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Clinical and Demographic Characteristics of Newborns with Meconium-stained Amniotic Fluid: A Retrospective Single-centre Study

Mekonyumlu Amniyotik Sıvı Boyalı Yenidoğanların Klinik ve Demografik Özellikleri: Retrospektif Tek Merkezli Bir Çalışma

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Abstract

Objective: This study examines which clinical and demographic risk factors are associated with early complications in full-term infants born through meconium-stained amniotic fluid (MSAF).

Method: A retrospective cohort study included 76 term newborns delivered with MSAF at University of Health Sciences Turkey, İstanbul Bağcılar Training and Research Hospital, in İstanbul, between May 2023 and May 2025. Data covered maternal age, nationality, number of prenatal visits, Apgar scores, delivery method, and neonatal outcomes within 72 hours. Adequate prenatal care was defined as at least four antenatal visits, per World Health Organization standards. Maternal infections were noted based on symptoms or lab results. Multivariable logistic regression was used to identify predictors of early sepsis or referral.

Results: More than half of the infants were born to non-Turkish mothers. Adequate prenatal care was reported in 62.5% of these mothers, compared to 88.9% in Turkish mothers. Sepsis occurred in 17.1% of all cases, more frequently among non-Turkish newborns. A 1-minute Apgar score below 7, maternal infection, and fewer prenatal visits were each linked to increased risk of early complications. Nationality alone was not statistically significant after adjustment.

Conclusion: Among infants born with MSAF, low Apgar scores and insufficient prenatal care were the clearest indicators of early sepsis or referral. Strengthening prenatal support and education for migrant families may help reduce preventable neonatal risks.

Keywords: Apgar score, meconium-stained amniotic fluid, maternal infection, neonatal sepsis, prenatal care

Öz

Amaç: Bu çalışma, mekonyumla boyalı amniyotik sıvı (MSAF) ile doğan term bebeklerde erken komplikasyonlarla ilişkili klinik ve demografik risk faktörlerini incelemektedir.

Yöntem: Sağlık Bilimleri Üniversitesi, İstanbul Bağcılar Eğitim ve Araştırma Hastanesi'nde Mayıs 2023 ile Mayıs 2025 tarihleri arasında MSAF ile doğan 76 term yenidoğanı içeren retrospektif bir kohort çalışması yapılmıştır. Veriler; anne yaşı, uyruk, doğum öncesi ziyaret sayısı, Apgar skorları, doğum şekli ve ilk 72 saatteki neonatal sonuçları kapsamaktadır. Yeterli doğum öncesi bakım, Dünya Sağlık Örgütü standartlarına göre en az dört antenatal ziyaret olarak tanımlanmıştır. Maternal enfeksiyonlar semptomlara veya laboratuvar sonuçlarına göre kaydedilmiştir. Erken sepsis veya sevki öngören faktörleri belirlemek için çok değişkenli lojistik regresyon analizi kullanılmıştır.

Bulgular: Bebeklerin yarısından fazlası Türk olmayan annelerden doğmuştur. Yeterli doğum öncesi bakım oranı Türk annelerde %88,9 iken, bu gruptaki annelerde %62,5 olarak bildirilmiştir. Sepsis tüm olguların %17,1'inde görülmüş olup, Türk olmayan yenidoğanlarda daha sık izlenmiştir. Birinci dakika Apgar skorunun 7'nin altında olması, maternal enfeksiyon varlığı ve yetersiz doğum öncesi ziyaret sayısının her biri, artmış erken komplikasyon riski ile ilişkilendirilmiştir. İstatistiksel düzeltme yapıldıktan sonra uyruk tek başına anlamlı bir faktör olarak saptanmamıştır.

Sonuç: MSAF ile doğan bebekler arasında, düşük Apgar skorları ve yetersiz doğum öncesi bakım, erken sepsis veya sevkin en belirgin göstergeleridir. Göçmen aileler için doğum öncesi desteğin ve eğitimin güçlendirilmesi, önlenebilir neonatal risklerin azaltılmasına yardımcı olabilir.

Anahtar kelimeler: Apgar skoru, doğum öncesi bakım, maternal enfeksiyon, mekonyumla boyalı amniyotik sıvı, neonatal sepsis

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Introduction

Meconium-stained amniotic fluid (MSAF) occurs in approximately 8% to 15% of deliveries. It is often a physiological response to fetal stress or a sign of fetal maturation, particularly in term or post-term pregnancies (1,2). While frequently benign, MSAF is associated with adverse outcomes such as meconium aspiration syndrome (MAS), respiratory distress, and early-onset neonatal infections (3).

