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Original article

## Attitude and Acceptance of COVID-19 Vaccine in Parents and Adolescents: A Nationwide Survey



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### A B S T R A C T

**Purpose:** Coronavirus disease 2019 (COVID-19) vaccines are currently authorized for emergency use in adolescents aged 12–17 years; however, there is concern and uncertainty regarding the safety and necessity of COVID-19 vaccination. A survey was carried out to assess the attitudes and acceptance towards vaccination in adolescents.

**Methods:** A nationwide web-based survey was conducted among adolescents aged 12–17 years and their parents between June 29 and July 8, 2021 on a platform provided by the Ministry of Education.

**Results:** A total of 341,326 parents and 272,914 adolescents participated in this study. Intention for vaccination was 69.1% for adolescents, and 72.2% of parents reported they would recommend vaccination for their child. Among adolescents, perception of safety (odds ratio [OR] 4.09, 95% confidence interval [CI] 3.95–4.22), effectiveness (OR 2.24, 95% CI 2.17–2.32), and risk-benefit (OR 1.75, 95% CI 1.72–1.78) had the highest impact on intention for vaccination. Also, perceived risk (OR 1.14, 95% CI 1.12–1.17), severity (OR 1.12, 95% CI 1.10–1.13) for COVID-19 infection, self-health perception (OR 1.12, 95% CI 1.10–1.14) and recent vaccination of childhood vaccines (OR 1.25, 95% CI 1.19–1.32) were related to intention for COVID-19 vaccination. On the other hand, self-perceived knowledge (OR 0.96, 95% CI 0.95–0.98) was related to vaccine hesitancy. Gender or school district did not influence intention for COVID-19 vaccination in adolescents.

**Discussion:** Decisions on COVID-19 vaccination for adolescents should be a shared process between adolescents, parents, and physicians based on updated information on safety and effectiveness.

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### IMPLICATIONS AND CONTRIBUTION

In a nationwide survey among parents and adolescents in Korea, self-perceived knowledge, and perceptions on the safety, effectiveness, and risk-benefit had the highest impact on intention for COVID-19 vaccination in adolescents. Decision-making should be shared in adolescents, parents, and physicians based on updated information on safety and effectiveness.

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Introduction of coronavirus disease 2019 (COVID-19) vaccine has made a significant impact in the epidemiology in the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic [1,2]. However, with constraints in vaccine supplies, many countries have been prioritizing certain groups for vaccination and expanded the program according to availability. After the approval of the Pfizer-BioNTech COVID-19 vaccine for adolescents aged  $\geq 16$  years on December 11, 2020, the age limit has been lowered to adolescents aged 12–15 years on May 10, 2021 in the United States. This was soon followed by emergency authorization in Israel, Europe, Japan and other countries, and the vaccine was authorized for emergency use in adolescents aged 12–15 years in Korea on July 16, 2021. Vaccination in adolescents was initially provided for students in the third year of high school (12th grade) since July 19, 2021. This decision was based in relation to the nationwide college entrance examinations. The vaccination policies have been evolving rapidly during the pandemic and vaccinations for adolescents aged 12–17 years of age were later provided since October 18, 2021 in South Korea [3].

Although the Food and Drug Administration approved the first COVID-19 vaccine (Pfizer-BioNTech COVID-19) on August 23, 2021, for individuals aged  $\geq 16$  years [4], the vaccine is currently under Emergency Use Authorization for adolescents. With the rapid development timeline, application of new vaccine technologies, and the relatively less severe disease spectrum of COVID-19, there is concern and uncertainty for the safety and necessity of COVID-19 vaccination in adolescents [5]. On October 29, 2021, the Food and Drug Administration issued an Emergency Use Authorization for children 5–11 years of age, however, it is not yet available in South Korea [6].

The hesitancy for the COVID-19 vaccine has not only been seen in adolescents, but also in adults. Recent reports among adults of different populations show hesitancy for vaccination in 26.0%–35.4% of adults [7–9]. Various factors have been found to be related to hesitancy, such as age groups, female sex, low educational level and income, and absence of comorbidities. The most common concerns regarding COVID-19 vaccines were reported to be doubts on safety and efficacy [7,10]. Decisions on vaccination are also associated with the social and psychological conditions of an individual [11] and previous experiences with vaccination [12].

