Early Version – Uncorrected



Comparable COVID-19 Risk in Infants Who Were Breastfed-Dominant and Formula-Fed-Dominant in Mothers Who Had Received At Least 2 Doses of the COVID-19 Vaccines

Kamolwish Laoprasopwattana, Nattaporn Tassanakijpanich, Puttichart Khantee, Sirinthip Kittivisuit, Vanlaya Koosakulchai

DOI: http://dx.doi.org/10.31584/jhsmr.20261525

Received: 24 March 2026

Revised: 19 June 2026

Accepted: 25 June 2026

Published online: 24 November 2026

Please cite this article as: Laoprasopwattana K, Tassanakijpanich N, Khantee P, Kittivisuit S, Koosakulchai V. Comparable COVID-19 risk in infants who were breastfed-dominant and formula-fed-dominant in mothers who had received at least 2 doses of the COVID-19 vaccines. J Health Sci Med Res 2026. doi: http://dx.doi.org/10.31584/jhsmr.20261525

Early Version — Uncorrected: This accepted manuscript has not been typeset or proofread. Content and formatting may change prior to final publication and should not be regarded as the final Version of Record.

© 2026 JHSMR. Hosted by Prince of Songkla University.

This is an open access article under the CC BY-NC-ND license (https://creativecommons.org/licenses/by-nc-nd/4.0/).

Original Article

Comparable COVID-19 Risk in Infants Who Were Breastfed-Dominant and Formula-Fed-Dominant in Mothers Who Had Received At Least 2 Doses of the COVID-19 Vaccines

Kamolwish Laoprasopwattana, Nattaporn Tassanakijpanich, Puttichart Khantee, Sirinthip Kittivisuit, Vanlaya Koosakulchai

Department of Pediatrics, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand.

*** Corresponding Author:**

Kamolwish Laoprasopwattana

Department of Pediatrics, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand.

E-mail: kamolwish@gmail.com

Early Version - Uncorrected

Abstract

Objective: To assess the variation in COVID-19 hazards over time associated with the Omicron variant among vaccinated mothers based on their nursing status.

Materials and methods: A prospective cohort study was conducted during the Omicron outbreak (January 1-October 1, 2022). Infants who exhibited respiratory symptoms were tested for SARS-CoV-2 by RT-PCR. Those who tested positive were defined as having the event for the survival analysis.

Results: Of 234 infants, 109 (46.6%) tested positive for SARS-CoV-2 within the study period. The majority of the events occurred during the first two months of follow-up. Compared to those who tested negative, infants who tested positive had a significantly higher proportion of mothers testing positive for SARS-CoV-2 (93.6% vs 24.8%, $P < 0.001$). In the multivariate Cox regression model, we did not demonstrate any protective effects of breastfeeding against COVID-19 at both the 6- and 12-month durations. However, having a mother test positive for COVID-19 remained a statistically significant risk factor, with a hazard ratio of 20.48 (95% CI = 9.39–44.67).

Conclusion: Breastfeeding did not confer protective benefits to infants against COVID-19, nor did it elevate the likelihood of infection. The majority of infants infected with SARS-CoV-2 acquired the virus from their mothers.

Keywords: SARS-CoV-2, COVID-19, breastfeeding, vaccine, infants

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has impacted billions of people worldwide since March 11, 2020.[1] Young children were more likely than other age groups to experience symptoms from the Omicron variant of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and its outbreak in Thailand from January to September 2022.[2] In Thailand, the Ministry of Public Health downgraded COVID-19 from a dangerous communicable disease to an endemic disease for which active surveillance was not needed on 1st October 2022.

Children being more vulnerable to Omicron could be explained by the Omicron variant's extremely high transmissibility and a lack of built-up immunity from vaccinations or past

Early Version - Uncorrected

infections. In Thailand, a policy of COVID-19 vaccinations for children aged six months to five years was implemented in October 2022. Previous studies found SARS-CoV-2 in breast milk. [3,4] Anti-SARS-CoV-2 antibodies were also found in breast milk following both natural SARS-CoV-2 infection and COVID-19 vaccinations, which could potentially protect very young children.[5-10] Previous studies in lactating women vaccinated with 2 doses of a COVID-19 mRNA vaccine found SARS-CoV-2 IgG in breast milk [7,8,11], with a high correlation with SARS-CoV-2 IgG levels in the serum (Pearson correlation of 0.7).[11]

