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Expert Consensus on COVID-19 Vaccination in Korean Adolescents: A Modified Delphi Survey

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ABSTRACT

The effectiveness of coronavirus disease 2019 (COVID-19) vaccines had been shown in many studies in adult population, however, the real-world evidence in the childhood population was scarce. We aimed to organize the collective expert's opinions on adolescent vaccination against COVID-19 in Korea, therefore to guide the vaccination policy in the setting of available evidence. The Delphi panels responded that adolescents were greatly impacted by the quarantine measures, and COVID-19 is an important health problem for adolescents. Panels responded that in general, the benefits of the COVID-19 vaccine overweigh the potential risks in Korean adolescents. Continuing monitoring of available data is needed to provide the best vaccination practices in adolescents guided by the updated evidence.

Keywords: COVID-19; Vaccine; Adolescent; Delphi; Survey

Coronavirus disease 2019 (COVID-19) has posed a substantial burden on public health since the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Rapid development and distribution of vaccines against SARS-CoV-2 enabled more than 8 billion vaccine doses administered by December, 2021.[1] The effectiveness of a COVID-19 vaccine had been replicated in many studies in the adult population, however, the real-world evidence in the childhood population was scarce.[2] Children and adolescents are known to have milder clinical presentations and to have more favorable outcomes than adults.[3] However, the number and hospitalization rates of COVID-19 in adolescents have been increasing recently, in the setting of new variants of concern (VOC).[4] In the summer of 2021, there was a public need to convey the COVID-19 vaccination policy in 12–17-year-old adolescents in Korea, in the setting of global introduction of vaccines in this age group.[5] However, the scarcity of health outcome data on this age group made the policy development challenging. In the present study, we aimed to organize the collective expert's opinions on adolescent vaccination against COVID-19 in Korea, therefore to guide the vaccination policy in given evidence.

We developed a modified Delphi survey questionnaire to gather an expert consensus on adolescent COVID-19 vaccination in Korea. The target of Delphi survey consisted of 43 panels, including 18 Korea Advisory Committee on Immunization Practices (KACIP)

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members, nine members from the Infectious Disease Committee of Korean Pediatric Society, eight COVID-19 vaccine experts consulting the Ministry of Health and Welfare, and 11 board members of the Korean Society of Pediatric Infectious Diseases.[6] Prior to the survey, recently updated information about COVID-19 disease and COVID-19 vaccination in adolescents were assessed. At the time of the survey, the number of children who were confirmed COVID-19 in Korea was 35,739 (13.7%), and 3 children were classified as severe COVID-19. We first reviewed vaccine strategies of countries that started COVID-19 vaccination to adolescents, and literature on the benefits and risks of pediatric COVID-19 vaccination. Second, we collected the vaccination rate in adult and COVID-19 epidemic situation in Korea at the time of the investigation. At last, we collected the results of the survey about parents' perceptions of COVID-19. The data collected in this way were provided to participants to make an accurate survey through equal information after the first round of the survey. It was clarified that adolescents in this survey are limited between 12 and 17 years.

Contests in the questionnaire were classified into four topics: 1) impact on health following pediatric COVID-19 infection, 2) benefits and risks in COVID-19 vaccination in adolescents, 3) acceptability of COVID-19 vaccination for adolescents, 4) recommendation and level of evidence for pediatric COVID-19 vaccination. The questionnaire consists of 14 questions including 13 multiple-choice types and 1 free-answer type. The multiple-choice questions consisted of 10 items that were to be evaluated on a Likert scale by the participants and 3 items in which the participants shared their opinions. Likert scale consisted of a 5-point scale—1, strongly disagree; 2, disagree; 3, neutral; 4, agree; and 5, strongly agree— and a scoring system was applied to this survey based on this scale. Additional opinions of the participants were gathered from a question about other opinions. The questionnaire was revised after pediatric infectious experts' feedback before the survey. On August 9, 2021, a self-developed questionnaire created using Google sheets was sent to the participants by e-mail for the first round of the survey. Among 43 invited panels, 33 (76.6%) responded to all items on the first round of the survey. And all of 33 panels who responded on the 1st round responded to the 2nd round survey. The detailed outcomes and results of the first round were then forwarded to the participants of the first round by e-mail on August 16, 2021, which was followed by the second round of the survey. All responses were statistically analyzed, and personal opinions were gathered to summarize the survey outcomes.