Along with non-pharmaceutical interventions, COVID-19 vaccines serve as a powerful tool for controlling the pandemic. Assessing the acceptability before introduction of vaccines is important in developing applicable policies and to achieve high uptake. Acceptance differs between countries, ages, occupations, subjects with underlying medical conditions, thus it is important to identify common and discriminatory factors between different populations [13–17].

In this respect, a nationwide survey was conducted among adolescents and parents in Korea on COVID-19 vaccination. The aim of this study was to analyze the acceptance among parents and adolescents for the COVID-19 vaccine in the adolescent population. We also analyzed factors that influence acceptance for COVID-19 vaccination which are important for developing policies for implementation.

## Methods

### Study design

A nationwide, cross-sectional, web-based survey was conducted among adolescents aged 12–17 years (grades 6–11) and

their parents. The survey was performed between June 29 and July 8, 2021, on an online platform provided by the Ministry of Education in collaboration with the Korea Disease Control and Prevention Agency. A uniform resource locator and quick response code of the survey was sent to all schools (elementary, middle and high school) throughout the country. At each school, the survey was sent to both parents and students in a form of web-based notices, commonly used for announcements at all schools, containing general information about the survey. The survey was accessible by cell-phone, computers and tablets. Responses among parents and students were collected individually, voluntarily, and anonymously and no personal identification data was collected. In many cases only a parent or student may have participated. The survey was conducted in the eight major cities (Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, and Sejong) and nine provinces (Gyeonggi-do, Gangwon-do, Chungcheongbuk-do, Chungcheongnam-do, Jeollabuk-do, Jeollanam-do, Gyeongsangbuk-do, Gyeongsangnam-do, and Jeju-do) of the Republic of Korea.

### Questionnaire

The questionnaire consisted of questions for demographic characteristics and perceptions of COVID-19 and the COVID-19 vaccine. Demographic characteristics included questions on the school grade, year of birth, sex, school district, child health status, and recent vaccinations. Perceptions of COVID-19 and the COVID-19 vaccine were measured, including questions on COVID-19 infection or exposure history, perceptions of risk and severity of COVID-19, COVID-19 vaccine safety and effectiveness, and intention to vaccinate. Each construct was measured with a single item. Questions also included reasons to vaccinate or not, and participants were to choose two of the most important reasons. The questionnaire was mostly identical for the parents and adolescents, except the parents who had two additional questions regarding their perception of how safe school is in regards to COVID-19 and methods for school opening.

Responses were measured on a five-point Likert scale of “Strongly agree”, “Agree”, “Neutral”, “Disagree”, and “Strongly disagree”. Responses on COVID-19 vaccine safety and effectiveness were assessed using a four-point scale, which excluded the “Neutral” option. “Unsure” was included in questions on COVID-19 vaccine safety, effectiveness, risk-benefit of vaccine, and willingness to vaccinate to assess the uncertainty among the participants. We reverse coded in negatively keyed items for consistency.

### Ethics statement

Review from the Korea University Anam Hospital Institutional Board was exempted as this survey was conducted in support of the Korea Disease Control and Prevention Agency and Ministry of Education to be utilized in developing vaccination policies for adolescents (IRB No. 2021AN0313).

### Statistical analysis

Statistical analyses were conducted using the R version 4.0.2 (R Foundation for Statistical Computing, Vienna, Austria). Categorical variables were presented as count and frequency (%). Multivariate logistic regression analysis of parental intent to vaccinate adolescent children and of adolescent intent to

vaccination themselves was performed and paired comparison analyses were performed using Wilcoxon signed-rank tests. Odds ratios (OR) were calculated for parental intention for vaccination for their child (ORp) and adolescent intention for vaccination (ORa). Parental intent for vaccination for themselves was analyzed only using descriptive statistics as vaccination of adolescents was the main focus of this study. Statistical significance was set at  $p < .05$ .

## Results

### Baseline characteristics of the population

Overall, 341,326 parents and 272,914 adolescents aged 12–17 years participated in the survey, which accounts for approximately, 10.3% of all adolescents of the age group ( $N = 2,656,220$ ) throughout the country. Baseline characteristics of the population are shown in Table 1. Among adolescents, the distribution according to grade ranged from 12.8% to 18.7%. Males accounted for 44.0% and 38.2% were from the metropolitan areas of Seoul, Incheon, and Gyeonggi-do. In response to health perception, 97.3% of the adolescents reported as being subjectively good, very good, or excellent. Over 83.1% of the adolescents and 89.4% of the parents reported having their child vaccinated within 5 years (such as influenza, Td/Tdap, Japanese encephalitis, and human papillomavirus vaccine).