In Thailand, alternative vaccine strategies, including heterologous regimens, CoronaVac-ChAdOx1, CoronaVac-BNT162b2, and ChAdOx1-BNT162b2, were used to improve vaccine coverage. These regimens have been found to be safe and capable of inducing similar or higher humoral and cellular immune responses than the homologous BNT162b2-BNT162b2 vaccinations in both children and adults.[12,13]

The objective of this study was to assess the different hazards of COVID-19 during the Omicron outbreak in Thailand between infants who were breastfed-dominant and formula-fed-dominant in mothers who had received at least 2 doses of the COVID-19 vaccines before their child was one year old.

Materials and Methods

Study design and setting

A prospective cohort study was conducted during the Omicron outbreak of the COVID-19 pandemic, from January 1, 2022, to 30 September 2022, at the outpatient pediatric clinic*. The hospital is a V114-032/PNEU-ERA research study site (NCT04193215) granted by Merck Sharp & Dohme LLC. According to the project, our site enrolled 700 healthy participants who were aged 2 months and born at term. The participants underwent health checks and immunizations according to the standard child health supervision schedule until they reached 36 months of age.

We enrolled children whose mothers had received at least two doses of a COVID-19 vaccine before the child reached 12 months of age during the Omicron outbreak. Children who had COVID-19 before January 1, 2022, were excluded.

During the study period, if an infant exhibited respiratory symptoms such as fever, cough, runny nose, and/or difficulty breathing, the mother was asked to bring the infant to the hospital. If

Early Version - Uncorrected

a family member had a current COVID-19 infection, the infant would undergo RT-PCR testing for SARS-CoV-2 (Sansure Biotech Inc).

Variables

Demographic information of the infant patients was collected, including age, gender, and parental socioeconomic status (SES). SES variables included the education levels of both the mother and father, as well as household income. A household income lower than 25,000 Baht per month was classified as low. The exposure variables collected to assess their protective effect included breastfeeding status at 6 and 12 months. During the study period, the mothers were asked about their infant's feeding habits at 6 and 12 months of age and were recorded as either primarily breastfed or formula fed. Infants who consumed more breast milk than formula milk during the first six months and 12 months of life were categorized as breastfed dominant, while infants who consumed more formula milk than breast milk were classified as formula dominant.

Several independent variables were collected to adjust for the effect of breastfeeding, including the type of COVID-19 vaccine used and whether the mother tested positive along with her infant. The mothers' vaccinations were classified into 2 regimens: 1) an mRNA regimen, which was defined as a regimen containing at least one mRNA vaccine as a second dose after a first dose of either Sinovac/Sinopharm or AstraZeneca, and 2) a 'no mRNA' regimen, defined as two doses of any of the non-mRNA vaccines. The outcome variable was the status of COVID-19 during the Omicron outbreak, confirmed by the result of RT-PCR.

Statistical analysis

Sample size was calculated based on an expected infection rate of 50% in the control group[14] and 30% in the breastfeeding group, representing a 20% absolute reduction. Using a two-sided α of 0.05 and 80% power, the required sample size was 93 participants in each group.

All statistical analyses were conducted in the R program version 4.2.3. Descriptive statistics were used to summarize the child cohort from the beginning of the Omicron outbreak. We described the continuous variables using median and interquartile range (IQR) values, after the Shapiro-Wilk test indicated a non-normal distribution. Frequencies and percentages were used to summarize the categorical variables. Univariate association tests such as the Mann-Whitney U test,

Early Version - Uncorrected

chi-squared test, and Fisher's exact test were conducted to pre-select covariates to adjust for in the multivariate analysis process using a *P* value of 0.05 as the cutoff.