Modern obstetric and neonatal care practices, including the avoidance of routine tracheal suctioning in vigorous infants and prompt resuscitation, have significantly improved outcomes in recent years (4). Nevertheless, MSAF requires vigilant monitoring. In diverse urban hospital settings, infants born to migrant mothers may face compounded risks due to inconsistent access to prenatal services and varying levels of health literacy (5).

Research indicates that early and regular prenatal care plays a pivotal role in mitigating neonatal risks (6). Mothers with fewer antenatal visits are more likely to deliver infants with lower Apgar scores, signs of infection, or requirements for neonatal intensive care unit (NICU) admission (7). Migrant women often encounter structural barriers including language difficulties, unfamiliarity with local healthcare systems, and socioeconomic constraints that limit their utilization of prenatal services (8,9).

Rather than attributing adverse outcomes solely to systemic issues, this study aims to identify specific clinical markers that predict risks in MSAF-exposed newborns. Identifying these factors could enable healthcare providers to intervene earlier and tailor care, particularly for families from migrant backgrounds (10).

Materials and Methods

Study Design and Ethics

This retrospective cohort study was conducted at University of Health Sciences Turkey, İstanbul Bağcılar Training and Research Hospital, a tertiary care center in İstanbul. Ethical approval was granted by the University of Health Sciences Turkey, İstanbul Bağcılar Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (decision no: 2025/08/20/983, date: 07.07.2025). Since only anonymized patient data were used, individual consent was not necessary.

Population and Data Collection

All singleton term newborns delivered with MSAF between May 1, 2023, and May 31, 2025, were eligible for inclusion. Newborns with congenital anomalies, multiple gestations, or incomplete records were excluded. A total of 76 cases were included in the final analysis.

Maternal data collected included age, nationality, number of prenatal visits, and the presence of infections. Neonatal variables included sex, gestational age, birth weight, Apgar scores at 1 and 5 minutes, need for respiratory support, occurrence of MAS or sepsis, NICU admission, and referrals. Adequate prenatal care was defined as attending at least four antenatal visits, in accordance with World Health Organization guidelines (11).

Outcome Definition

The primary outcome was any early neonatal complication occurring within the first 72 hours of life, defined as suspected or confirmed sepsis, or referral to another facility. Maternal infection was recorded if the mother had a documented bacterial or viral illness requiring treatment during pregnancy.

Statistical Analysis

All data were analyzed using IBM SPSS version 28. The Shapiro-Wilk test was applied to assess normality. Continuous variables were presented as means with standard deviations or medians with interquartile ranges. Categorical data were summarized as frequencies and percentages (n, %). For comparisons, Student's t-test or Mann-Whitney U test was applied to continuous variables, and the chi-square or Fisher's exact test for categorical variables. Variables with p-values below 0.20 in univariate analysis were included in the multivariable logistic regression model. Statistical significance was set at $p<0.05$.

Results

Among the 76 newborns included in the study, 36 (47.4%) were born to Turkish mothers and 40 (52.6%) to non-Turkish mothers. The median maternal age was slightly lower in the non-Turkish group. Infants in the non-Turkish group had slightly lower gestational ages and birth weights compared to the Turkish group, though these differences were not statistically significant (Table 1).

Adequate prenatal care was reported in 32 (88.9%) Turkish mothers compared to only 25 (62.5%) non-Turkish mothers, a difference that was statistically significant ($p<0.01$).

Sepsis was diagnosed in 13 (17.1%) of all infants. The incidence was higher among non-Turkish newborns [9 (22.5%)] compared to Turkish newborns [4 (11.1%)], with a p-value of 0.03. Oxygen therapy was administered in 11 (14.5%) cases, and one infant required intubation. NICU referrals occurred in 12 (15.8%) of the cohort, with no statistically significant difference between the two groups (p=0.65) (Table 2, Figure 1).

Table 1. Maternal and neonatal characteristics of newborns with MSAF

Parameter	Turkish (n=36)	Non-Turkish (n=40)	p
Maternal age (years)	30.8±6.3	27.9±7.1	0.04
Gestational age (weeks)	40.1±1.2	39.5±1.4	0.07
Birth weight (g)	3492±487	3350±526	0.12
Male gender, n (%)	20 (55.6%)	21 (52.5%)	0.78
Cesarean section, n (%)	10 (27.8%)	6 (15.0%)	0.17
Adequate prenatal care, n (%)	32 (88.9%)	25 (62.5%)	<0.01

MSAF: Meconium-stained amniotic fluid

Table 2. Clinical outcomes and delivery room interventions

Outcome/ intervention	Total (n=76)	Turkish (n=36)	Non-Turkish (n=40)	p
Sepsis, n (%)	13 (17.1%)	4 (11.1%)	9 (22.5%)	0.03
Referral to NICU, n (%)	12 (15.8%)	5 (13.9%)	7 (17.5%)	0.65
Oxygen support, n (%)	11 (14.5%)	4 (11.1%)	7 (17.5%)	0.43
PPV and/or intubation, n (%)	1 (1.3%)	0 (0%)	1 (2.5%)	0.34

