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Special Article

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COVID-19 Vaccination Recommendations for 2024-2025 in Korea

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ABSTRACT

The Korean Society of Infectious Diseases has been regularly publishing guidelines for adult immunization since 2007. Following the release of coronavirus disease 2019 (COVID-19) vaccination recommendations in 2023, significant changes have occurred due to the emergence of new variant strains and the waning immunity from previous vaccinations. This article provides a comprehensive update as of November 2024, incorporating the latest evidence and guidelines. Focusing on the 2024-2025 season, this article reviews vaccines currently authorized in Korea and assesses their effectiveness against the predominant JN.1 lineage variants. The updated recommendations prioritize high-risk groups, including adults aged 65 and older, individuals with underlying medical conditions, residents of facilities vulnerable to infection, pregnant women, and healthcare workers, for vaccination with updated vaccines targeting the JN.1 strain. Additionally, COVID-19 vaccination is available for all individuals aged 6 months and older. For most adults, a single-dose strategy is emphasized, while tailored schedules may be recommended for immunocompromised individuals. This update aims to optimize vaccination strategies in Korea to ensure comprehensive protection for high-risk populations.

Keywords: Vaccination; COVID-19; SARS-CoV-2

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<SUMMARY>

1. Who should get vaccinated and when

1) It is recommended that all adults at an elevated risk of infection with coronavirus disease 2019 (COVID-19) or of developing a severe illness from COVID-19 receive a dose of a vaccine (mRNA or recombinant protein vaccine, either of the JN.1 lineage) against the virus in the 2024–2025 season.
   (1) Adults aged 65 or over
   (2) Children aged 6 months or older and adults
   - Individuals at high risk of severe COVID-19 infection
   - Residents of long-term care facilities and other facilities vulnerable to infection
   - Pregnant women

   (3) Healthcare workers and workers in facilities vulnerable to infection
2) All children and adults aged 6 months or older will be eligible to receive the COVID-19 vaccine in the 2024–2025 season.

2. Doses and methods of vaccination

1) In the 2024–2025 season, adults who have not been vaccinated against COVID-19 will receive a single dose of either the mRNA vaccine or the recombinant protein vaccine.
2) Adults who have previously received a COVID-19 vaccine prior to the 2024–2025 season should receive a single dose of either the mRNA vaccine or the recombinant protein vaccine at least 3 months after the last dose of a COVID-19 vaccine.
3) Adults aged 65 and older and moderately or severely immunocompromised individuals who are at high risk of COVID-19 may require two doses of the vaccine administered 6 months apart. It is therefore recommended that such individuals consult with a healthcare professional about the possibility of requiring multiple doses.

3. Contraindications and precautions

1) In the event of a severe allergic reaction (*e.g.*, anaphylaxis) being confirmed by the component of the vaccine in question, it is contraindicated to proceed with vaccination using the same vaccine type as that which caused the reaction.
2) In the event that myocarditis or pericarditis is confirmed in a vaccinated individual, the administration of the vaccine in question should be postponed until such time as evidence of its safety can be provided.

INTRODUCTION

The Korean Society of Infectious Diseases (KSID) has been regularly publishing guidelines for adult immunization since 2007 [1-3]. In 2023, the Committee on Adult Immunization of the KSID included guidance for coronavirus disease 2019 (COVID-19) vaccination [4]. Since the last update, significant changes have occurred in the field of COVID-19 vaccination, primarily driven by the emergence of new variant strains and the waning immunity from previous vaccinations. This article provides an updated overview of COVID-19 vaccination in Korea as of November 2024, reflecting the latest recommendations from the KSID.

Given the continuously evolving landscape of COVID-19, this article reviews the vaccines currently authorized in Korea and evaluates the latest evidence regarding COVID-19 vaccination for the 2024–2025 season, including international recommendations. Based on this review, we propose updated recommendations for COVID-19 vaccination in Korea. It is important to note that this guidance is subject to change in response to ongoing research, developments in the COVID-19 pandemic, and other factors. Future updates will be provided as needed.