Responses to the Delphi survey on COVID-19 vaccination in Korean adolescents are summarized in **Table 1**. The Delphi panels responded that COVID-19 is not dangerous for adolescents, and it was evaluated that the transmission of SARS-CoV-2 by infected adolescents was not high. However, it was judged that adolescents were greatly impacted by the quarantine measures, and COVID-19 is an important health problem for adolescents. In this field, there was no significant difference in mean scores between 2 rounds, and the standard deviations of 4 questions among panels have decreased in the second round. Information about the high effectiveness and acceptable safety profile of COVID-19 vaccination to adolescents were provided to panels before the survey. The effectiveness of COVID-19 vaccination for adolescents was evaluated to be "strong" in preventing infection and reducing transmission. Enrolled panels' opinions on the safety of COVID-19 vaccination for adolescents were neutral. Totally, it was judged that the expected benefits of the COVID-19 vaccine overweigh the potential risks in Korean adolescents. In general, the assessment of whether the public acceptability of the COVID-19 vaccine for adolescents was positive. Opinions on vaccine recommendations for adolescents were close to neutral, especially in the second round compared to the first round.

Table 1. Summary of Delphi survey on COVID-19 vaccination policy in Korean adolescents, by number of rounds

Questions	First round			Second round		
	Mean	SD	CVR	Mean	SD	CVR
Is COVID-19 dangerous for adolescents?	2.21	0.96	−0.82	2.21	0.74	−0.88
Do adolescents infected with COVID-19 easily transmit the disease to others?	2.94	1.06	−0.45	2.85	0.94	−0.70
Are adolescents greatly impacted by quarantine measures due to COVID-19?	4.73	0.63	0.94	4.88	0.33	1.00
Is COVID-19 an important health problem for adolescents?	3.85	1.06	0.33	3.97	0.73	0.58
Does the COVID-19 vaccination effectively prevent infections in adolescents?	4.39	0.90	0.88	4.39	0.75	0.82
Does the COVID-19 vaccine reduce the infectivity of vaccinated adolescents?	4.03	0.77	0.58	3.94	0.43	0.76
Is the COVID-19 vaccine safe for adolescents?	3.27	0.94	−0.09	3.12	0.78	−0.45
In Korean adolescents, do the expected benefits of the COVID-19 vaccine outweigh the potential risks?	3.30	1.10	−0.03	3.33	0.96	−0.09
Do the people accept COVID-19 vaccination for adolescents?	4.09	0.52	0.82	4.00	0.35	0.88
Is the COVID-19 vaccine recommended for adolescents aged between 12 and 17 years?	3.52	1.15	0.03	3.21	0.99	−0.33

Values are presented as scoring scale. Applied scales were followed as: 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; and 5, strongly agree.
COVID-19 = coronavirus disease 2019, SD = standard deviation, CVR = coefficient variation.

Fig. 1 depicts the detailed summary of operational perspectives on COVID-19 vaccination in Korean adolescents. To the question about the appropriate age of COVID-19 vaccination, "all adolescents above the age of 12 years" opinion was the most common (48.5%), and that was similar to "all high-risk adolescents above the age of 12 years" opinion (45.5%). The reasons for recommending COVID-19 vaccination to adolescents were diverse and the distribution was not concentrated on one side: to expand and maintain school attendance (36.4%), to prevent COVID-19 infections in individuals (30.3%), and to protect high-risk adult groups (21.2%) on the second round. The most important reason for recommendations against COVID-19 vaccination to adolescents was the unknown long-term adverse events of vaccination (63.6% on second round). In the first round, the timing of pediatric COVID-19 vaccination was divided into "after 70–80% coverage of high-risk adult group" (21.2%) and "after 70–80% coverage of whole adult population" (33.3%). After sharing the result in the first round and additionally collected
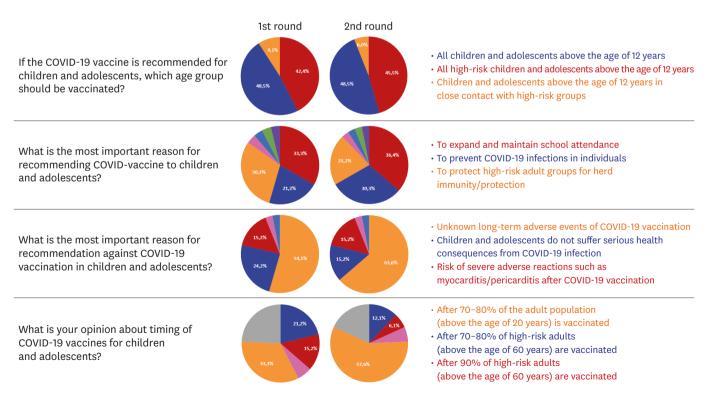

