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Risk of anxiety disorders and insomnia following COVID-19 vaccination

Haerin Cho [a,1], Joon Hyung Jung [b,1], Hwoyeon Seo [c,d], Won Chul Shin [e], Jung-Ick Byun [e], Suvin Park [a], Na-Young Jeong [f], Sanghoon Oh [g,*,2], Nam-Kyong Choi [a,h,**,2]

[a] Department of Health Convergence, Ewha Womans University, Seoul, Republic of Korea
[b] Department of Psychiatry, Chungbuk National University Hospital, Cheongju, Republic of Korea
[c] Graduate School of Future Strategy, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea
[d] Center for Technology and Behavioral Health, Geisel School of Medicine, Dartmouth College, NH, United States
[e] Department of Neurology, Kyung Hee University Hospital at Gangdong, Seoul, 05278, Republic of Korea
[f] Health Science Convergence Research Institute, Ewha Womans University, Seoul, Republic of Korea
[g] Department of Psychiatry, Uijeongbu Eulji Medical Center, Eulji University School of Medicine, Uijeongbu, Republic of Korea
[h] Graduate School of Industrial Pharmaceutical Science Department of Health Convergence, Ewha Womans University, Seoul, Republic of Korea

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ABSTRACT

Objective: Despite extensive evaluations of potential adverse events related to COVID-19 vaccination, the risk of mental health outcomes following vaccination remains unclear. We evaluated the risk of anxiety disorders and insomnia associated with COVID-19 vaccination in Korea.

Methods: We performed a self-controlled case series study using COVID-19 vaccination registration data from the Korea Disease Control and Prevention Agency and claims data from the National Health Insurance Service. This study included individuals over 18 who received their first COVID-19 vaccine between February 26 and September 30, 2021, and were subsequently diagnosed with anxiety disorders or insomnia. The risk intervals were defined as 1–7, 8–14, 15–21, and 22–42 days following vaccination, with the observation period extending to 365 days after the first dose. Incidence rate ratios (IRRs) were estimated using conditional Poisson regression by comparing outcome incidence in the risk and control windows, with adjustment for calendar month.

Results: A total of 156,290 anxiety disorders cases and 250,704 insomnia cases were identified. The risk of anxiety disorders was elevated across all risk intervals with IRRs (95 % confidence intervals [CIs]) of 1.05 (1.03–1.08), 1.12 (1.10–1.15), 1.13 (1.10–1.15), and 1.09 (1.08–1.11), respectively. The risk of insomnia increased in all intervals except for days 1–7, with IRRs (95 % CIs) of 0.98 (0.96–1.00), 1.10 (1.08–1.12), 1.07 (1.06–1.09), and 1.13 (1.12–1.14).

Conclusion: COVID-19 vaccination was associated with an increased risk of anxiety disorders and insomnia. These findings should be interpreted with caution in light of pandemic-related psychosocial stressors and changes in healthcare-seeking patterns.

1. Introduction

The COVID-19 pandemic profoundly affected daily life worldwide, causing significant disruptions across various sectors, including the economy, education, and healthcare systems (Nicola et al., 2020). Public health practice such as self-quarantine, social distancing (or lockdowns) combined with fear of infection has been reported to negatively impact the mental health of the general population (Brooks et al., 2020). The development and widespread administration of COVID-19 vaccines have played a crucial role in reducing mortality and hospitalizations associated with the virus (Zheng et al., 2022). By alleviating fears of severe outcomes, these vaccines have been proposed to positively influence public mental health. However, concerns have also been raised about the potential negative impact of COVID-19 vaccination on mental health (Ryoo et al., 2024). Several hypotheses have been proposed to explain potential associations between COVID-19 vaccination and mental health

* Corresponding author. Department of Psychiatry, Eulji University School of Medicine 712, Dongil-ro, Uijeongbu-si, Gyeonggi-do, Republic of Korea.
** Corresponding author. Department of Health Convergence, Ewha Womans University 52 Ewhayeodae-gil, Seodaemun-gu, Seoul, 03760, Republic of Korea.
E-mail addresses: sanghoon.oh@eulji.ac.kr (S. Oh), nchoi@ewha.ac.kr (N.-K. Choi).
[1] joint first authors.
[2] joint corresponding authors

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outcomes. These include the impact of misinformation and fear of adverse events, immune-mediated mechanisms involving inflammatory cytokines, and hyperarousal triggered by activation of the hypothalamic-pituitary-adrenal (HPA) axis due to the stress of receiving a novel vaccine during a global pandemic (Blake et al., 2018; Riemann et al., 2010). Supporting these perspectives, some case reports (de Souza Melo and da Silva Magalhães, 2023; Rhim et al., 2023) and case series (Yesilkaya et al., 2021) have documented instances of anxiety, depression, and insomnia following COVID-19 vaccination, highlighting the need for further investigation into these relationships.