COVID-19 VACCINE IN THE 2024–2025 SEASON AND THE SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-COV-2) VARIANTS

COVID-19 is an infectious disease caused by SARS-CoV-2 that can result in severe illness and hospitalization in some high-risk patient groups, with a potential for death [4-6]. The virus has resulted in a global pandemic since its initial report at the conclusion of 2019. However, due to the expeditious advancement of vaccines, the majority of individuals have developed immunity to SARS-CoV-2 through infection or vaccination [7, 8]. However, the immunity acquired through infection or vaccination is known to diminish over time [9, 10]. The emergence of new virus variants with antigenic properties distinct from those of the virus that previously predominated has prompted the recommendation of periodic vaccination with the updated SARS-CoV-2 vaccine in high-risk groups at elevated risk of SARS-CoV-2 infection or severe illness [11].

Accordingly, the administration of a bivalent vaccine containing the antigen of the Omicron variant (BA.4/BA.5)

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was recommended for the second half of 2022. For the 2023–2024 season, the administration of a monovalent vaccine against the XBB.1.5 strain, a subvariant of Omicron, was recommended. The globally prevalent variants of the virus in the first half of 2024 are the JN.1 lineage (*e.g.*, JN.1, KP.2, and KP.3), and the World Health Organization's Technical Advisory Group on COVID-19 Vaccine Composition recommended at its April 2024 meeting that the JN.1 lineage, which was the dominant variant at the time, be included as an antigen in any future COVID-19 vaccine [12]. The monovalent XBB.1.5 vaccine demonstrated suboptimal immunogenicity against the JN.1 lineage variants and limited efficacy in preventing symptomatic and severe infections. In the second half of 2024, the KP.3 strain, a subvariant of the JN.1 lineage, and its subvariants are expected to become the dominant variants worldwide. In October 2024, the KP.3 strain was confirmed to be the dominant variant in Korea [13, 14].

OVERSEAS COVID-19 VACCINATION RECOMMENDATIONS FOR THE 2024–2025 SEASON

In the United States (US), the Advisory Committee on Immunization Practices reported that the vaccine effectiveness against symptomatic COVID-19 infection was 58% (95% confidence interval [CI], 33%–73%) against XBB sublineage infection and 37% (95% CI, 13%–51%) against JN.1 sublineage infection 60–119 days after vaccination [15]. This analysis focused on individuals who received the updated vaccine between October 2023 and April 2024, during the 2023–2024 season when the XBB.1.5 vaccine was administered, suggesting a reduced effectiveness of the 2023–2024 vaccine against JN.1 variant infection [15]. The 50% neutralization titer against the JN.1 variant was markedly diminished in the serum of an individual infected with the XBB.1.5 variant [16]. The JN.1 variant was observed to exhibit resistance to the serum of individuals who had received the XBB.1.5 vaccine, thereby confirming that the JN.1 variant could circumvent the immunity induced by the XBB.1.5 vaccine. From April 2024, the KP.2 and KP.3 strains, which are subvariants of JN.1, increased, and both strains showed higher immune evasion ability compared to the JN.1 variant [17, 18]. Since June 2024, the KP.3.1.1 strain, a subvariant of KP.3, has been prevalent, and as of October 2024, the dominant virus variant in the US is KP.3.1.1 [13] In consideration of the circumstances, the Advisory Committee on Immunization Practices and the Centers for Disease Control and Prevention advise that all individuals aged 6 months and over should be vaccinated against the Omicron JN.1 lineage during the 2024–2025 season, which is approved or authorized by the Food and Drug Administration for emergency use. In particular, the vaccination is being emphasized for those who have not been vaccinated against COVID-19, adults aged 65 and over, individuals at high risk of severe COVID-19, people living in long-term care facilities, pregnant women, and individuals who want to reduce the risk of post-COVID-19 sequelae (long COVID) [11]. As of October 2024, the vaccines approved for the 2024–2025 season in the US are the mRNA vaccines from Pfizer/BioNTech and Moderna against the KP.2 variant and the recombinant protein vaccine from Novavax against the JN.1 variant.

