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

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ABSTRACT

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.

Conflicts of interest: The authors have no conflicts of interest relevant to this article to disclose. * Address correspondence to: Myoungsoon You, Ph.D., Department of Public Health Sciences, Graduate School of Public Health, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 08826, South Korea.

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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 ≥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 ≥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 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”.

Table 1

| Baseline characteristics of participants among parents and adolescents aged 12–17 years | Parents (N = 341,326) (%) | Adolescents aged 12–17 years (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 (2.0) |
| **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) |
Table 2
Perceptions regarding COVID-19 and COVID-19 vaccination among parents and adolescents aged 12–17 years

| Variables | Parents (%) | Adolescents (%) |
|-----------|-------------|-----------------|
|           | (N = 341,326) | (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 | 21.5 | 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, 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.

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.
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

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**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.
The factors along with the National Vaccine Injury Compensation Program have also contributed to a high immunization rate of up to 95.9% 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 (≥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

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.
conducted between June 29, and July 8, 2021, and the desire to restore normal daily life. This study had some limitations. First, 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 affect 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 the 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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**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) | <.001 | 0.02 | 0.02 | 1.02 (0.99–1.06) | <.001   |
| 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) | <.001   |
| Health perception        | 0.01 | 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) | 0.14 | 0.02 | 1.07 (1.02–1.12) | <.001 | 0.23 | 0.03 | 1.25 (1.19–1.32) | <.001   |
| Perceived risk for COVID-19 infection | 0.28 | 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 (2.62–2.69) | <.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.
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