Fig. 1. Summary of Delphi survey on recommending COVID-19 vaccination in Korean adolescents, by number of rounds.
COVID-19 = coronavirus disease 2019.

information, 57.6% of panels responded that COVID-19 vaccination for adolescents should start after 70–80% of the whole adult population is vaccinated on the second round. As the survey was progressing, the acquisition of the latest data on adverse events of COVID-19 vaccination and increased interest in herd immunity seem to make large differences between the first and second-round surveys in the opposite reason and the timing of vaccination.

In this study, we found that the Korean experts in vaccines find the indirect disease burden of COVID-19 in the adolescent population to be high, whereas the public need for vaccinating this group was slightly more than neutral. Although it's been almost 10 months since the vaccination against COVID-19 was supplied over the world, the collective effects and safety of the COVID-19 vaccine are still being assessed rigorously.[7-9] COVID-19 vaccination in the adolescent recipients had a favorable safety profile in an early clinical trial before expanding the vaccine coverage to children.[10] The effect of vaccination on the prevention of infections of SARS-CoV-2 was strongly agreed upon. However, the expected benefits of the COVID-19 vaccine were evaluated as not so great compared with the potential risks.

The Delphi panels in this study responded that COVID-19 was an important health problem for children, but children were not recognized as the risk group of progression to severe COVID-19. In terms of health problems, children were recognized as great victims due to the strict quarantine policy such as school closure.[11-13] However, it was not well known that the true infection rates and transmission were decreased after school closures. In several studies, school closure had no significant impact on the incidence of laboratory-confirmed cases and symptomatic COVID-19.[14,15] In contrast, outbreaks related to schools in USA and Israel demonstrate that children are susceptible to SARS-CoV-2 in some circumstances.[16,17] The role of children in the transmission of SARS-CoV-2 is still not fully understood, but it should not be overlooked that young children were important potential spreaders of other respiratory viruses.[18,19]

This study is limited by the unclear methodological design intrinsically posed by the Delphi method. Moreover, given the time frame of the survey, the hard-science data including vaccine effectiveness and safety surveillance were not fully-presented to the survey respondent. Lastly, this survey was based on a specific epidemiological situation as of August 15, 2021, in Korea. Many different variables can come into play, so multiple scenarios should be considered together. Despite these, our finding suggests the rapid approach in organizing an expert consensus in a topic rather than in development, therefore to contributing to the public health policymaking. We quickly synthesized the opinions of a transparent expert group and drew meaningful conclusions on the vaccination of children against COVID-19 at a national level. Panels were generally in favor of COVID-19 vaccination against children but concerns about long-term safety should not be overlooked. Continuous monitoring of the data about the safety of the COVID-19 vaccine may reduce the anxiety of adolescents and their parents and allow COVID-19 vaccines to be accepted.

As the incidence of infections and serious diseases caused by the delta variant of SARS-CoV-2 in children is increasing, vaccination might be considered for Korean adolescents aged 12–17 years. This might achieve completion of two doses of vaccines as early as possible rather than waiting for the development of herd immunity to prevent serious disease, resume normal education, and discontinue social distancing for physical activities. Given the evolving momentum of COVID-19 epidemiology and vaccine's effectiveness findings, we propose continuing monitoring of available data, therefore providing best vaccination practice in adolescents guided by the updated evidence.

Ethics statement

ACKNOWLEDGMENTS

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