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Original Article

Dynamics of Preterm Birth and Intensive Care Admission Rates Before and During COVID-19 Pandemic: A Comparative Observational Study

COVID-19 Pandemisi Öncesinde ve Sırasında Preterm Doğum ve Yoğun Bakıma Yatış Oranlarının Değişimi: Karşılaştırmalı Gözlemsel Bir Çalışma

Kardelen Türközü Kanter[1], Eda Karadağ Öncel[2], Özgün Uygur[3], Deniz Gönülal[4], Defne Engür[3], Mehmet Yekta Öncel[5]

[1]İzmir Atatürk Training and Research Hospital, Clinic of Pediatrics, İzmir, Türkiye
[2]Dokuz Eylül University Faculty of Medicine, Department of Pediatrics, Division of Pediatric Infectious Diseases, İzmir, Türkiye
[3]University of Health Sciences Türkiye, İzmir Tepecik Training and Research Hospital, Department of Pediatrics, Division of Neonatology, İzmir, Türkiye
[4]University of Health Sciences Türkiye, İzmir City Hospital, Department of Pediatrics, Division of Neonatology, İzmir, Türkiye
[5]İzmir Bakırçay University Faculty of Medicine, Department of Pediatrics, Division of Neonatology, İzmir, Türkiye

ABSTRACT

Objective: To compare preterm birth and neonatal intensive care unit admission rates before and during the coronavirus disease-2019 (COVID-19) pandemic in a tertiary care center, and to examine whether pandemic-related restriction phases and selected sociodemographic characteristics were associated with changes in neonatal outcomes.

Method: This retrospective, cross-sectional study was conducted at a tertiary care hospital in İzmir, Türkiye. Medical records of 813 newborns delivered between September 11, 2018 and September 11, 2021 were reviewed. Pre-pandemic (n=401) and pandemic (n=412) cohorts were defined. Maternal and neonatal clinical variables were analyzed. Primary outcomes were preterm births (delivery before 37 weeks of gestation) and neonatal intensive care (NICU) admissions; secondary outcome analyses evaluated indications for NICU care. Non-parametric and chi-square tests were used, with the level of statistical significance set at $p<0.05$.

Results: The overall preterm birth rate was 28.2%, with similar rates in the pre-pandemic (28.7%) and pandemic (27.7%) groups (p=0.732). The NICU admission rate was 30.3%, rising from 27.7% in the pre-pandemic period to 32.8% during the pandemic period (p=0.114). Transient tachypnea of the newborn and respiratory distress syndrome were the most common NICU diagnoses. In the pre-pandemic period, preterm birth was more frequent among Syrian newborns (p=0.021), and first-minute Apgar scores of preterm infants were lower (p=0.002). Preterm birth and NICU admission rates did not differ between lockdown and normalization phases (all $p>0.05$).

Conclusion: Preterm birth rates were similar before and during the COVID-19 pandemic. NICU admission rates showed a non-significant absolute increase of approximately 5 percentage points during the pandemic, but the available sample size was not sufficiently powered to exclude a clinically relevant difference. The higher proportion of preterm Syrian infants in the pre-pandemic period suggests that social and healthcare-access factors may be important when interpreting pandemic-related neonatal outcomes. These findings should be considered hypothesis-generating and require confirmation in larger multicenter cohorts.

Keywords: Preterm birth, neonatal intensive care unit, pandemic, neonatal outcomes, respiratory distress, transient tachypnea of the newborn

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Corresponding Author
Kardelen Türközü Kanter,
İzmir Atatürk Training and Research Hospital, Clinic of Pediatrics, İzmir, Türkiye
E-mail: kardelenturkozu@gmail.com
ORCID: 0000-0003-0211-0978

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ÖZ

Amaç: Bu çalışmada, üçüncü basamak bir merkezde koronavirüs hastalığı-2019 (COVID-19) pandemisi öncesi ve pandemi döneminde preterm doğum ve yenidoğan yoğun bakım ünitesi yatış oranlarının karşılaştırılması, ayrıca kısıtlama dönemleri ve seçilmiş sosyodemografik özelliklerin neonatal sonuçlarla ilişkili olup olmadığının değerlendirilmesi amaçlandı.