### Perception of the risk and impact of COVID-19 on adolescents

In the parents' response to the perceived safety of school from COVID-19, 26.6% reported that schools were safe, 54.2% were neutral, and 19.2% reported that they were not safe (Table 2). This perceived safety was higher in students of the sixth grade

**Table 1**  
Baseline characteristics of participants among parents and adolescents aged 12–17 years

	Parents		Adolescents aged 12–17 years	
	(N = 341,326)	(%)	(N = 272,914)	(%)
Student grade				
6th grade	65,270	19.1	51,170	18.7
7th grade	70,675	20.7	50,635	18.6
8th grade	61,204	17.9	41,687	15.3
9th grade	47,786	14.0	34,862	12.8
10th grade	50,186	14.7	47,472	17.4
11th grade	46,205	13.5	47,088	17.3
Student sex				
Male	179,477	52.6	119,993	44.0
Female	161,849	47.4	152,921	56.0
School district				
Metropolitan	159,915	46.9	104,345	38.2
Non-metropolitan	181,411	53.1	168,569	61.8
Health perception				
Excellent	130,729	38.3	107,231	39.3
Very good	169,313	49.6	114,752	42.0
Good	37,611	11.0	43,572	16.0
Fair	3,469	1.0	6,766	2.5
Poor	204	0.1	593	0.2
Recent vaccination within 5 years				
Yes	305,159	89.4	226,746	83.1
No	31,209	9.1	22,629	8.3
Uncertain	4,958	1.5	23,539	8.6

compared with students of higher grades, was higher in the non-metropolitan area compared with the metropolitan area and was higher in those who had better subjective health perception (data not shown).

In response to the perceived risk of adolescents becoming infected with COVID-19, only 6.7% of parents and 5.2% of adolescents reported a “somewhat likely or extremely likely” perceived chance of infection (Table 2). And 32.7% of the parents and 58.3% of adolescents reported that the chance of infection was “somewhat unlikely or extremely unlikely”. Among respondents, 67.4 of parents and 69.1% of adolescents reported that the severity would be “high or very high”.

### Perception of COVID-19 vaccine

Regarding the perceived knowledge of health information related to the COVID-19 vaccine, 42.5% of parents and 32.9% of adolescents reported that self-perceived knowledge was “high or very high” (Table 2). Regarding opinions on vaccine safety and effectiveness, 57.6% of parents and 50.9% of adolescents reported the COVID-19 vaccine as “safe or very safe”, and 69.5% of parents and 57.3% of adolescents reported it as “effective or very effective”. On the question of vaccine importance, 47.6% of adolescents reported the vaccine as “important or very important”. When asked about the risks and benefits of COVID-19 vaccination, 49.8% of parents and 28.9% of adolescents reported the “benefit was higher or much higher than the risk” and 8.2% of parents and 16.5% of adolescents reported that the “risk was higher or much higher than the benefit”.

### Intention for vaccination and influencing factors on acceptance of COVID-19 vaccine

When asked about their intention to vaccinate, 9.3% of the parents were already previously vaccinated, and 77.9% of parents reported an intention to vaccinate when available. Among parents, 72.2% reported they would recommend vaccination for their child (“recommend” 58.1% and “strongly recommend” 14.1%). Among adolescents, 69.1% reported a willingness to vaccinate when available (“probably will vaccinate” 48.9% and “definitely will vaccinate” 20.2%). While the intention to vaccinate increased as the students' grade increased among parents, there was not a significant difference in the adolescents' intentions for vaccination according to student grade (Figure 1).

Among the reasons for vaccination, prevention of infection for each individual and prevention of transmission to family and friends were the most common reasons. Among the reasons to not vaccinate, the most common reason was concern regarding its side effects in 95.6% of the parents and 90.4% of the adolescents (Figure 2).