We performed survival analysis to assess the hazard over time of contracting COVID-19 during the outbreak of the Omicron strain. R packages including "survival" and "survminer" were used for this analysis.[14] The starting point of the follow-up time was January 1st, 2022, which was reported to be the start of the Omicron outbreak, while the end of the outbreak on September 30th, 2022, was defined as the endpoint. Those diagnosed with COVID-19 during this period were defined as having the event for the survival analysis. Therefore, the endpoint was defined as the date of the COVID-19 diagnosis for those with the event. The follow-up time was obtained in days by subtracting the start point from the end point. A life table was used to describe the overall event, number at risk, and cumulative hazard over time. For summarization purposes, follow-up time in the life table was aggregated in monthly units. We used Kaplan-Meier curves to visualize different hazards over time between the exposure variable groups, while the Cox regression model was used to determine the adjusted hazard ratios (HR) for the selected variables after the proportional hazards assumption was tested for using the Schoenfeld residuals test. Covariates used for adjusting the hazard ratio were based on previously reported clinical evidence of increased risk of COVID-19. The regression results are presented in a hazard ratio table format with 95% confidence intervals and *P* values from Wald's test for each hazard ratio. Firth's penalized Cox proportional hazards regression was performed using the coxphf package in R. The level of significance (α) in this study was 0.05.

Ethics approval

The study was approved by the Institutional Review Board of the Faculty of Medicine* (65-066-2), and it was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from a legally authorized representative.

Results

Clinical characteristics of infants with and without COVID-19

A total of 253 children were initially recruited for the study cohort. Nineteen children were excluded from the cohort because their mothers did not receive at least two doses of the vaccine during the study period.

Early Version - Uncorrected

Within the study cohort, comprising 234 children, 109 individuals were identified as positive for COVID-19 throughout the observation period. A notably higher percentage of infants diagnosed with COVID-19 had mothers who were concurrently infected with SARS-CoV-2, when compared to infants without COVID-19 (93.6% vs 24.8%, P value < 0.001).

The median (IQR) age at enrollment and the age at which the mother received the second dose of vaccination, as well as the proportions of gender, mRNA vaccine status, maternal full vaccination within 6 months of childbirth, and breastfeeding status at both 6 and 12 months of age, showed no significant differences between the two groups (Table 1).

The impact of breastfeeding status and different COVID-19 vaccination regimens on the prevention of COVID-19 infection

Following the follow-up period, all COVID-19 cases were identified within a seven-month timeframe. A significant decline in the probability of remaining free from COVID-19 was observed between the first and second months, with the number of cases increasing from 20 to 50. The trend stabilized around months 4–5 after the outbreak (Table 2).

After stratifying according to exposure variables such as breastfeeding status at 6 and 12 months, along with maternal mRNA vaccination, the Kaplan-Meier curves demonstrated similar trends of a notable decrease in probability during the initial follow-up period, as shown in Figure 1.

In the analysis of breastfeeding status in relation to the prevention of COVID-19 infection, the trajectory for individuals within the breastfeeding dominant group indicates an elevated likelihood of remaining free from COVID-19 from approximately day 100 to day 200 for those with a 6-month breastfeeding status, and from day 75 throughout the follow-up period for those with a 12-month breastfeeding status; nevertheless, the 95% confidence intervals exhibited overlap between infants predominantly breastfed and those primarily formula-fed (Figure 1A-B).

In the analysis of COVID-19 vaccine regimens in relation to the prevention of COVID-19 infection, a comparable crossover pattern was observed in both mRNA and non-mRNA vaccine regimen groups (Figure 1C).

Following the adjustment for age, sex, and socioeconomic-related variables, the maternal COVID-19 status continued to demonstrate statistical significance as a risk factor for COVID-19, with a hazard ratio of 20.48 (P < 0.001). Among infants who were exclusively or predominantly

Early Version - Uncorrected

breastfed at 12 months, the risk of COVID-19 infection was lower but did not reach statistical significance compared with the reference group (HR 0.85, 95% CI 0.55–1.32) (Table 3).

In a sensitivity analysis using Firth's penalized Cox proportional hazards regression, the estimated hazard ratios were similar to those obtained from the conventional Cox proportional hazards model (Table 3 and Supplementary Table 1). These findings indicate that the observed associations were robust and were not materially affected by sparse-data bias related to the limited number of mothers who received mRNA vaccines.

An exploratory analysis, including an interaction term between breastfeeding status and maternal COVID-19 infection status, showed no significant interaction (HR = 1.20, P = 0.83). The inclusion of the interaction term did not materially change the estimated associations in the multivariable Cox proportional hazards model. The full results of the interaction model are in Supplementary Table 2.

Discussion

During the Omicron outbreak, 46.5% of infants were diagnosed with COVID-19. The incidence of COVID-19 among infants who were exclusively or predominantly breastfed at 6 and 12 months of age did not differ significantly compared with formula-fed infants. Similarly, no statistically significant differences in infection rates were observed between infants born to mothers who received an mRNA vaccine regimen and those whose mothers did not receive mRNA vaccination.

