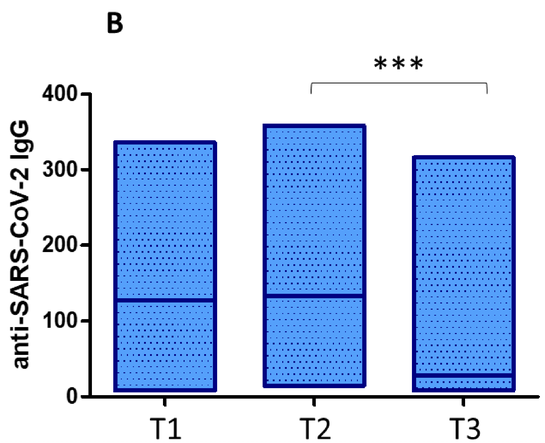


Fig 1. Longitudinal observation of anti-SARS-CoV-2 IgA (Panel A) and anti-SARS-CoV-2 IgG (Panel B) in COVID-19 young patients (n=115) at one-month (T1), two-months (T2) and eight-months (T3) after infection. Statistical analysis were performed using Wilcoxon test. ***p<0.0001; ** p<0.001

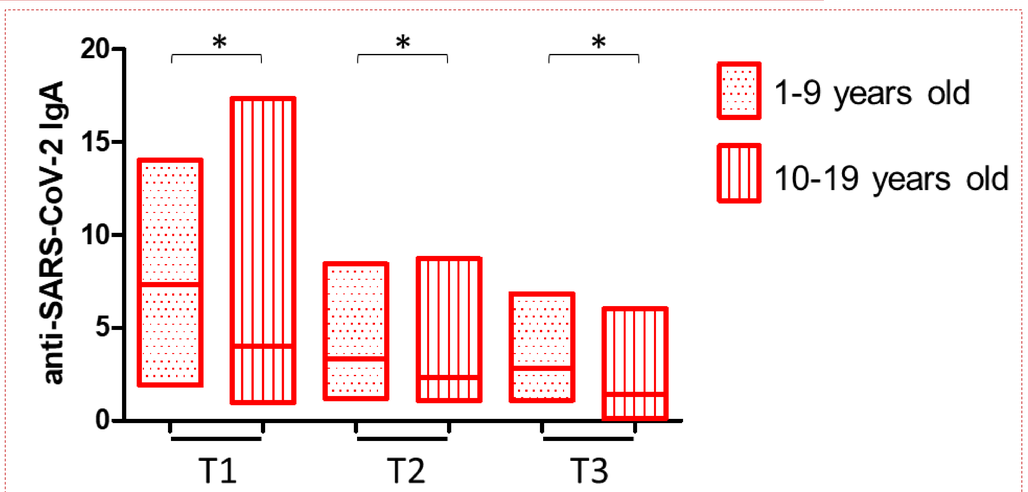


Fig 2. Comparison of anti-SARS-CoV-2 IgA between young patients (1-9 years old) and children older than 10 years. Statistical analysis were performed using Mann Whitney test. *p<0.05

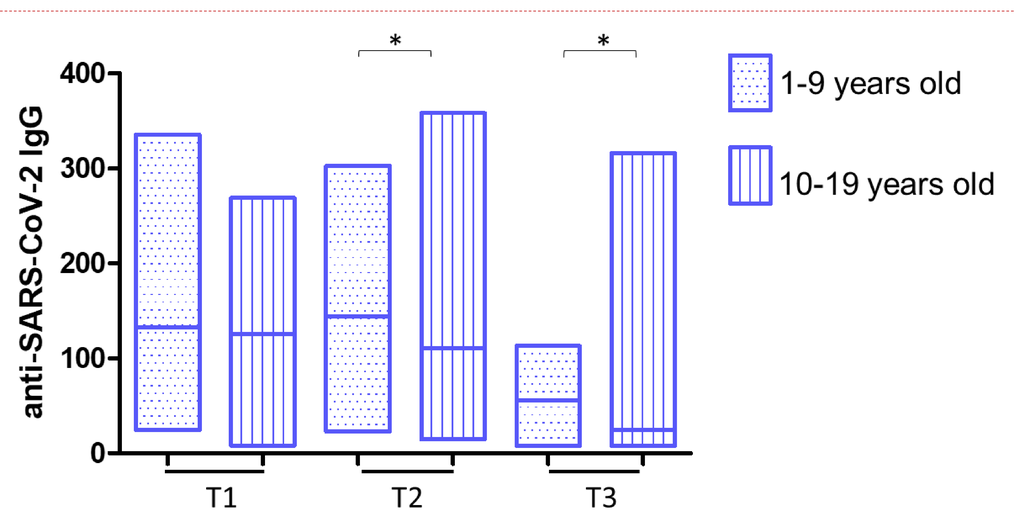


Fig 3. Comparison of anti-SARS-CoV-2 IgG between young patients (1-9 years old) and children older than 10 years. Statistical analysis were performed using Mann Whitney test. *p<0.05

CONCLUSIONS

Our longitudinal data indicated that younger children are characterized by an elevated peak of early IgA and are also defined by a robust induction of IgG, with respect to the older. These results contrast with what is common in SARS-CoV-2 infection in adults that elicit higher levels of polyfunctional Abs in severe disease. If confirmed in larger groups, these data would suggest that pediatric patients that usually have an efficient control of SARS-CoV-2 infections without inflammation would also elicit a humoral immune response protective from reinfections.