Factors influencing intention to vaccinate adolescents aged 12–17 years for parents and adolescents are presented in Table 3. Demographic and COVID-19 vaccine related perception variables accounted for approximately, 9.15% of the variance in the intention for parents to vaccinate adolescents and 7.76% for the adolescents' vaccination intention. Attending a school in the metropolitan area (ORp 0.93, 95% CI 0.91–0.96,  $p < .001$ ) and perceived knowledge of the COVID-19 vaccine (ORp 0.89, 95% confidence interval CI 0.87–0.90,  $p < .001$ ) were related to vaccine hesitancy in parents' intention to vaccinate their children, whereas only perceived knowledge of the COVID-19 vaccine (ORa 0.96, 95% CI 0.95–0.98,  $p < .001$ ) was related to

**Table 2**  
Perceptions regarding COVID-19 and COVID-19 vaccination among parents and adolescents aged 12–17 years

Variables	Parents (%) (N = 341,326)	Adolescents (%) (N = 272,914)
How safe do you think schools are with respect to COVID-19?		
Very safe	1.8	-
Safe	24.8	-
Neutral	54.2	-
Not safe	15.9	-
Not safe at all	3.3	-
How likely do you think your child (you) may get COVID-19?		
Extremely unlikely	6.0	22.3
Somewhat unlikely	26.7	36.0
Neutral	60.6	36.4
Somewhat likely	6.3	4.3
Extremely likely	0.4	0.9
If your child (you) gets COVID-19, how likely do you think that its effects are serious on his/her (your) health?		
Not serious or severe at all	0.7	2.6
Not serious or severe	4.9	4.9
Neutral	27.1	23.4
Somewhat serious or severe	43.8	37.8
Extremely serious or severe	23.6	31.3
Which of the following is your level of knowledge about COVID-19 vaccines?		
Know very little	1.0	6.7
Know little	8.0	21.4
Neutral	48.5	39.1
Know well	38.0	29.4
Know very well	4.5	3.5
Which of the following is close to your thoughts on the safety of COVID-19 vaccines?		
Very safe	2.3	3.2
Safe	55.3	47.8
Not safe	24.4	20.1
Very not safe	2.4	4.1
Unsure	15.5	24.8
Which of the following is close to your thoughts on the effectiveness of COVID-19 vaccines?		
Very effective	4.9	5.5
Effective	64.6	51.8
Ineffective	7.9	8.2
Not effective at all	1.2	2.2
Unsure	21.5	32.4
How important do you consider the COVID-19 vaccine?		
Very important	-	15.4
Important	-	32.2
Neutral	-	30.8
Not important	-	6.4
Not important at all	-	2.8
Unsure	-	12.4
What of the following is close to your thoughts on the risk-benefit of COVID-19 vaccines?		
Risks much higher than benefit	2.7	5.8
Risks higher than benefit	5.5	10.7
Risks and benefits are equal	36.1	38.1
Benefits higher than risk	37.8	21.7
Benefits much higher than risk	12.0	7.2
Unsure	5.9	16.5
If a vaccine against COVID-19 was available to you, how likely would you be to get vaccinated?		
Definitely will get vaccinated	35.7	-
Probably will get vaccinated	42.2	20.2

(continued on next page)

**Table 2**  
Continued

Variables	Parents (%) (N = 341,326)	Adolescents (%) (N = 272,914)
Unlikely to get vaccinated	5.3	48.9
Very unlikely to get vaccinated	1.2	13.1
Unsure	6.3	4.0
Already vaccinated	9.3	13.8
If a vaccine against COVID-19 was available, would you recommend your child to get vaccinated?		
Strongly recommend	14.1	-
Recommend	58.1	-
Do not make any recommendations	3.3	-
Would not recommend	11.7	-
Strongly would not recommend	3.7	-
Unsure	9.1	-