We found a similar infection rate (48.8%) following the Omicron outbreak in a previous study of Thai children aged 5–7 years.[15]

In this study, the median age of children when their mothers received two doses of the COVID-19 vaccine and at study enrollment was 6.6 and 9.2 months, respectively. These ages did not differ significantly between children who subsequently developed COVID-19 and those who did not.

Previous studies have demonstrated that SARS-CoV-2–specific IgA and IgG antibodies can be detected in breast milk for longer than 6 months.[11,16-18] In this study, we evaluated the protective effect of breast milk during the first year of life. As the median age of children when their mother received vaccination was 6.6 months, we therefore assessed the protective efficacy of breast milk at both 6 and 12 months of age.

Early Version - Uncorrected

To the best of our knowledge, no other study to date has examined the benefit of a non-mRNA vaccine-recipient mother's breast milk in preventing infants from contracting COVID-19. We did not find a significant protective effect from vaccinated breast milk.

The study had several limitations: firstly, there was a limited number of infants whose mothers had received complete COVID-19 vaccination regimens before the infants reached 6 months of age; secondly, there was a very limited number of mothers who had received an mRNA vaccine before their infants reached the age of 6 months, making it impossible to compare the efficacy between these two vaccine groups; and finally, none of the infants were exclusively fed formula milk so the infants might have gotten some passive antibodies from their breast milk.

Conclusion

Breastfeeding did not confer protective benefits against COVID-19 in infants, nor did it increase the likelihood of infection. Although most infants infected with SARS-CoV-2 acquired the virus from their mothers, mothers who contracted COVID-19 could safely breastfeed without increasing the risk of SARS-CoV-2 transmission to their infants.

Conflict of interest:

No existing or potential conflict of interest relevant to this article was reported.

Funding resource:

This research was financially supported by the Faculty of Medicine*.

References

1. WHO. COVID-19. [accessed 2023 Apr 1]. https://covid19.who.int/
2. Worldometer. COVID-19 coronavirus pandemic. 2019. [accessed 2023 Apr 1]. https://www.worldometers.info/coronavirus/
3. Gross R, Conzelmann C, Muller JA, Stenger S, Steinhart K, Kirchhoff F, Munch J. Detection of SARS-CoV-2 in human breastmilk. Lancet. 2020;395(10239):1757-8.

Early Version - Uncorrected

4. Murano Y, Yamahira S, Shoji H, Hisata K, Koshizaka T, Nakazawa T, et al. Evaluation of the transmission of SARS-CoV-2 through breast milk: a case series. Front Pediatr. 2023;11:1160790.
5. Peng S, Zhu H, Yang L, Cao L, Huang X, Dynes M, et al. A study of breastfeeding practices, SARS-CoV-2 and its antibodies in the breast milk of mothers confirmed with COVID-19. Lancet Reg Health West Pac. 2020;4:100045.
6. Bauerl C, Randazzo W, Sanchez G, Selma-Royo M, Garcia Verdevio E, Martinez L, et al. SARS-CoV-2 RNA and antibody detection in breast milk from a prospective multicentre study in Spain. Arch Dis Child Fetal Neonatal Ed. 2022;107(2):216-21.
7. Esteve-Palau E, Gonzalez-Cuevas A, Guerrero ME, Garcia-Terol C, Alvarez MC, Garcia G, et al. Quantification and Progress Over Time of Specific Antibodies Against Severe Acute Respiratory Syndrome Coronavirus 2 in Breast Milk of Lactating Women Vaccinated With BNT162b2 Pfizer-BioNTech Coronavirus Disease 2019 Vaccine (LacCOVID). Open Forum Infect Dis. 2022;9(6):ofac239.
8. Duncombe CJ, McCulloch DJ, Shuey KD, Logue JK, Franko NM, Wolf CR, et al. Dynamics of breast milk antibody titer in the six months following SARS-CoV-2 infection. J Clin Virol. 2021;142:104916.
9. Bauerl C, Zulaica J, Rusu L, Moreno AR, Perez-Cano FJ, Lerin C, et al. Assessment of SARS-CoV-2 neutralizing antibody titers in breastmilk from convalescent and vaccinated mothers. iScience. 2023;26(6):106802.
10. Juncker HG, Mulleners SJ, van Gils MJ, Bijl TPL, de Groot CJM, Pajkrt D, et al. Comparison of SARS-CoV-2-Specific Antibodies in Human Milk after mRNA-Based COVID-19 Vaccination and Infection. Vaccines (Basel). 2021;9(12).
11. Esteve-Palau E, Gonzalez-Cuevas A, Guerrero ME, Garcia-Terol C, Alvarez MC, Casadevall D, Diaz-Brito V. Quantification of Specific Antibodies Against SARS-CoV-2 in Breast Milk of Lactating Women Vaccinated With an mRNA Vaccine. JAMA Netw Open. 2021;4(8):e2120575.
12. Wittawatmongkol O, Bunjoungmanee P, Kosalaraksa P, Laoprasopwattana K, Boonsathorn S, Chantasrisawad N, et al. Immunogenicity and reactogenicity of fractional, heterologous primary COVID-19 vaccination schedules with BNT162b2 boosters in 5-11-year-old Thai