Yöntem: Bu retrospektif kesitsel çalışmada, İzmir, Türkiye'deki bir hastanede 11 Eylül 2018 ile 11 Eylül 2021 arasında doğan 813 yenidoğanın kayıtları incelendi. Yenidoğanlar pandemi öncesi (n=401) ve pandemi dönemi (n=412) olarak gruplandırıldı. Maternal ve neonatal değişkenler analiz edildi. Primer sonlanımlar preterm doğum ve yenidoğan yoğun bakım yatışıydı; sekonder analizlerde yatış endikasyonları değerlendirildi. Non-parametrik testler ve ki-kare testi kullanıldı.

Bulgular: Genel preterm doğum oranı %28,2 olup pandemi öncesi ve pandemi grupları arasında fark yoktu (%28,7'ye karşı %27,7; p=0,732). Yenidoğan yoğun bakım yatışı %27,7'den %32,8'e yükseldi, ancak bu artış anlamlı değildi (p=0,114). En sık yatış tanıları yenidoğanın geçici takipnesi ve respiratuvar distres sendromuydu. Pandemi öncesi dönemde preterm doğum Suriyeli yenidoğanlarda daha sıktı (p=0,021) ve preterm bebeklerde birinci dakika Apgar skorları daha düşüktü (p=0,002). Preterm doğum ve yoğun bakım yatış oranları kısıtlama ve normalleşme dönemleri arasında farklılık göstermedi.

Sonuç: Preterm doğum oranları COVID-19 pandemi öncesi ve pandemi döneminde benzerdi. Yenidoğan yoğun bakım yatışlarında anlamlı olmayan yaklaşık 5 puanlık mutlak artış izlendi, ancak çalışma klinik olarak anlamlı bir farkı dışlamak için yeterli güce sahip değildi. Pandemi öncesi preterm doğumlarda Suriyeli bebek oranının yüksek olması, sosyal ve sağlık hizmetlerine erişimle ilişkili faktörlerin neonatal sonuçları etkileyebileceğini düşündürmektedir. Bulgular hipotez oluşturucu niteliktedir ve çok merkezli çalışmalarla doğrulanmalıdır.

Anahtar kelimeler: Preterm doğum, yenidoğan yoğun bakım ünitesi, pandemi, neonatal sonuçlar, respiratuvar distress, yenidoğanın geçici takipnesi

INTRODUCTION

Since preterm birth is one of the leading causes of neonatal morbidity and mortality, it remains a significant public health concern worldwide[1]. Deliveries occurring before the 37th week of gestation may lead to multiple health complications, particularly respiratory and metabolic disorders, and increase the need for neonatal intensive care unit (NICU) admissions. The frequency of preterm births and their associated sequelae constitute a substantial burden not only for individuals but also for healthcare systems.

At the end of 2019, the coronavirus disease-2019 (COVID-19) pandemic emerged and rapidly evolved into a global crisis, affecting healthcare delivery in multiple dimensions. It significantly altered both individuals' healthcare-seeking behaviors and perinatal care practices[2,3]. Social isolation, restrictions, hygiene protocols, and avoidance of hospital visits during the pandemic adversely influenced the quality of prenatal care[4]. Whether these changes played a decisive role in the incidence of preterm birth and NICU admission rates remains a matter of debate.

In the literature, some studies have suggested a decrease in preterm birth rates during the pandemic[5-8], while others argued that maternal infection, prenatal stress, limited access to healthcare services, and rising cesarean delivery rates might have increased these rates[9,10]. Similarly, variations in NICU admission rates have been reported across different regions and time periods[11]. In addition to the direct effects of the pandemic, the indirect influence of public health measures may also have shaped these outcomes.