Recent studies investigating the mental health effects of COVID-19 vaccination have reported conflicting findings. While three studies (Chourpiliadis et al., 2023; Zhang et al., 2023a; Zhu et al., 2024) demonstrated reductions in anxiety and depressive symptoms following vaccination, one study (AlSayed et al., 2024) identified increased anxiety as a post-vaccination outcome. The evidence to date remains inconclusive, as the majority of existing studies rely on self-reported surveys and offer only cross-sectional assessments of anxiety and depressive symptom prevalence. These limitations highlight the necessity for further research to comprehensively elucidate the relationship between COVID-19 vaccination and mental health outcomes. Accordingly, we investigated the association between COVID-19 vaccination and mental health outcomes, specifically anxiety disorders and insomnia requiring medical care, in the Korean population, using a nationwide self-controlled case series (SCCS) analysis of national administrative claims that encompass nearly the entire population. The SCCS uses within-person comparisons to mitigate time-invariant confounding, and the use of objectively ascertained outcomes from claims data helps address limitations of self-reported, cross-sectional studies. Our findings complement prior survey-based work and provide additional real-world evidence.

2. Methods

2.1. Data Sources and study population

We used a large database that combined the Korea Disease Control and Prevention Agency's (KDCA) COVID-19 Immunization Registry (February 26, 2021 to September 30, 2022) and the National Health Insurance System (NHIS) insurance claims database (January 1, 2002 to September 30, 2022). KDCA has collected nationwide COVID-19 vaccination data since the initiation of the vaccination program on February 26, 2021. The collected data include information such as vaccination date, vaccine type, and dose number (Jeong et al., 2023). The NHIS database encompasses records of medical services and diagnoses for approximately 97 % of the entire Korean population covered by the National Health Insurance program. Additionally, we utilized KDCA's registry of confirmed SARS-CoV-2 cases to determine SARS-CoV-2 infection status.

We identified individuals over 18 years of age who received their first COVID-19 vaccination between February 26, 2021, and September 30, 2021. Of these, we included individuals who were diagnosed with anxiety disorders or insomnia from February 27, 2021 to September 30, 2022. We excluded individuals with incomplete vaccination records, including overseas vaccination, missing data on dose number or vaccine type, or duplicate entries for the same dose. Individuals with a prior diagnosis of the same condition within three years before the onset of anxiety disorders or insomnia were excluded to capture incident cases. Additionally, individuals with a history of SARS-CoV-2 infection prior to the onset of the outcomes of interest were excluded, as isolation due to infection could influence the occurrence of these conditions (Zhang et al., 2024). We also excluded individuals who did not have a recorded diagnosis of anxiety disorders or insomnia within the defined observation period (i.e., 365 days following the first COVID-19 vaccine dose).

2.2. Exposure

All types of COVID-19 vaccines administered to the study population during the observation period were defined as exposures. The COVID-19 vaccines available for individuals aged 18 years and older in South Korea during the study period included BNT162b2 (Pfizer-BioNTech), mRNA-1273 (Moderna), AZD1222 (AstraZeneca), Ad26. COV2-S (Janssen), NVX-CoV2372 (Novavax), and GBP510 (SKYCovione). Homologous vaccination was defined as receiving the same platform or type of COVID-19 vaccine for all doses—nucleic acid-based (Pfizer-BioNTech, Moderna), non-replicating viral vector (AstraZeneca, Janssen), or protein-based (Novavax, SKYCovione)—whereas heterologous vaccination referred to receiving different vaccine platforms or types for any of the doses.

2.3. Outcomes

A case of anxiety disorder was defined as the first inpatient or outpatient visit during the observation period with a primary diagnosis of anxiety disorder accompanied by a prescription for anxiolytics or antidepressants on the same day as the diagnosis. The diagnosis of anxiety disorder was identified using the international classification of diseases 10th revision (ICD-10) codes F41.0 (panic disorder), F41.2 (mixed anxiety and depressive disorder), F41.3 (other mixed anxiety disorders), F41.8 (other specified anxiety disorders), and F41.9 (anxiety disorder, unspecified). Prescription of anxiolytics and antidepressants were identified using Anatomical Therapeutic Chemical (ATC) codes (Supplementary Table 1).