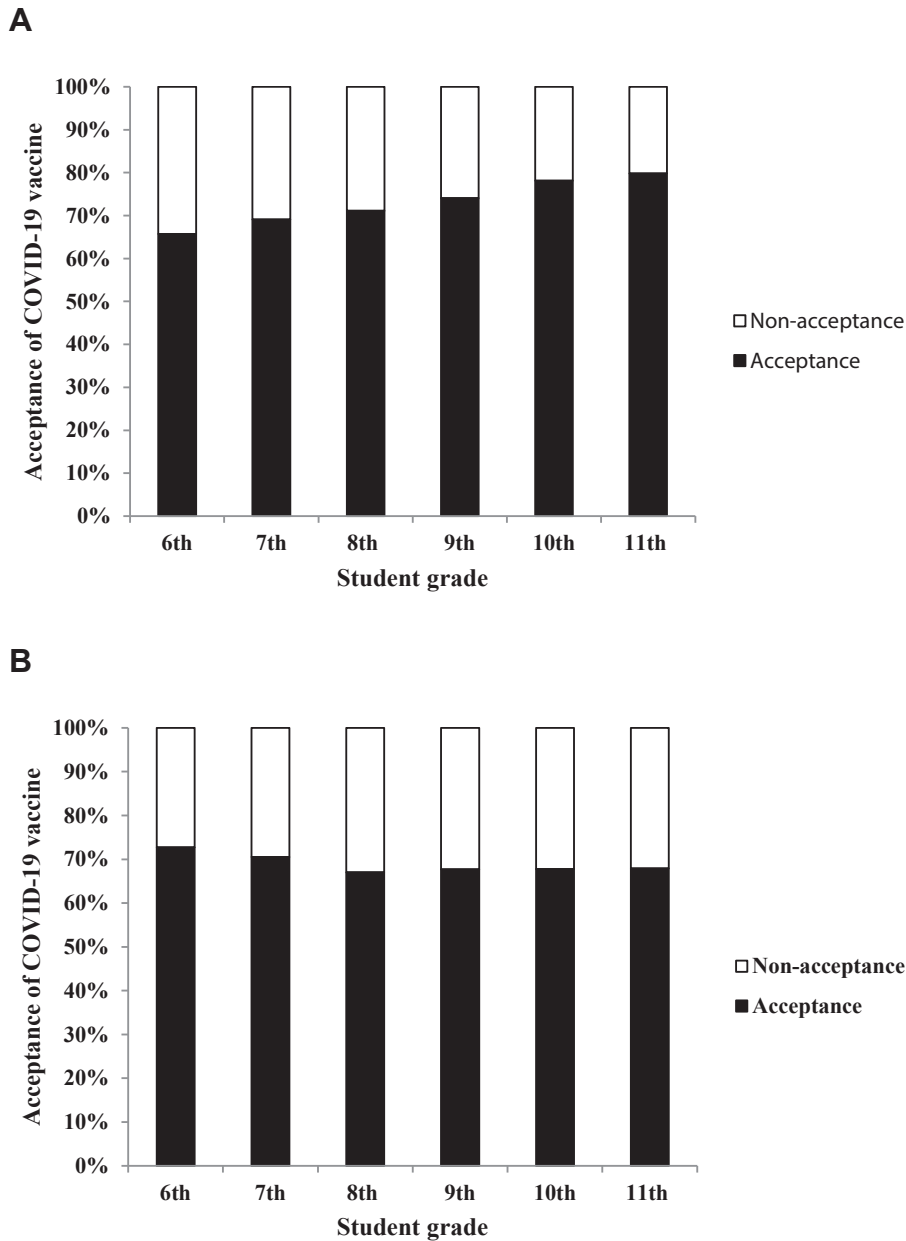
COVID-19 = coronavirus disease 2019.

vaccine hesitancy in adolescents. Grade (ORa 1.05, 95% CI 1.04–1.06,  $p < .01$ ), subjective health perception (ORa 1.12, 95% CI 1.01–1.14,  $p < .01$ ), recent vaccination history (ORa 1.25, 95% CI 1.19–1.32,  $p < .01$ ), perceived risk (ORa 1.14, 95% CI 1.12–1.17,  $p < .01$ ), and severity of COVID-19 (ORa 1.12, 95% CI 1.10–1.13,  $p < .10$ ) were related to acceptance for COVID-19 vaccination in adolescents aged 12–17 years in both parents and adolescents. Among the influencing factors, perception of vaccine safety (ORa 4.09, 95% CI 3.96–4.22,  $p < .01$ ), effectiveness (ORa 2.24, 95% CI 2.17–2.32,  $p < .01$ ), and risk-benefit (ORa 1.75, 95% CI, 1.72–1.78,  $p < .01$ ) showed the greatest significant impact on vaccine acceptance.

**Discussion**

In this study, we aimed to assess acceptability for COVID-19 vaccines in adolescents aged 12–17 years in a large cohort comprising 341,326 parents and 272,914 adolescents. We found a relatively high acceptance for COVID-19 vaccination in adolescents among both parents (72.2%) and adolescents (69.1%).