The aim of this study was to compare preterm birth and NICU admission rates between the pre-pandemic and pandemic periods and to evaluate whether pandemic-related restriction phases and selected sociodemographic characteristics were associated with these neonatal outcomes.

MATERIALS and METHODS

Study Design

This study was designed as a retrospective, cross-sectional, and comparative observational research. It was conducted at the Department of Obstetrics and Gynecology, University of Health Sciences Türkiye, İzmir Tepecik Training and Research Hospital, by reviewing the medical records of newborns delivered between September 11, 2018 and September 11, 2021. The study was conducted in accordance with the WMA Declaration of Helsinki and its recent amendments after the ethical approval was obtained from the University of Health Sciences Türkiye, İzmir Tepecik Training and Research Hospital Ethics Committee on September 15, 2022 (decision no. 2022/09-24). Due to the retrospective design of the study and the use of anonymized medical records, the requirement for informed consent was waived.

Study Population

The study population consisted of newborns delivered within the specified period whose discharge summaries were fully available. Based on the official start date of the COVID-19 pandemic in Türkiye (11 March 2020), two timeframes were established as pre-pandemic (11 September 2018-11 March 2020) and pandemic (11

March 2020-11 September 2021) periods. A total of 813 newborns including 401 infants from the pre-pandemic period and 412 infants from the pandemic period were analyzed.

Data Collection

A standardized data form was used for each case. Recorded variables included gender, mode of delivery, gestational age, birth weight, APGAR scores at 1st and 5th minutes, presence of multiple pregnancy, intrauterine growth restriction (IUGR), premature rupture of membranes (PROM), maternal age and obstetric history, maternal comorbidities, maternal history of COVID-19 infection, resuscitation requirement at birth, and NICU admission status and indications.

Additionally, taking into account the partial/complete lockdowns and normalization periods implemented by the Turkish Ministry of Health during the pandemic, NICU admission and preterm birth rates were compared separately across these periods.

Outcome Measures

Two primary outcome measures were defined:

1. Preterm birth rate: (Deliveries before the 37th week of gestation).

2. NICU admission rate: (Newborns requiring intensive care treatment for any indication after birth), In secondary outcome analyses, indications fot NICU admissions were examined within subgroups (e.g., respiratory distress syndrome, transient tachypnea of the newborn, congenital heart disease).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics v27.0 (IBM Corp., Armonk, NY, USA) and MedCalc® v20.0 statistical software. Descriptive statistics for continuous variables were presented as mean ± standard deviation, median (minimum-maximum), and interquartile range. Categorical variables were expressed as numbers and percentages.

Normality of distribution was assessed using the Kolmogorov-Smirnov test, and homogeneity of variance was evaluated with Levene's test. Since continuous variables did not meet the assumptions for parametric tests, the Mann-Whitney U test was used for intergroup comparisons, while the Kruskal-Wallis H test was applied for comparisons among three or more groups. The chi-square test was used to compare categorical variables. A p-value <0.05 was considered statistically significant for all analyses.

Power and Precision Assessment

Since this was a retrospective study including all eligible newborns within the predefined study periods, no a priori sample size calculation was performed. To address the interpretation of non-significant findings, a post-hoc power and precision assessment was conducted for the primary outcomes. For NICU admissions, the observed rates were 27.7% in the pre-pandemic and 32.8% in the pandemic periods, corresponding to an absolute risk difference of 5.1 percentage points. With the available sample size, the study had approximately 35% power to detect this observed difference at a two-sided alpha level of 0.05. The 95% confidence interval for the absolute risk difference ranged from approximately -1.2 to 11.3 percentage points. Therefore, the non-significant p-value should be interpreted cautiously, as the study may not have been sufficiently powered to exclude a clinically meaningful increase in NICU admission rates.