The Public Health Agency of Canada recommended, in accordance with the recommendations of the National Advisory Committee on Immunization, that individuals at high risk of SARS-CoV-2 infection or severe COVID-19 be vaccinated with the JN.1 or KP.2 strains of the COVID-19 vaccine in September 2024. It is possible to receive the mRNA vaccines of Pfizer/BioNTech and Moderna against the KP.2 variant and the recombinant protein vaccine of Novavax against the JN.1 variant [19]. Vaccination is recommended for all adults aged 65 and over and people aged 6 months and older who meet one or more of the following criteria: (1) residents of long-term care homes and other congregate living settings; (2) individuals with underlying medical conditions that place them at higher risk of severe COVID-19; (3) individuals who are pregnant; (4) individuals in or from First Nations, Métis, or Inuit communities; (5) members of racialized and other equity-deserving communities; or (6) people who provide essential community services [19].

The European Medicines Agency Emergency Task Force recommends vaccination against the JN.1 subvariant as a COVID-19 vaccine for the 2024–2025 season [20]. The genetic divergence between the spike proteins expressed by the JN.1 and KP.2 variants is less pronounced than that observed between the spike proteins expressed by the XBB.1.5 and JN.1 variants. The European Medicines Agency Emergency Task Force recommended vaccination against the JN.1 variant based on the grounds that there was no significant difference in the protective effect against severe COVID-19 in the past when vaccination targeted the spike protein of genetically similar variants [21]. Furthermore, there was no clear evidence that a vaccine targeting the KP.2 variant was superior in immunogenicity

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to a vaccine targeting the JN.1 variant based on animal experiments [20]. In light of the shift from KP.2 to KP.3 as the dominant variant, the necessity for a timely supply of vaccines with sufficient protection rather than vaccines that precisely match the prevalent variant was also highlighted. Thus, the European Medicines Agency has found it difficult to recommend vaccination against the KP.2 variant over vaccination against the JN.1 variant and notes that the details of vaccination should be discussed according to the prevailing circumstances and epidemic situation in each country.

The United Kingdom (UK) recommends that adults aged 65 and over, residents in a care home for the older adults, and individuals aged 6 months and over who are in a clinical risk group that are at risk of developing severe COVID-19 be vaccinated with the COVID-19 vaccine as part of the vaccination campaign in the fall of 2024. Additionally, the campaign recommends the use of mRNA monovalent vaccines (Pfizer/BioNTech, Moderna) against the JN.1 variant [22, 23].

VACCINES APPROVED IN KOREA AND RECOMMENDATIONS

As of October 2024, the virus strain prevalent in Korea is the KP.3 strain [14]. Currently, in Korea, mRNA vaccines for adolescents and adults from Pfizer/BioNTech (Comirnaty JN.1 injection) and Moderna (Spikevax JN.1) have been approved in response to the JN.1 variant [24]. The recombinant protein vaccine developed by Novavax, which is designed to target the JN.1 variant, and the mRNA vaccine for infants and children developed by Pfizer/BioNTech have been granted emergency use authorization (**Table 1**) [24]. A paucity of data exists for a direct comparison of the effectiveness of vaccines approved in Korea and overseas against infection with the KP.3 variant and other variants. However, the KP.3 variant belongs to a subvariant of the JN.1 lineage and is genetically more similar to the JN.1 variant than to the XBB.1.5 variant, which has been the target of vaccines in the previous season. Therefore, the vaccine against the JN.1 variant is expected to have a significant effect on the KP.3 variant as well. Because several studies have demonstrated that the KP.2 and KP.3 subvariants have additional immune evasion capabilities in comparison to the JN.1 variant [17, 18, 25], the JN.1 and KP.2 variants are used in JN.1 lineage vaccines in North America. However, there is currently limited data directly comparing the effects of the vaccines on the two variants.

All three vaccines currently available in Korea have been approved for use in children aged 12 and older. The vaccine for infants and children (aged 6 months to 4 years) from Pfizer/BioNTech has been granted emergency use authorization and is, therefore, available for use. Although Pfizer/BioNTech's vaccine for children between the ages of 5 and 11 has not yet been introduced in Korea, Moderna's vaccine can be administered to children between the ages of 6 months and 11 years at half the adult dose (0.25 mL/25 μg) (**Table 1**).