Early Version - Uncorrected

children: A multicenter, prospective, double-blind, randomized control trial. Vaccine. 2023;41(40):5834-40.

13. Niyomnaitham S, Toh ZQ, Wongprompitak P, Jansarikit L, Srisutthisamphan K, Sapsutthipas S, et al. Immunogenicity and reactogenicity against the SARS-CoV-2 variants following heterologous primary series involving CoronaVac and ChAdOx1 and BNT162b2 plus heterologous BNT162b2 booster vaccination: An open-label randomized study in healthy Thai adults. Hum Vaccin Immunother 2022;18:2091865.
14. Therneau T. A Package for Survival Analysis in R. R package version 3.8-3.2024. [accessed 2025 May 1] https://CRAN.R-project.org/package=survival
15. Suntronwong N, Vichaiwattana P, Klinfueng S, et al. SARS-CoV-2 infection- induced seroprevalence among children and associated risk factors during the pre- and omicron-dominant wave, from January 2021 through December 2022, Thailand: A longitudinal study. PLoS One 2023; 18(4): e0279147.
16. Narayanaswamy V, Pentecost BT, Schoen CN, Alfandari D, Schneider SS, Baker R, Arcaro KF. Neutralizing Antibodies and Cytokines in Breast Milk After Coronavirus Disease 2019 (COVID-19) mRNA Vaccination. Obstet Gynecol. 2022;139(2):181-91.
17. Calvo-Lerma J, Bueno-Llamoga P, Bauerl C, Cortes-Macias E, Selma-Royo M, Perez-Cano F, et al. Persistence of Anti SARS-CoV-2 Antibodies in Breast Milk from Infected and Vaccinated Women after In Vitro-Simulated Gastrointestinal Digestion. Nutrients. 2022;14(10).
18. Stafford LS, Valcarce V, Henry M, et al. Detection of SARS-CoV-2 IgA and IgG in human milk and breastfeeding infant stool 6 months after maternal COVID-19 vaccination. J Perinatol 2023; 43(6): 775-81.

Early Version - Uncorrected

Table 1 Clinical characteristics of the infants who contracted or did not contract COVID-19 during the study period

Variables	**Total** (N=234)	**COVID-19 positive** (N=109)	**COVID-19 negative** (N=125)	**p-value**
Age, months, median (IQR)	9.2 (8.6-9.6)	9.2 (8.6,9.6)	9.2 (8.7,9.7)	0.65[a]
Age at 2nd dosage of maternal vaccination, months, median (IQR)	6.6 (5.3-7.6)	6.4 (5.2,7.6)	6.6 (5.4,7.6)	0.55[a]
Male, n (%)	115 (49.1)	53 (48.6)	62 (49.6)	0.99[b]
Father's education				0.21[b]
Less than high school	123 (52.6)	52 (47.7)	71 (56.8)	
High school or higher	111 (47.4)	57 (52.3)	54 (43.2)	
Mother's education, n (%)				0.16[b]
Less than high school	85 (36.3)	34 (31.2)	51 (40.8)	
High school or higher	149 (63.7)	75 (68.8)	74 (59.2)	
Household income, n (%)				0.84[b]
Low income	194 (85.1)	90 (84.1)	104 (86)	
Middle to high income	34 (14.9)	17 (15.9)	17 (14)	
mRNA vaccine status, n (%)				0.39[b]
mRNA included regimen	83 (35.5)	35 (32.1)	48 (38.4)	
no mRNA included	151 (64.5)	74 (67.9)	77 (61.6)	
Fully vaccinated within six months of childbirth, n (%)	86 (36.8)	42 (38.5)	44 (35.2)	0.70[b]
Breastfeeding status at 6-month, n (%)				0.87[b]
Formula dominant	71 (30.3)	32 (29.4)	39 (31.2)	
Breastfed only/dominant	163 (69.7)	77 (70.6)	86 (68.8)	
Breastfeeding status at 12-month, n (%)				0.31[b]
Formula dominant	163 (69.7)	80 (73.4)	83 (66.4)	
Breastfed only/dominant	71 (30.3)	29 (26.6)	42 (33.6)	