RESULTS

A total of 813 newborns (male: 49.4%, and female 50.6%) both from the pre-pandemic (n=401; 49.3%) and pandemic (n=412; 50.7%) periods were included in the study. Study population consisted of Turkish (76.6%), and Syrian (23.4%) newborns. The mean gestational age (37.26±3.29 weeks), mean birth weight (3018±713 g), and mean maternal age (28.89±6.37 years) of the study participants were as indicated. Detailed descriptive data are presented in Table 1. Among newborns admitted to the NICU, the most frequent diagnosis was transient tachypnea of the newborn (63.0%), followed by respiratory distress syndrome (28.0%), congenital heart disease (4.9%), congenital anomalies (1.6%), and other causes (2.4%) (Table 1). Severe acute respiratory syndrome-coronavirus-2 positivity at the time of delivery was detected in 21 (5.1%) mothers. Seven (33.3%) infants, were born prematurely and 10 (47.6%) of them required NICU admission.

The overall preterm birth rate in the study population was 28.2%, with birth rates of 28.7% in the pre-pandemic and 27.7% in the pandemic periods. No statistically significant difference was observed between groups regarding birth rates (p=0.732). NICU admission rate was 30.3% in the entire cohort (p=0.114) (pre-pandemic period: 27.7%, and pandemic period: 32.8%). Although this difference did not reach statistical significance, the absolute increase was 5.1 percentage points, with a 95% confidence interval ranging from approximately -1.2 to 11.3 percentage points.

Table 1. Demographic and clinical characteristics of the patients (n=813)	
Gender*	
Female	411 (50.6)
Male	402 (49.4)
Ethnicity*	
Turkish	623 (76.6)
Syrian	190 (23.4)
Groups*	
Prepandemic period	401 (49.3)
Pandemic period	412 (50.7)
Mode of delivery*	
NSVD	283 (34.8)
C/S	530 (65.2)
Gestational age (weeks)**	37.26±3.29
Birth weight, (g)**	3018±713
Birth weight, (g)*	
<1500 g	33 (4.1)
<2500 g	147 (18.1)
Maternal age (years)**	28.89±6.37
Gravidity***	3 (1-10)
Parity***	1 (0-8)
Number of abortions***	0 (0-3)
Number of living children***	1 (0-8)
Maternal disease*	
None	648 (79.7)
DM	58 (7.1)
HT/preeclampsia	51 (6.1)
Oligohydramnios	36 (4.4)
Polyhydramnios	20 (2.5)
Apgar score (1st min)**	7.38±1.14
Apgar score (5th min)**	8.90±3.24
Apgar score <5 (1st min)*	20 (2.5)
Apgar score <5 (5th min)*	8 (1.0)
Delivery room resuscitation*	14 (1.7)
Maternal COVID positivity*	21 (5.1)
PROM (>18 h)*	39 (4.8)
IUGR*	116 (14.3)
Multiple pregnancy*	38 (4.7)
Prematurity* **<37 weeks**	229 (28.2)
<32 weeks	60 (7.4)
NICU admission*	246 (30.3)
Table 1. Continued	
Indications for NICU admission*	
RDS	69 (28.04)
TTN	155 (63.01)
CHD	12 (4.88)
Congenital anomaly	4 (1.63)
Other	6 (2.44)

*: n (%), **: Mean ± standard deviation, ***: Median (min-max); NSVD: Normal spontaneous vaginal delivery, C/S: Cesarean section, DM: Diabetes mellitus, HT: Hypertension, PROM: Premature rupture of membranes, IUGR: Intrauterine growth restriction, NICU: Neonatal intensive care unit, RDS: Respiratory distress syndrome, TTN: Transient tachypnea of the newborn, CHD: Congenital heart disease, COVID: Coronavirus

Demographic and clinical characteristics were comparable between groups (Table 2).

The number of preterm infants was 115 in the pre-pandemic period and 114 in the pandemic period. When demographic and clinical characteristics of these infants were compared, Syrian infants were found to be more frequently born preterm in the pre-pandemic period (p=0.021), and the 1st minute Apgar scores of preterm infants were significantly lower in the pre-pandemic period (p=0.002) (Table 3).