When analyzing factors associated with vaccine acceptance, perceptions on vaccine safety, effectiveness, and risk-benefit were the most highly related factors. Student grade (age), recent vaccination history, perception of risk, and severity of infection were also related to the intention to vaccinate adolescents for both parents and adolescents. Perception of safety has been reported as one of the most important determinates for vaccination [18–21]. Interestingly, self-reported perceived knowledge of COVID-19 vaccine was associated with vaccine hesitancy. This finding contrasts with previous reports in which perceived insufficient knowledge has been associated with general vaccine hesitancy [22]. This may reflect the current infodemic parents are placed in [23]; those with perceived greater knowledge consisted of misinformation on COVID-19 vaccination may have higher tendency of vaccine hesitancy [24]. As the COVID-19 vaccine has been developed in such a robust timeline, continuous monitoring of vaccine safety and effectiveness and risk-benefit analyses along with risk communication are essential for COVID-19 vaccination in children and adolescents. Based on the results in this study and other reports, previous attitudes on childhood vaccination [14,21,25], differences in personal experiences during the COVID-19 outbreak such as infection or exposure, knowledge of the disease or vaccine [18], and personal differences in priorities have an impact on vaccine acceptance.



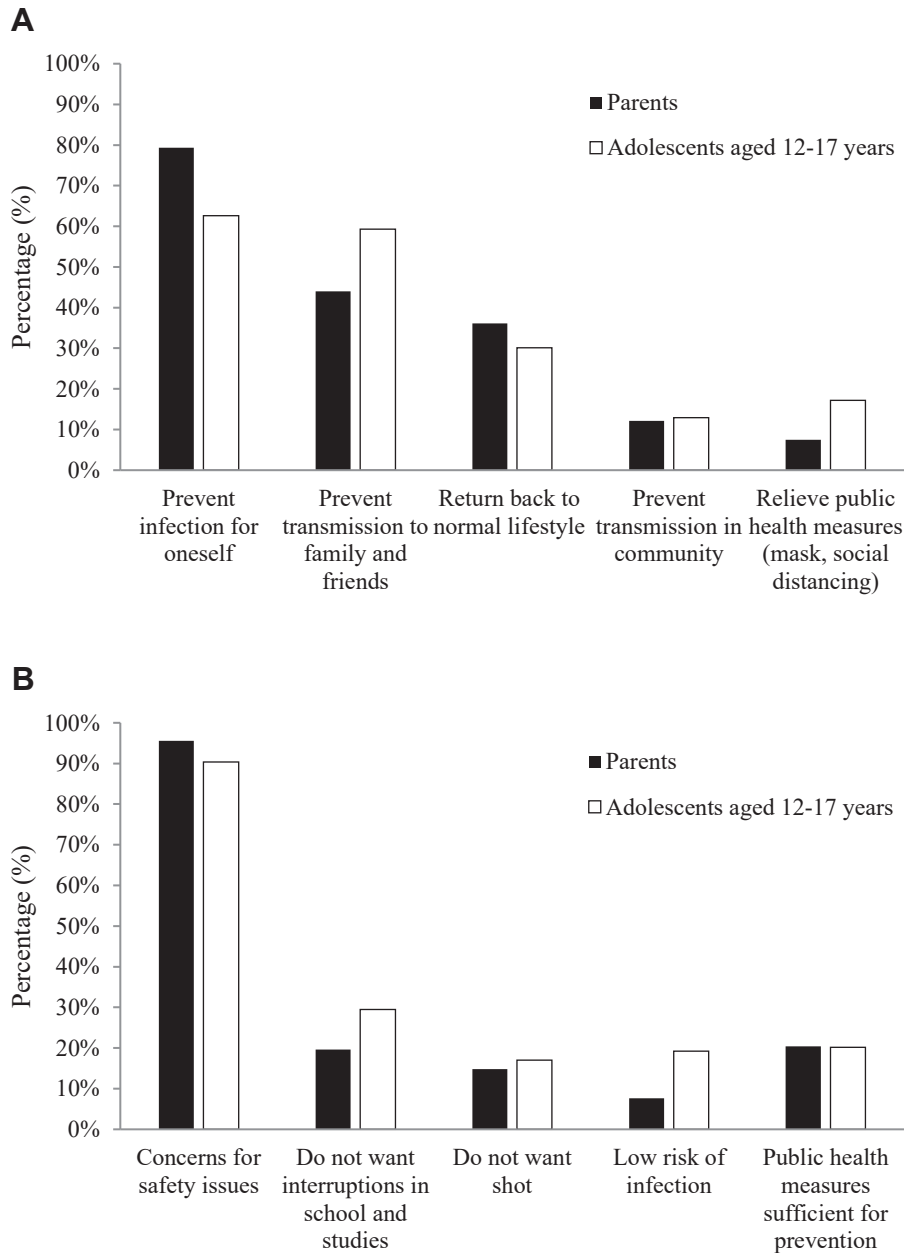
**Figure 1.** Trend for acceptance of COVID-19 vaccine in adolescents aged 12–17 years among parents (A) and adolescents (B). COVID-19 = coronavirus disease 2019.