Early Version - Uncorrected

Variables	Total (N=234)	COVID-19 positive (N=109)	COVID-19 negative (N=125)	p-value
Maternal COVID-19 positive, n (%)	133 (56.8)	102 (93.6)	31 (24.8)	<0.01[b]

Table 2. Life table analysis of COVID-19 infection among children during the Omicron outbreak

Month	Number at risk	Number of events	COVID-19 free probability	Cumulative hazard
0	234	1	1.00	0.00
1	233	20	0.91	0.09
2	213	50	0.70	0.32
3	163	19	0.62	0.44
4	144	5	0.59	0.48
5	139	3	0.58	0.50
6	136	5	0.56	0.53
7	131	6	0.53	0.58

Table 3. Cox proportional hazards regression analysis of the factors associated with COVID-19 infection in children during the Omicron outbreak

Variables	β	Adj. HR	95% CI	$P_{Wald's\ test}$
Age	0.18	1.19	0.89,1.59	0.24
Male (ref: female)	0.11	1.11	0.74,1.67	0.61
Father with high school or higher education (ref: lower than high school)	0.09	1.1	0.72,1.66	0.66
Mother with high school or higher education (ref: lower than high school)	-0.33	0.72	0.45,1.15	0.17

Early Version - Uncorrected

Variables	**β**	**Adj. HR**	**95% CI**	***P*Wald's test**
Middle to high household income (ref: low income)	-0.11	0.89	0.51,1.56	0.69
Mother tested positive for COVID-19 (ref: tested negative)	3.02	20.48	9.39,44.67	<0.01
Breastfed only/dominant (ref: formula dominant)	-0.16	0.85	0.55,1.32	0.47