Preterm birth and NICU admission rates were comparable among both groups across the partial/complete lockdown and normalization periods during the COVID-19 pandemic, (p=0.961 and p=0.977, respectively) (Table 4).

DISCUSSION

In this single-center cohort study, preterm birth rates were similar in both pre-pandemic and pandemic periods. This result is consistent with findings reported from studies conducted in countries including the United States, Germany, and Japan[5,12,13]. More recent systematic evidence has also shown that most studies comparing pandemic and pre-pandemic periods did not report a substantial increase in preterm birth rates[14]. Although direct and indirect effects of the pandemic on pregnancy outcomes remain debated, previous studies have suggested that changes in social interaction, physical activity, exposure to infections, healthcare access and healthcare-seeking behavior may influence preterm birth rates in different populations[13,14]. In the present cohort, however, distribution of gestational ages, incidence rates of multiple pregnancy, PROM and IUGR were comparable between the two periods. Therefore, our findings suggest that the pandemic period was not associated with a measurable change in preterm birth rates in the population of this single-center population.

However NICU admission rates increased from 27.7% in the pre-pandemic period to 32.8% during the pandemic period. Although this difference did not reach statistical significance, the absolute increase of approximately 5 percentage points may still be clinically relevant in a NICU

Table 2. Comparison of pre-pandemic and pandemic groups in terms of their characteristic features			
	Pre-pandemic period	**Pandemic period**	**p-value**
Ethnicity n (%) Turkish Syrian	 300 (74.8) 101 (25.2)	 323 (78.4) 89 (21.6)	0.227
Mode of delivery n (%) NSVD C/S	 149 (37.2) 252 (62.8)	 134 (32.5) 278 (67.5)	0.166
Gestational age (weeks) mean ± SD	37.49±2.89	37.04±4.12	0.697
Birth weight, (g) mean ± SD	3016±737	3019±691	0.743
Birth weight, (g) n (%)			
<1500 g (VLBW)	18 (4.5)	15 (3.6)	0.103
<2500 g (LBW)	77 (19.2)	70 (17.0)	0.179
Delivery room resuscitation n (%) No Yes	 394 (98.3) 7 (1.7)	 405 (98.3) 7 (1.7)	0.959
PROM n (%) No Yes	 380 (94.8) 21 (5.2)	 394 (95.6) 18 (4.4)	0.563
IUGR n (%) No Yes	 335 (83.5) 66 (16.5)	 362 (87.9) 50 (12.1)	0.078
Apgar score n (%) <5 (1st min) <5 (5th min)	 10 (2.5) 4 (1.0)	 10 (2.4) 4 (1.0)	0.934
Multiple pregnancy n (%)	17 (4.2)	21 (5.1)	0.630
Prematurity n (%) <37 weeks No Yes	 286 (71.3) 115 (28.7)	 298 (72.3) 114 (27.7)	0.732
<32 weeks			
No	373 (93.0)	380 (92.2)	0.814
Yes	28 (7.0)	32 (7.8)	
NICU admission n (%) No Yes	 290 (72.3) 111 (27.7)	 277 (67.2) 135 (32.8)	0.114

Values are given as mean ± standard deviation (SD), median (IQR), or n (%). χ^2: Chi-square test statistic, z: Mann-Whitney U test.
NSVD: Normal spontaneous vaginal delivery, C/S: Cesarean section, PROM: Premature rupture of membranes, IUGR: Intrauterine growth restriction, NICU: Neonatal intensive care unit, IQR: Interquartile range

setting. Therefore, this finding should not be interpreted as definitive evidence of absence of any pandemic-related effect. Rather, it may reflect the limited statistical power of the study to detect a difference of this magnitude. Recent evidence has emphasized that neonatal outcomes among infants born to mothers with COVID-19 disease are heterogeneous across studies, and that risks such as NICU admissions may increase particularly in parallel with more severe maternal infection[15]. In our cohort, the most common diagnosis requiring NICU admissions was transient tachypnea of the newborn, followed by respiratory distress syndrome[7,16]. These respiratory indications are consistent with the neonatal morbidity profile reported in previous pandemic-era studies[7,12,17,18]. However, because the increase in NICU admission rates was not statistically significant, this finding should be regarded as hypothesis-generating rather than a conclusive remark .