Considering the types and characteristics of the currently prevalent COVID-19 variants, overseas vaccination guidelines, and domestic approval, it is recommended that adults aged 65 and over, people with underlying medical conditions, which place them at high risk of severe COVID-19 (**Table 2**), residents of facilities vulnerable to infection such as long-term care facilities, pregnant women, healthcare workers, and workers in facilities vulnerable to infection be vaccinated with the COVID-19 vaccine against the JN.1 lineage approved in Korea in the 2024–2025 season. Anyone over the age of 6 months who wants to reduce the risk of contracting COVID-19 or the risk of post-COVID complications (long COVID) may consider getting a COVID-19 vaccine [26].

Table 1. COVID-19 vaccines in use in Korea in 2024–2025 (as of October 2024)

Product	Manufacturer	Vaccine platform	Age of vaccination	Vaccination method
Comirnaty JN.1 injection	Pfizer/BioNTech	mRNA vaccine	6 months–4 years old (for infants and children)[a]	0.3 mL/30 μg, intramuscular injection
			12 years old and older (for adolescents and adults)	0.3 mL/30 μg, intramuscular injection
Spikevax JN.1	Moderna	mRNA vaccine	6 months–11 years old	0.25 mL/25 μg[b], intramuscular injection
			12 years old and older	0.5 mL/30 μg, intramuscular injection
Novavax COVID-19 vaccine (2024–2025 formulation)	Novavax	Recombinant protein vaccine	12 years old and older[a]	0.5 mL/5 μg, intramuscular injection

[a]Emergency use authorization.
[b]Moderna vaccine (0.5 mL/50 μg) for adolescents and adults can be administered at half the dose (0.25 mL/25 μg).

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Table 2. Risk factors for severe COVID-19[a]

High risk	Asthma, cancer, cerebrovascular disease, chronic kidney disease, chronic lung disease (interstitial lung disease, pulmonary embolism, pulmonary hypertension, bronchiectasis, chronic obstructive pulmonary disease), chronic liver disease (cirrhosis, non-alcoholic fatty liver disease, alcoholic liver disease, autoimmune hepatitis), cystic fibrosis, type 1 and type 2 diabetes, disabilities[b] (neurodevelopmental disorders, Down syndrome, etc.), heart conditions (heart failure, coronary artery disease, cardiomyopathy), HIV infection, mental health conditions (mood disorders, schizophrenia spectrum disorders), dementia, Parkinson's disease, obesity (body mass index [BMI] ≥30 or ≥95th percentile in children), physical inactivity, current or recent pregnancy, primary immunodeficiencies, current or past smoking, solid organ or hematopoietic stem cell transplantation, tuberculosis, or use of corticosteroids or immunosuppressive drugs
Suggestive high-risk	Epilepsy, hemophilia, overweight (25≤BMI<30), sickle cell disease, or substance use disorder
Inconclusive	Alpha-1 antitrypsin deficiency, bronchopulmonary dysplasia, hepatitis B, hepatitis C, hypertension, or thalassemia

[a]Centers for Disease Control and Prevention, USA [37].
[b]For a complete list of disabilities that qualify as a risk factors, see link in Reference 37.

In non-immunocompromised adults with no vaccination history for the 2024–2025 season, one dose of either the mRNA vaccine or the recombinant protein vaccine is administered at least 3 months after the last dose of a previous vaccine, regardless of the previous vaccination history. Two doses of an mRNA vaccine or recombinant protein vaccine were administered as the primary vaccination to individuals who had no history of COVID-19 infection or vaccination in the past [4]. However, following the emergence of the Omicron variant, there has been a notable increase in the seropositivity rate for SARS-CoV-2 globally. In 2022, the seropositivity rate for the spike protein was confirmed to be 97.6%, while the seropositivity rate for the nucleocapsid protein, which is associated with past natural infection, was 57.1% in Korea [27, 28]. Given that the majority of adults have been exposed to SARS-CoV-2 antigens through natural infection or vaccination, a single dose of the 2024–2025 season vaccine is recommended for adults, irrespective of their past vaccination history. A decline in the effectiveness of the vaccine has been documented over time following vaccination with the COVID-19 vaccine, necessitating the administration of a booster vaccination [29, 30]. Because the occurrence of vaccine-associated myocarditis is known to be increased in cases with short intervals between vaccinations, it is recommended that a minimum of 3 months be allowed to elapse between the administration of the last dose and the administration of the 2024–2025 season vaccine [31].