Early Version - Uncorrected

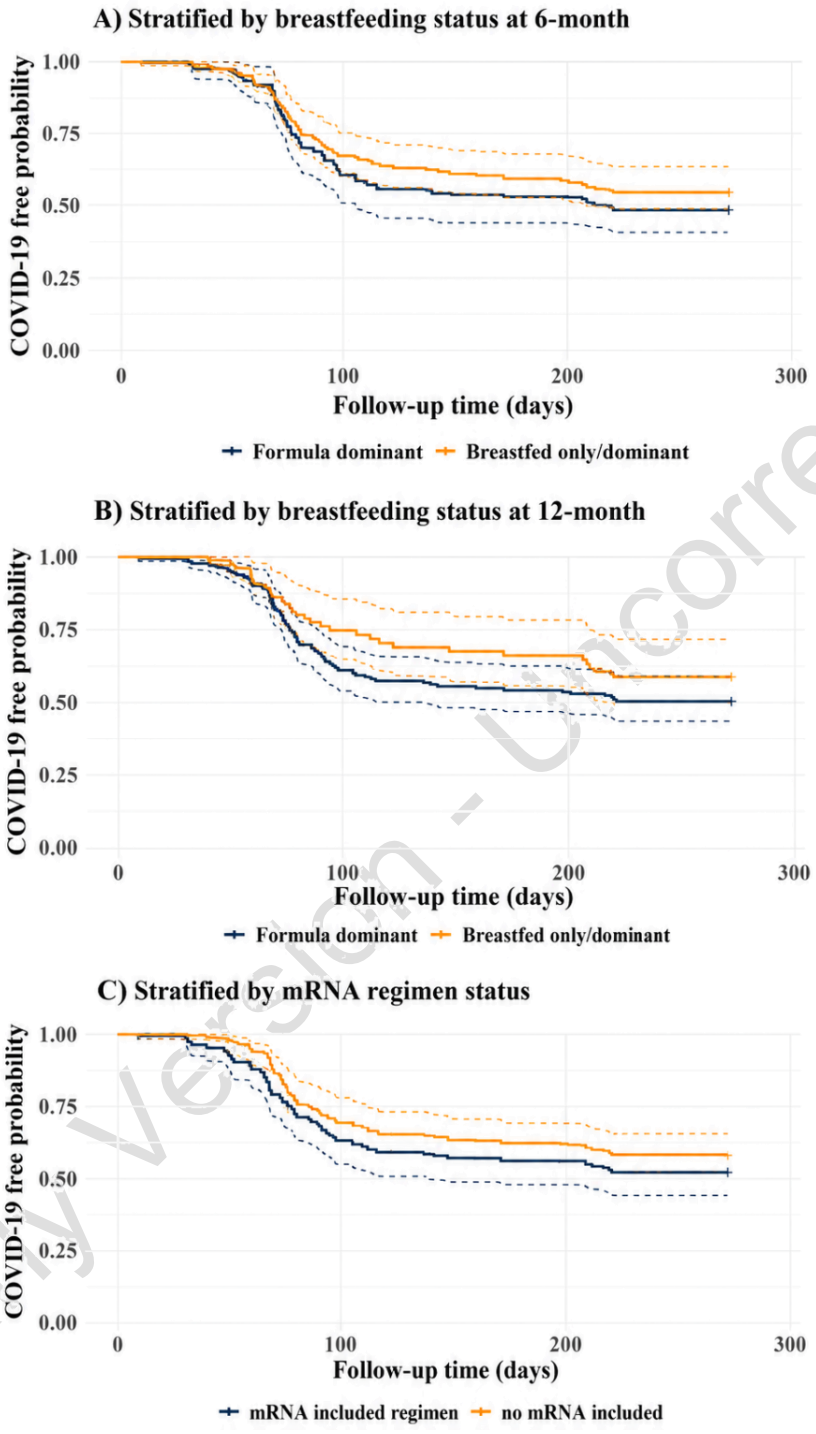

Figure 1. Kaplan-Meier curves of COVID-19 free probability. A) stratified by breastfeeding status at 6-month, B) stratified by breastfeeding status at 12-month, and C) stratified by mRNA regimen status

Early Version - Uncorrected

Supplementary Table 1. Firth's penalized Cox proportional hazards regression analysis of factors associated with COVID-19 infection in children during the Omicron outbreak

Variables	**β**	**Adj. HR**	**95% CI**	***P*Wald's test**
Age	0.16	1.17	0.88,1.56	0.27
Male (ref: female)	0.1	1.11	0.74,1.66	0.63
Father with high school or higher education (ref: lower than high school)	0.08	1.09	0.72,1.65	0.69
Mother with high school or higher education (ref: lower than high school)	-0.32	0.73	0.46,1.16	0.18
Middle to high household income (ref: low income)	-0.1	0.9	0.52,1.58	0.72
Mother tested positive for COVID-19 (ref: tested negative)	2.95	19.02	8.9,40.65	<0.01
Breastfed only/dominant (ref: formula dominant)	-0.15	0.86	0.56,1.33	0.49

Early Version - Uncorrected

Supplementary Table 2. Cox proportional hazards regression analysis of factors associated with COVID-19 infection in children during the Omicron outbreak with interaction term

Variables	**β**	**Adj. HR**	**95% CI**	***P*Wald's test**
Age	0.18	1.19	0.89,1.6	0.23
Male (ref: female)	0.11	1.12	0.74,1.68	0.6
Father with high school or higher education (ref: lower than high school)	0.09	1.1	0.72,1.66	0.66
Mother with high school or higher education (ref: lower than high school)	-0.33	0.72	0.45,1.15	0.17
Middle to high household income (ref: low income)	-0.11	0.89	0.51,1.56	0.69
Mother tested positive for COVID-19 (ref: tested negative)	2.97	19.4	7.77,48.4	<0.01
Breastfed only/dominant (ref: formula dominant)	-0.33	0.72	0.14,3.71	0.69
Interaction of mother tested positive for COVID-19 and breastfed only/dominant	0.18	1.2	0.22,6.61	0.83

Early Version - Uncorrected