A case of insomnia was defined as the first inpatient or outpatient visit during the observation period with a primary or secondary diagnosis of insomnia, accompanied by a same-day prescription for hypnotics with a duration of at least 7 days. The diagnosis of insomnia was identified using ICD-10 codes G47.0 (disorders of initiating and maintaining sleep) and F51.0 (nonorganic insomnia). Prescription of hypnotics such as doxepin, flunitrazepam, flurazepam, triazolam, zolpidem, trazodone, and eszopiclone were identified using ATC codes (Supplementary Table 1). Patients with a history of hypnotic prescriptions lasting 7 days or more within the three years prior to the confirmed onset of insomnia were excluded.

2.4. Study design

We used a Self-Controlled Case Series (SCCS) design to evaluate the association between COVID-19 vaccination and the risk of anxiety disorders or insomnia. The SCCS design method compares the incidence rate of the outcome of interest during risk windows, assumed to be associated with vaccination, to that during control windows, assumed to be unrelated to vaccination, within the same individuals who have experienced the outcome of interest (Petersen et al., 2016). This study design is especially effective when selecting a control group is challenging and is widely used in vaccine safety research. By using individuals as their own controls, it effectively controls for time-invariant confounders. The SCCS design relies on specific assumptions. First, the events should be independently recurrent. Second, the occurrence of an outcome must not influence the probability of subsequent exposure. Therefore, only the first episode of the outcome of interest within the observation period was included in the analysis. The observation period was defined as 365 days from the date of the first vaccination to minimize the impact of time-varying confounders. Based on case reports (de Souza Melo and da Silva Magalhães, 2023; Rhim et al., 2023; Yesilkaya et al., 2021) and consultations with psychiatric clinicians, the risk windows were defined as 1–7, 8–14, 15–21, and 22–42 days after each dose, where day 0 is the day of vaccination. All remaining observation period outside these risk windows constituted the control windows. (Fig. 1).

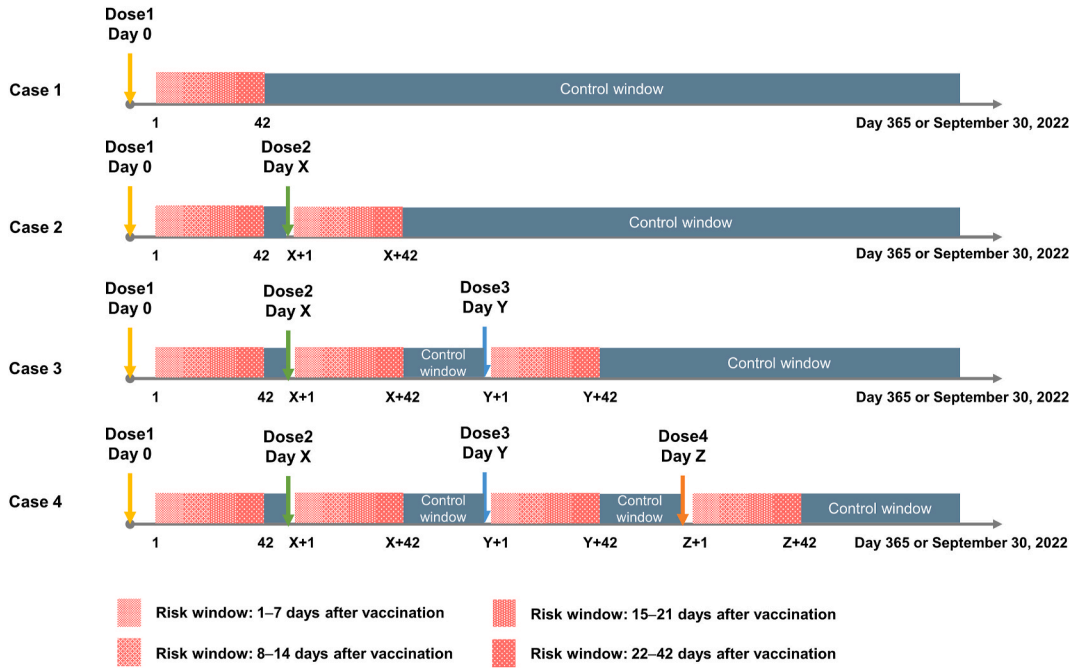


Fig. 1. Overview of the self-controlled case series study design. Case 1 Subjects who received only one vaccination during the observation period; Case 2 Subjects who received two vaccinations during the observation period; Case 3 Subjects who received three vaccinations during the observation period; Case 4 Subjects who received four vaccinations during the observation period.