Although not assessed in this study, other factors associated with acceptability for COVID-19 vaccines in adolescents have been reported as social media [21,25], peer, and parental norms [20] and trust in the child's doctor [21]. Previous studies among adults in South Korea have reported stability in job status, decreased family income, worsening health, and trust in government as predictors of vaccine hesitancy [26].

The acceptance rate for the COVID-19 vaccine in adolescents in this survey was higher than reports from other countries. In a survey performed from February to March 2021 in the United States among 1,745 parents of 3,759 children, 46% of parents reported that they were "likely or very likely" to vaccinate their children [21]. The difference in acceptance may be due to the

time of survey in the United States (before emergency authorization of adolescents aged >12 years) and the age of child (0–18 years vs. 12–17 years). A study performed in Italy reported that the majority (60.4%) of the parents/guardians were inclined to vaccinate, 29.6% were considering the opportunity, and 9.9% were hesitant [27]. Hesitancy was seen in female parents or guardians of children aged 6–10 years, those aged ≤29 years, those with low educational level, those relying on information found on the web or social media, and those disliking mandatory vaccination policies.

The relatively low hesitancy regarding COVID-19 vaccination may be related to the high acceptance rate for other vaccines among Korean children and adolescents. All vaccines



**Figure 2.** Reasons for and against COVID-19 vaccination in parents and adolescents aged 12–17 years. (A) Reasons for COVID-19 vaccination in adolescents. (B) Reasons against COVID-19 vaccination in adolescents. COVID-19 = coronavirus disease 2019.

included in the national immunization program are provided by the government and certification for vaccination before school entry (elementary and middle school) is required. These factors along with the National Vaccine Injury Compensation Program have also contributed to a high immunization rate of up to 95.9%–100% among children in Korea [28]. The relatively low hesitancy may also be attributed to the impact that COVID-19 has made on our lives and the desire to return back to a healthy and normal life. Among the reasons for vaccination, 36.1% of parents and 30.1% of adolescents claimed that this was one of the most important reasons. Furthermore, adult vaccination rates have been accelerating throughout the

world, including Korea. Adolescent vaccination has also started in countries such as the United States, Israel, United Kingdom (high-risk groups), Japan and more countries are expanding recommendations for adolescents, such as Germany, which initially recommended vaccination for high-risk groups, but now recommends vaccination for all children aged 12–17 years. The vaccination rate ( $\geq 1$  dose) in the United States among children aged 12–17 years was 42.4% as of July 31, 2021 [29]. These factors may have influenced the acceptance rate of vaccination in adolescents in Korea. In addition to vaccine hesitancy and acceptance, changes in epidemiology and public health policies such as vaccine passes have also

**Table 3**

Results of multivariate logistic regression analysis of COVID-19 vaccination intention for adolescents

	Parents				Adolescents aged 12–17 years			
	B	SE	OR (95% CI)	p-value	B	SE	Or (95% CI)	p-value
(Intercept)	−9.15	0.07	<0.001	<.001	−7.76	0.09	0.0004	<.001
Student grade	0.18	0.003	1.2 (1.19–1.21)	<.001	0.05	0.005	1.05 (1.04–1.06)	<.001
Sex (male = 1, female = 0)	0.02	0.01	1.02 (0.995–1.05)	.12	0.02	0.02	1.02 (0.99–1.06)	.13
School district (metropolitan = 1, non-metropolitan = 0)	−0.07	0.01	0.93 (0.91–0.96)	<.001	0.02	0.02	1.02 (0.99–1.05)	.26
Health perception	0.16	0.01	1.17 (1.15–1.19)	<.001	0.11	0.01	1.12 (1.10–1.14)	<.001
Recent vaccination in 5 years (yes = 1, no = 0)	0.07	0.02	1.07 (1.02–1.12)	<.01	.23	.03	1.25 (1.19–1.32)	<.001
Perceived risk for COVID-19 infection	0.12	0.01	1.13 (1.11–1.15)	<.001	0.13	0.01	1.14 (1.12–1.17)	<.001
Perceived severity of COVID-19 infection	0.07	0.01	1.07 (1.06–1.09)	<.001	0.11	0.01	1.12 (1.10–1.13)	<.001
Perceived knowledge of COVID-19 vaccine	−0.12	0.01	0.89 (0.87–0.90)	<.001	−0.04	0.01	0.96 (0.95–0.98)	<.001
Perceived safety of COVID-19 vaccine	1.17	0.01	3.23 (3.15–3.31)	<.001	1.41	0.02	4.09 (3.96–4.22)	<.001
Perceived effectiveness of COVID-19 vaccine	0.92	0.02	2.52 (2.44–2.60)	<.001	0.81	0.02	2.24 (2.17–2.32)	<.001
Perceived risk-benefit of COVID-19 vaccine	0.97	0.01	2.65 (2.61–2.69)	<.001	0.56	0.01	1.75 (1.72–1.78)	<.001