One of the most notable findings of this study was the difference in the ethnic distribution of preterm infants. Although any evidence of overall direct association was not observed between ethnicity and prematurity or NICU admission in the entire cohort, Syrian newborns

Table 3. Comparison of characteristic features of infants in the pre-pandemic, and pandemic peirods			
	Pre-pandemic period	**Pandemic period**	**p-value**
Gender n (%) Male Female	 67 (59.0) 48 (41.0)	 57 (50.0) 57 (50.0)	 0.262
Ethnicity n (%) Turkish Syrian	 86 (74.8)[a] 29 (25.2)[a]	 99 (86.8)[b] 15 (13.2)[b]	 **0.021**
Mode of delivery n (%) NSVD C/S	 30 (26.1) 85 (73.9)	 25 (21.9) 89 (78.1)	 0.462
Birth weight, (g) mean ± SD	2580±931 2660 (1315)	2388±807 2500 (947)	0.093
Apgar (1st min), mean ± SD	6.61±1.39	6.98±1.60	**0.002**
Apgar (5th min), mean ± SD)	8.09±1.58	8.26±1.60	0.168
Delivery room resuscitation n (%) No Yes	 107 (76.5) 8 (23.5)	 108 (84.2) 6 (15.7)	 0.228
PROM n (%) No Yes	 103 (93.0) 12 (7.0)	 98 (86.0) 16 (14.0)	 0.406
IUGR n (%) No Yes	 84 (73.0) 31 (27.0)	 88 (77.2) 26 (22.8)	 0.468
Maternal COVID positivity n (%) No Yes	 - -	 107 (93.9) 7 (6.1)	 0.730
NICU admission n (%) No Yes	 52 (45.2) 63 (54.8)	 43 (37.7) 71 (62.3)	 0.250

Different superscript letters within the same row indicate a statistically significant difference between column proportions.
NSVD: Normal spontaneous vaginal delivery, C/S: Cesarean section, PROM: Premature rupture of membranes, IUGR: Intrauterine growth restriction, NICU: Neonatal intensive care unit, COVID: Coronavirus, SD: Standard deviation,[a],[b]: Different superscript letters indicate statistically significant differences between column proportions ($p<0.05$)

Table 4. Comparison of preterm birth and NICU admission rates during lockdown and normalization periods				
	Preterm birth	**p-value**	**NICU admission**	**p-value**
Normalization periods (n=212) n (%)	59 (27.83)	0.961	69 (32.54)	0.977
Lockdown periods (n=200) n (%)	55 (27.50)		66 (33.00)	

NICU: Neonatal intensive care unit

were significantly more frequent affected among preterm infants in the pre-pandemic period. This finding may reflect the broader social and healthcare-access determinants that affect refugee and migrant populations. Higher parity, socioeconomic disadvantage, language barriers, difficulties in accessing regular antenatal care and delayed presentation to healthcare services may all contribute to adverse perinatal outcomes in vulnerable populations. Previous reports have emphasized that high fertility rates and obstetric risk factors among refugee populations may negatively affect neonatal and perinatal outcomes[19]. In addition, recent evidence from Türkiye has highlighted persistent maternal and newborn health inequalities among Syrian refugees, supporting the need to interpret perinatal outcomes in this population within a broader social and healthcare-access framework[20]. From this perspective, this fact related to Syrian infants represents an important social neonatology signal. However, because individual-level data on antenatal care attendance, socioeconomic status, maternal education

and healthcare access were not available, this association cannot be interpreted causally.