2.5. Statistical analysis

Descriptive analyses were conducted to evaluate the baseline characteristics of patients who experienced the outcome of interest within the observation period. Continuous variables were summarized as means with standard deviations and assessed for statistical significance using t-tests. Categorical variables were expressed in frequencies and percentages and assessed for statistical significance using χ^2 tests. The Charlson Comorbidity Index (CCI) was calculated based on comorbidities identified within one year prior to the first vaccination.

Incidence rate ratios (IRRs) were estimated by comparing the incidence of the outcome of interest in the risk windows to that in the control windows using conditional Poisson regression with the log of person-time as an offset. We included calendar-month indicator variables to account for temporal variation during the COVID-19 pandemic, including changes in healthcare utilization and the emergence of dominant SARS-CoV-2 variants. Subgroup analyses were conducted based on demographic characteristics and other factors potentially influencing the occurrence of anxiety disorders or insomnia. The subgroups were stratified by age at the time of vaccination (18–34, 35–49, 50–64, ≥65), sex, socioeconomic status (SES; low, middle, high), vaccine platform or type in homologous and heterologous vaccination, and CCI (0–4, +5). The CCI reflected comorbidity status during the 12 months preceding the first vaccination.

We performed sensitivity analysis to assess the robustness of our findings and to evaluate the impact of different definitions and assumptions used in the analysis. To ensure the reliability of outcome definitions, analyses were repeated with a one-year exclusion period prior to the confirmed onset of the event. Additionally, recognizing that anxiety disorders and insomnia may influence one another (Marcks et al., 2010; Cox et al., 2016), we conducted a sensitivity analysis that excluded individuals with a three-year prior history of the other outcome, such that the anxiety analyses excluded prior insomnia and the insomnia analyses excluded prior anxiety. All statistical analyses were performed using SAS Enterprise Guide 7.1 (SAS Institute Inc., Cary, NC, USA) and R 4.0.3 (R Foundation for Statistical Computing, Vienna, Austria).

2.6. Ethics statement

This study was approved by the Public Institutional Review Board Designated by Ministry of Health and Welfare of the Republic of Korea (P01-202203-01-005).

3. Results

A total of 156,290 cases of anxiety disorder and 250,704 cases of insomnia following COVID-19 vaccination met the eligibility criteria and were included in the primary analysis. Table 1 presents the characteristics of these individuals. The mean age of patients with anxiety disorders was 49.8 years, with a higher proportion in the 30–49 age group. In contrast, the mean age of patients with insomnia was 57.5 years, with an increasing proportion observed in older age groups. Women represented a slightly higher proportion of cases (60.8 % among anxiety disorder patients; 58.7 % among insomnia patients), and the majority had received three or more vaccinations during the observation period (76.7 % for anxiety disorder; 84.7 % for insomnia).

In the primary analysis, the incidence rate of anxiety disorders significantly increased across all risk intervals compared with the control period. The IRRs were 1.05 (95 % CI: 1.03–1.08) for 1–7 days, 1.12 (95 % CI: 1.09–1.15) for 8–14 days, 1.12 (95 % CI: 1.10–1.15) for 15–21 days, and 1.09 (95 % CI: 1.07–1.10) for 22–42 days post-vaccination. The risk of anxiety disorders was notably elevated following the first dose compared to subsequent doses (IRR: 1.42 [95 % CI: 1.35–1.49] for days 1–7, 1.47 [95 % CI: 1.39–1.54] for days 8–14, 1.40 [95 % CI: 1.33–1.48] for days 15–21, and 1.21 [95 % CI: 1.17–1.26] for days 22–42 post-vaccination) (Fig. 2). Similarly, the incidence rate of insomnia significantly increased during the 8–14 days (IRR = 1.10; 95 % CI: 1.08–1.12), 15–21 days (IRR = 1.12; 95 % CI: 1.11–1.14), and 22–42 days (IRR = 1.07; 95 % CI: 1.05–1.09) post-vaccination intervals compared to the control period. Additionally, the risk of insomnia was higher following the first dose compared to subsequent doses (IRR: 1.14 [95 % CI: 1.09–1.20] for days 1–7, 1.25 [95 % CI: 1.19–1.30] for days 8–14, 1.26 [95 % CI: 1.20–1.31] for days 15–21, and 1.19 [95 % CI: 1.16–1.23] for days 22–42 post-vaccination) (Fig. 3). The results of the

Table 1
Characteristics of the patients diagnosed with anxiety disorder or insomnia.