Moderately or severely immunocompromised individuals are at an elevated risk of complications and mortality from COVID-19. The immunogenicity and effectiveness of COVID-19 vaccines are diminished in individuals with impaired immune function relative to those with normal immunity [32]. The overseas vaccination guidelines recommend a booster dose of the COVID-19 vaccine 6 months after the last dose in the 2024–2025 season [11, 19, 22]. The decision to receive a booster dose of the COVID-19 vaccine, the number of booster doses, and the timing of the booster dose in moderately or severely immunocompromised individuals should be made on an individual basis, depending on the number and type of vaccines previously received and the immune status of the individual. Consultation with a specialist regarding the booster dose is recommended.

At the end of October, the Advisory Committee on Immunization Practices in the US recommended that adults aged 65 and over receive a booster dose of the COVID-19 vaccine 6 months after their last dose in the 2024–2025 season [11]. In the US, 70% of hospitalizations and 80% of in-hospital deaths related to COVID-19 were among adults aged 65 and older between the second half of 2023 and the middle of 2024 [33]. Furthermore, the effect of vaccination in the 2023–2024 season was found to significantly decrease up to 6 months following the last dose [32]. Six months after the last vaccination, the effectiveness of the vaccine against COVID-19-related emergency department or urgent care visits and hospitalizations was close to 0%. However, 5 months after vaccination, the effectiveness of the vaccine against COVID-19-related intensive care unit admissions and deaths was relatively high, at more than 40% [32]. Furthermore, the findings of a cost-effectiveness analysis conducted in the US indicating that the two-dose vaccination strategy for the 2024–2025 season was a cost-effective alternative to vaccination for individuals aged 65 and above compared to those aged 65 and below ultimately influenced the formulation of the guidelines [34]. Meanwhile, the UK is incorporating the findings of a cost-effectiveness analysis into its vaccination recommendations, which are scheduled to take effect in spring 2025. Based on evidence highlighting the cost-effectiveness of a more targeted vaccination strategy [35], the UK has announced plans to elevate the age-based vaccination recommendation

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from 65 to 75, effective from spring 2025. Consequently, the UK recommends vaccinations every 6 months for adults aged 75 and above, residents in a care homes for the older adults, and immunocompromised individuals aged 6 months or above [36]. Given the necessity for individualized assessment of the benefits of administering two doses of the 2024–2025 season vaccine 6 months apart to adults aged 65 and older, particularly in light of the regional COVID-19 epidemic situation, the emergence of new variants, and clinical risk factors, it is recommended that individuals consult an expert regarding additional doses following the first dose of the 2024–2025 season vaccine. Future selection of vaccine recipients should be guided by the findings of cost-effectiveness analysis in Korea, with related research currently ongoing.

It is contraindicated for individuals who have had a severe allergic reaction, such as anaphylaxis, to a COVID-19 vaccine or vaccine ingredient in the past to receive that vaccine [24], including those with a history of severe allergic reaction to specific vaccine component such as polyethylene glycol in the Pfizer/BioNTech and Moderna vaccines, tris(hydroxymethyl)aminomethane in the Moderna vaccine, or polysorbate in the Novavax vaccine. In the event that myocarditis or pericarditis caused by a COVID-19 vaccine is confirmed in a vaccinated individual, further administration of the vaccine in question should be postponed until sufficient evidence regarding their safety becomes available.

SUPPLEMENTARY MATERIAL

Supplementary Material
Korean version

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Conceptualization: WBP, WSC. Data curation: WBP, YHH. Writing – original draft: WBP, YHH. Writing – review & editing: WBP, YHH, KTK, JYN, SHP, JYS, EJC, MJC, JYC, JYH, WSC.

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