B = beta coefficient; CI = confidence interval; COVID-19 = coronavirus disease 2019; OR = odds ratio; SE = standard error.

contributed greatly to the actual vaccination rates. After vaccines were introduced in South Korea for adolescents 12–17 years of age in October 2021, initial vaccination rates after 1 month were low, 37.1% and 10.7% for one dose and two doses, respectively [30], however with the significant increase in COVID-19 cases in the country, introduction of further variants and plans for initiation of vaccine passes in this population, as of February 19, 2022, the vaccination rate for one dose and two doses among adolescents 13–18 years of age in South Korea are 82.2% and 78.4%, respectively [31]. The vaccination rate for adults 20 years and over for one dose, two doses and three doses are 97.0%, 96.1% and 68.9%, respectively [31].

In this study, the perceived likelihood of infection for children was found to be relatively low (parents 6.7%, adolescents 5.2%), whereas the perceived severity of infection was high (parents 67.4%, adolescents 69.1%). This is interesting as children and adolescents have been reported to have relatively less severe symptoms compared with adults [32]. The relatively high perceived severity of COVID-19 for adolescents may be largely influenced by reports of morbidity and mortality in adults and high-risk groups. However, in addition to the disease itself, this may also reflect the perception of COVID-19 as a threat or burden on adolescents' lives and social relationships in regards of the strong public health measures to contain COVID-19 (i.e., school closure). The relatively high acceptance for the vaccine infers the desire for not only preventing infection itself, but also to prevent further social damage and a desire to restore normal daily life.

This study had some limitations. First, the survey was conducted between June 29, and July 8, 2021, and the perceived vaccine safety and infection threat may have changed over time. The cross-sectional design may not reflect changes, including emergence of the delta-variant and the new vaccine safety data. Second, the survey was conducted through an online platform, which may not have reached vulnerable groups who cannot access the questionnaires. Finally, this study was conducted in South Korea within the context of highly efficient contact tracing and containment measures, which therefore, may effect the generalization of the survey results. Despite these limitations, our study recruited a large population of 341,326 parents and 272,914 adolescents on a national level. The results provide a baseline profile on attitude

and acceptance for the COVID-19 vaccine among parents and adolescents prior to the start of a vaccination campaign targeting the adolescent group.

## Conclusion

To develop and implement safe and effective vaccine policies, it is important to understand the thoughts and perceptions of the target population and stakeholders affected by the policies. Hence, this survey was performed among both parents and adolescents. The study found minor differences in attitudes and acceptance toward COVID-19 and the vaccine in those aged 12–17 years between adolescents and parents. Nonetheless, decisions for COVID-19 vaccination in children, especially adolescents, should be a shared decision based on information on vaccine safety, effectiveness, and risk-benefits.

COVID-19 has made a substantial impact across the globe. The illness and public health control measures to contain COVID-19 and prevent its spread have not only influenced each individual but also the society. In an amazingly short timeframe, COVID-19 vaccines have been introduced and have been shown to be effective in preventing SARS-CoV-2 infection and severe disease requiring hospitalization [1]. In contrast, there is concern for safety and controversy exists regarding the necessity of COVID-19 vaccination in children and adolescents. Therefore, social consensus is required for developing and implementing safe and effective vaccine policies for this population. The study results will provide insight into the perceptions of adolescents and their parents and also implicate the necessity of continuous monitoring on the safety, effectiveness, and risk-benefit analyses of COVID-19 vaccination in children and adolescents, along with providing appropriate information for decision-making of adolescents and their parents.

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