Characteristics	Anxiety disorder	Insomnia
	N (%)	N (%)
Total	156,290 (100.0)	250,704 (100.0)
Gender		
Male	61,269 (39.2)	103,610 (41.3)
Female	95,021 (60.8)	147,094 (58.7)
Age, years		
Mean (SD)	49.8 (18.2)	57.5 (17.0)
18-29	127,523 (17.6)	20,835 (8.3)
30-49	248,995 (31.4)	53,055 (21.2)
50-64	342,841 (27.4)	85,253 (34.0)
+65	436,931 (23.6)	91,561 (36.5)
Insurance type		
Health insurance	151,495 (96.9)	238,464 (95.1)
Medical aid	4795 (3.1)	12,240 (4.9)
Socioeconomic status		
Low	36,621 (23.5)	61,223 (24.4)
Middle	44,566 (28.5)	70,962 (28.3)
High	67,398 (43.1)	102,519 (40.9)
Unknown/Missing	7705 (4.9)	16,000 (6.4)
Vaccination status[a]		
1st dose only	2714 (1.7)	2145 (0.9)
Fully vaccinated	33,796 (21.6)	36,111 (14.4)
Extra vaccinated	119,780 (76.7)	212,448 (84.7)
Charlson comorbidity index		
0-4	58,929 (38.7)	88,535 (36.3)
+5	97,361 (62.3)	162,169 (64.7)

Abbreviation: SD, standard deviation.
[a] Vaccination status indicates the exposure status assigned based on all vaccine doses received during the entire study period.

sensitivity analyses are presented in Supplementary Table 2 and Supplementary Table 3. When excluding individuals with a prior history of each condition within only one year before the onset, the risks of anxiety disorders and insomnia remained consistent with the primary results. Similarly, excluding individuals with a three-year prior history of the other outcome produced results consistent with the primary analysis for both anxiety and insomnia.

Subgroup analyses were conducted with stratification by gender, age group, SES, homologous and heterologous vaccine platform or type, and CCI (Supplementary Table 4). The analyses by gender, SES and CCI showed results consistent with the primary findings. Stratified by age group, the risk of anxiety disorders increased after the first and second dose, which aligns with the primary findings, but after the third and fourth doses, the risk was attenuated or not statistically significant in most age groups. In contrast, for insomnia, an increased risk was observed only during the 15–42 days risk interval following the first dose among individuals aged 18–29 years. Subgroup analyses stratified by homologous vaccine platform or type showed a substantially increased risk of anxiety disorders and insomnia associated with nucleic acid-based or non-replicating viral vector vaccines during the first 14 days following the first dose.

4. Discussion

To assess the association between COVID-19 vaccination and the risk of anxiety disorders and insomnia in South Korea, we conducted a SCCS study, a widely used approach for vaccine safety evaluation. Our findings indicate that the risk of anxiety disorders increased by 5–12 % within the first 42 days post-vaccination and the risk of insomnia increased by 7–12 % during the 8–42 days following vaccination. Notably, the risk of both anxiety disorders and insomnia was higher following the first dose compared to subsequent doses.

Previous studies investigating the association between COVID-19 vaccination and mental health have primarily relied on survey-based assessments. These studies have reported conflicting findings regarding the psychological impact of vaccination. Several studies (Chourpiliadis et al., 2023; Perez-Arce et al., 2021) observed a reduction in anxiety and depression following vaccination, which was interpreted as a short-term relief effect. Other studies (Chaudhuri and Howley, 2022; Koltai et al., 2021; Zhang et al., 2024) compared mental health outcomes between vaccinated and unvaccinated individuals, demonstrating that SARS-CoV-2 vaccination may contribute to improvements