NICU: Neonatal intensive care unit, PPV: Positive predictive value

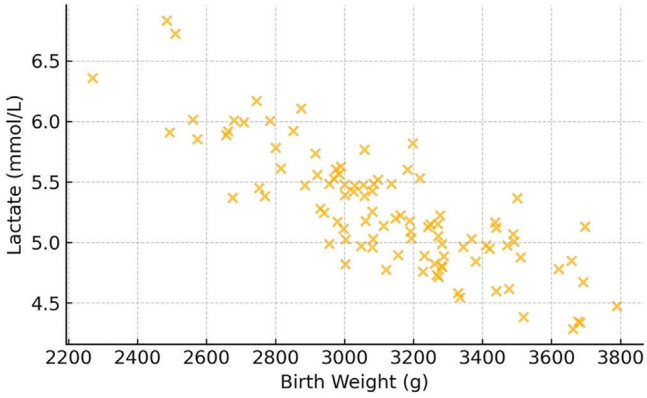

Figure 1. Prevalence of early neonatal sepsis by maternal nationality. The bar chart compares sepsis rates between newborns of Turkish mothers (11.1%) and those of non-Turkish mothers (22.5%), showing a statistically significant difference (p=0.03)

In the univariate analysis, a 1-minute Apgar score <7 (p<0.01) and the presence of maternal infection (p=0.02) were identified as significant risk factors associated with adverse outcomes. These factors were subsequently included in the multivariate model. Logistic regression analysis revealed that three factors significantly increased the odds of early complications: a 1-minute Apgar score below 7 [odds ratio (OR) 3.4, 95% confidence interval (CI) 1.1-9.8], maternal infection (OR 2.8, 95% CI 1.0-8.2), and inadequate prenatal care (OR 2.5, 95% CI 1.0-6.9). Nationality was not an independent predictor once these variables were controlled for (Table 3).

Discussion

The findings from this study reinforce the importance of specific clinical factors in predicting early complications among term infants exposed to MSAF. Specifically, low Apgar scores, the presence of maternal infection, and limited access to prenatal care emerged as key risk indicators. These results are consistent with previous research highlighting the protective effects of early and adequate antenatal monitoring (5-7).

Although higher rates of complications were noted among infants born to non-Turkish mothers, these outcomes were more likely tied to differences in care access and maternal health parameters rather than nationality itself (8). Once confounding variables such as prenatal care adequacy were incorporated into the analysis, nationality no longer had a significant independent impact.

Barriers such as language, socioeconomic status, and unfamiliarity with the healthcare system may limit how often migrant mothers seek or receive prenatal care (9,10). Addressing these gaps through community outreach programs, language support services, and culturally tailored health education could make a meaningful difference (12). Explaining the value of prenatal visits in multiple languages and encouraging early care enrollment may also improve continuity (13).

Table 3. Multivariate logistic regression analysis

Risk factor	OR	95% CI	p
Apgar 1-min <7	3.2	1.4-7.3	<0.01
Maternal infection	2.8	1.2-6.5	0.02
Non-Turkish nationality	1.9	0.9-4.1	0.09
No prenatal care	2.1	1.0-4.5	0.04

OR: Odds ratio, CI: Confidence interval

Study Limitations

This study was conducted in a single tertiary center, which may limit the generalizability of the findings. The retrospective nature of the study carries inherent limitations, including the possibility of incomplete records. Additionally, long-term neonatal outcomes beyond the first 72 hours were not evaluated. However, the findings remain relevant for urban centers serving diverse patient populations.

Conclusion

In term infants with MSAF, early complications were most strongly predicted by a low 1-minute Apgar score, maternal infection, and inadequate prenatal care. These factors had a greater impact than maternal nationality, which lost significance after statistical adjustment. Enhancing outreach and prenatal education, particularly for migrant families, while ensuring consistent follow-up for all mothers, may help reduce early neonatal complications.

Ethics

Ethics Committee Approval: This retrospective cohort study was conducted at University of Health Sciences Turkey, İstanbul Bağcılar Training and Research Hospital, a tertiary care center in İstanbul. Ethical approval was granted by the University of Health Sciences Turkey, İstanbul Bağcılar Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (decision no: 2025/08/20/983, date: 07.07.2025).

Informed Consent: Since only anonymized patient data were used, individual consent was not necessary.

Footnotes

Authorship Contributions

Concept: Y.K., E.C., Design: Y.K., E.C., Data Collection or Processing: Y.K., E.C., Analysis or Interpretation: Y.K., E.C., Literature Search: Y.K., Writing: Y.K., E.C.

Conflict of Interest: No conflict of interest was declared by the authors.

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