First-minute Apgar scores among preterm infants were also lower in the pre-pandemic period compared with the pandemic period. This difference should be interpreted cautiously. Although the lower proportion of Syrian infants among preterm births during the pandemic period may have contributed to a change in the clinical profile of preterm infants, the retrospective design of the study does not allow a clear explanation for this finding. Therefore, differences in the Apgar scores should be considered as an observed association rather than an evidence of improved neonatal condition during the pandemic.

No statistically significant differences were observed between preterm birth and NICU admission rates across full lockdown, partial lockdown and normalization phases during the COVID-19 pandemic which suggests that restriction phases were not associated with detectable changes in these neonatal outcomes in our cohort. However, studies from other countries have reported reductions in preterm birth rates during lockdown or mitigation periods[9,21,22]. A recent population-based study from the Netherlands reported a reduction in preterm birth rates after COVID-19 mitigation measures were implemented, without evidence of a substantial change in stillbirths[22]. Such discrepancies may be explained by differences in healthcare system structure, population characteristics, socioeconomic context, duration and strictness of restrictions and cultural variations in healthcare-seeking behaviors[13]. In addition, the relatively short duration of the full lockdown period in the present study may have limited the ability to detect phase-specific effects.

Study Limitations

This study has several limitations. First, it was a retrospective, single-center study, which limits the generalizability of the findings. Second, the sample size may have been insufficient to detect clinically meaningful but statistically non-significant differences, particularly among NICU admission rates. Third, the study did not include detailed data on antenatal care attendance, socioeconomic status, maternal education, language barriers or healthcare access, which limited the interpretation of the findings related to Syrian newborns. Fourth, severity of maternal COVID-19 disease, timing of infection during pregnancy, vaccination status and detailed obstetric management data were not available. This finding is important because recent studies have suggested that adverse neonatal outcomes may vary according to the severity of maternal infection and clinical context[15]. Finally, the full lockdown period was relatively short, and the comparison of lockdown and normalization phases may not have captured short-term temporal changes in preterm birth or NICU admission rates. Despite these limitations, the study provides useful single-center data on neonatal outcomes during the pandemic period and highlights the importance of considering both clinical and social determinants when interpreting pandemic-related perinatal outcomes.

CONCLUSION

In this single-center retrospective study, preterm birth rates were comparable between the pre-pandemic and pandemic periods. NICU admission rates showed a non-significant absolute increase of approximately 5 percentage points during the pandemic period; however, the available sample size was not sufficiently powered to exclude a clinically meaningful difference. The higher proportion of Syrian newborns among preterm infants in the prepandemic period highlights the potential importance of social and healthcare-access factors when interpreting pandemic-related neonatal outcomes. No detectable differences were observed regarding these parameters across lockdown and normalization phases. Larger-scale multicenter studies incorporating antenatal care access, socioeconomic indicators and maternal COVID-19-related clinical factors are needed to clarify the effects of pandemic-related healthcare changes on neonatal outcomes.

Ethics

Ethics Committee Approval: The study was conducted in accordance with the WMA Declaration of Helsinki and its recent amendments after the ethical approval was obtained from the University of Health Sciences Türkiye, İzmir Tepecik Training and Research Hospital Ethics Committee on September 15, 2022 (decision no. 2022/09-24).

Informed Consent: Due to the retrospective design of the study and the use of anonymized medical records, the requirement for informed consent was waived.

Declaration of AI Use: The authors declare that no generative artificial intelligence (AI) tools were used in the writing of this manuscript or in the analysis or interpretation of the study data.

Footnotes

Author Contributions

Concept: K.T.K., E.K.Ö., Ö.U., D.G., D.E., M.Y.Ö., Design: K.T.K., E.K.Ö., M.Y.Ö., Data Collection or Processing: K.T.K., Ö.U., D.G., D.E., Analysis or Interpretation: Ö.U., D.G., D.E., Literature Search: K.T.K., E.K.Ö., M.Y.Ö., Writing: K.T.K., M.Y.Ö.

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