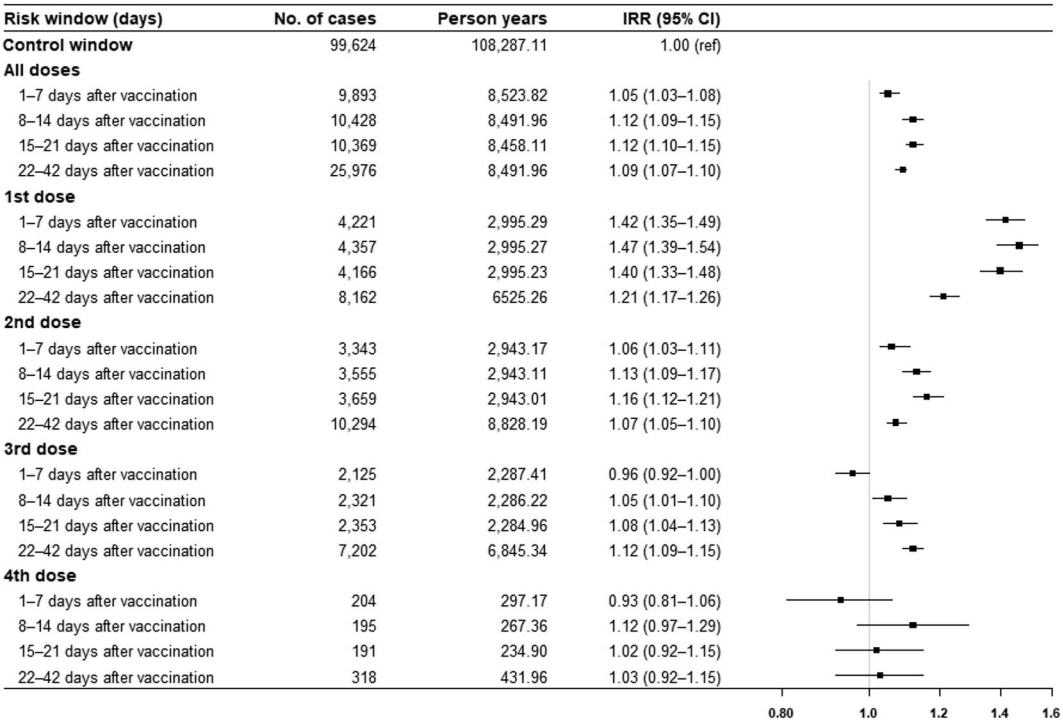


Fig. 2. Incidence rate ratios, with 95 % confidence intervals for anxiety disorder after COVID-19 vaccination. Abbreviation: IRR, Incidence rate ratio; CI, Confidence interval.

Risk window (days)	No. of cases	Person years	IRR (95% CI)
Control window	166,246	169,210.63	1.00 (ref)
All doses			
1–7 days after vaccination	13,336	14,374.83	0.98 (0.96–1.00)
8–14 days after vaccination	14,510	14,295.91	1.10 (1.08–1.12)
15–21 days after vaccination	14,999	14,211.38	1.12 (1.11–1.14)
22–42 days after vaccination	41,613	37,997.02	1.07 (1.05–1.09)
1st dose			
1–7 days after vaccination	4,349	4,804.72	1.14 (1.09–1.20)
8–14 days after vaccination	4,734	4,804.71	1.25 (1.19–1.30)
15–21 days after vaccination	4,773	4,804.65	1.26 (1.20–1.31)
22–42 days after vaccination	10,419	10,476.08	1.19 (1.16–1.23)
2nd dose			
1–7 days after vaccination	4,548	4,763.14	1.07 (1.03–1.10)
8–14 days after vaccination	5,016	4,762.89	1.15 (1.11–1.18)
15–21 days after vaccination	4,977	4,762.75	1.11 (1.07–1.14)
22–42 days after vaccination	15,090	14,286.42	1.09 (1.07–1.11)
3rd dose			
1–7 days after vaccination	3,926	4,054.90	0.92 (0.89–0.95)
8–14 days after vaccination	4,314	4,052.84	1.00 (0.97–1.04)
15–21 days after vaccination	4,775	4,050.17	1.11 (1.08–1.14)
22–42 days after vaccination	15,226	12,130.17	1.18 (1.15–1.20)
4th dose			
1–7 days after vaccination	513	752.07	0.85 (0.78–0.93)
8–14 days after vaccination	446	675.46	0.83 (0.76–0.91)
15–21 days after vaccination	474	593.81	1.02 (0.93–1.12)
22–42 days after vaccination	878	1,104.35	1.02 (0.95–1.09)

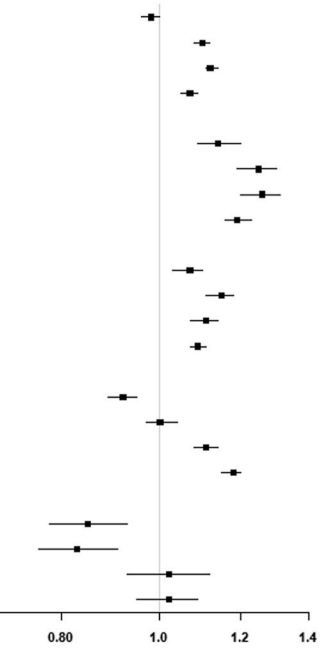


Fig. 3. Incidence rate ratios, with 95 % confidence intervals for insomnia after COVID-19 vaccination. Abbreviation: IRR, Incidence rate ratio; CI, Confidence interval.

in anxiety, insomnia, and depressive symptoms. These studies may reflect not only the direct effect of vaccination itself but also the psychological factors associated with the decision to receive the vaccine. Conversely, other studies reported an increased risk of anxiety following vaccination. One study, which focused exclusively on vaccinated individuals, found that anxiety levels remained elevated even after the third dose, suggesting that these psychological responses may not be solely attributable to early pandemic stressors such as lockdowns or social isolation (AlSayed et al., 2024). In a cross-sectional survey of 6984 vaccinated Chinese adults during the national campaign, prevalences of depression and anxiety were 19.4 % and 9.7 %, respectively. Rates were higher after the second dose, and female sex, healthcare occupation, higher educational attainment, and pregnancy planning were independently associated with increased odds of both outcomes (Zhang et al., 2023b). Similarly, a retrospective cohort study from South Korea reported that vaccinated individuals had a higher risk of anxiety and sleep disorders compared to their unvaccinated counterparts (Kim et al., 2024).

The increased risk of anxiety and insomnia observed following COVID-19 vaccination in this study may be attributable to several psychosocial and contextual factors. First, differences in vaccination policies and public health strategies across countries may have influenced psychological responses. In South Korea, the implementation of the "vaccine pass" system, which required vaccination certification or negative test result for public access (Korea Disease Control and Prevention Agency, 2022) may have pressured individuals who were hesitant or distrustful of vaccines to undergo immunization. Such policy measures could have heightened anxiety among certain vaccinated individuals. Second, the limited availability of safety evidence for newly developed COVID-19 vaccines during the early phase of the vaccination campaign may have exacerbated anxiety. As demonstrated in previous studies, these concerns may have been further amplified by extensive media coverage of vaccine-related adverse events, as well as reports of side effects leading to intensified anxiety (MacKrill, 2023). This may, in part, explain the increased risk of anxiety and insomnia observed in this study following the first and second vaccine doses, for which evidence on safety has been relatively limited. Given the multitude of psychosocial stressors during the COVID-19 pandemic, including policy shifts, altered healthcare access, and heightened public anxiety, the observed increases in anxiety and insomnia cannot be attributed solely to vaccination and should be interpreted within the broader societal and healthcare context.

Evidence regarding the risk of anxiety and sleep disorders following COVID-19 vaccination by vaccine type remains limited. In our study, an evaluation of the risk of anxiety and insomnia following homologous and heterologous vaccination demonstrated an elevated risk regardless of the vaccination regimen. Notably, a particularly heightened risk was observed among individuals who received a first dose of homologous nucleic acid-based or viral vector vaccines. This finding may be attributable to the characteristics of the initial COVID-19 vaccine rollout in South Korea, during which healthcare workers, military personnel, and general hospital staff — high-risk populations with increased exposure to COVID-19 and confined working environments — were prioritized for nucleic acid-based or viral vector vaccination (Kim et al., 2023). These occupational groups have been reported to experience a higher risk of mental health issues compared to the general population, as demonstrated in a meta-analysis conducted during the COVID-19 pandemic (Blasco-Belled et al., 2024). Such contextual factors may have played a role in the increased risk of anxiety and insomnia observed following a first dose of homologous nucleic acid-based or viral vector vaccines in our study. Aside from contextual or behavioral factors, some case studies (Renemane et al., 2022; Taube and Lesiņa, 2025; Uvais, 2022) have hypothesized that both mRNA and viral vector vaccines may induce immunological changes that affect mental health outcomes. The COVID-19 vaccine stimulates robust humoral and cellular immune responses, including T-cell activation and cytokine release (Tiyo et al., 2021). Immune dysregulation—particularly elevated interleukin-6 (IL-6)—has been linked to mood disturbances following vaccination, with studies showing that even mild increases in IL-6 are associated with heightened depressive symptoms (Kuhlman et al., 2018).

To our knowledge, this is the first nationwide study conducted in South Korea to evaluate the risk of anxiety disorders and insomnia

following COVID-19 vaccination. The utilization of large-scale, nationwide data strengthens the generalizability of our findings. However, this study has several limitations. First, while the SCCS design effectively controls for time-invariant confounders, it is less robust in addressing time-varying confounders. The incidence of anxiety disorders and insomnia may have been influenced by various factors during the pandemic, such as policy changes, shifts in healthcare utilization patterns, and fluctuations in individual mental health conditions. Although fully accounting for these changes is challenging, we sought to minimize this limitation by adjusting for calendar time on a monthly basis in the analysis. Second, while this study examined both diagnoses and medication prescriptions, individuals who received non-pharmacological interventions such as cognitive behavioral therapy, as well as those with mild symptoms who were diagnosed but not prescribed medication, may have been excluded. Given that non-pharmacological treatments are typically sought by individuals with milder symptoms, the study population may have been disproportionately composed of individuals with relatively severe anxiety disorders and insomnia. The absence of information on symptom severity in the claims data limited our ability to assess the potential impact of this bias. Future research incorporating qualitative components, such as structured interviews or validated questionnaires, is needed to understand patients' subjective perceptions and motivations for seeking medical care after vaccination. Third, although anxiety disorders and insomnia tend to co-occur, this study could not conduct a separate analysis of individuals with both conditions. Early anxiety symptoms following vaccination may have progressed into sleep disturbances; however, the sequential nature of these patterns could not be assessed using claims data. To evaluate each outcome while minimizing potential influence from the other, we conducted a sensitivity analysis that excluded individuals with a three-year prior history of the other outcome. These findings suggest that the associations observed in this study were not largely attributable to one condition triggering the onset of the other during the observation period. Nevertheless, further research is needed to investigate post-vaccination mental health trajectories and to examine the temporal and clinical associations between anxiety disorders and insomnia. Fourth, individual-level occupational information was unavailable in the claims data, precluding stratified SCCS analyses by high-risk occupational groups. As such groups may differ from the general population in baseline mental-health risk and healthcare-utilization patterns, future studies that explicitly incorporate occupation are warranted.

5. Conclusion

This study revealed an association between COVID-19 vaccination and an increased risk of anxiety disorders and insomnia. While this finding suggests a potential link between vaccination and these psychiatric conditions, the estimated effects were modest and the individual-level clinical implications are limited. It is essential to consider the broader context of the COVID-19 pandemic, which was characterized by unprecedented social, economic, and psychological stressors with significant impact on mental health outcomes. The observed association may reflect not only the direct effects of vaccination but also the complex interplay of pandemic-related factors, such as heightened public anxiety, disruptions in healthcare access, and increased psychological distress.

CRediT authorship contribution statement

Haerin Cho: Writing – review & editing, Writing – original draft, Visualization, Investigation, Formal analysis, Conceptualization. **Joon Hyung Jung:** Writing – review & editing, Validation, Investigation, Conceptualization. **Hwoyeon Seo:** Writing – review & editing, Investigation, Conceptualization. **Won Chul Shin:** Writing – review & editing, Investigation, Conceptualization. **Jung-Ick Byun:** Writing – review & editing, Investigation, Conceptualization. **Suvin Park:** Writing – review & editing, Validation, Investigation. **Na-Young Jeong:** Writing – review & editing, Validation, Investigation. **Sanghoon Oh:** Writing – review & editing, Supervision, Investigation, Conceptualization. **Nam-Kyong Choi:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Data statement

This study used a large database combining vaccination records from the Korea Disease Control and Prevention Agency (KDCA) and claims data from the National Health Insurance Service (NHIS). Access was granted by both institutions for the duration of the study. However, due to privacy and ethical regulations, the data are not publicly available and cannot be shared by the authors.

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Declaration of competing interest

All other authors have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2025.10.034.

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