

# Retrospective Analysis of Newborn Baby Transports in Ankara

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## Abstract

**Background:** The first hours after birth are when the most support is needed. The safest method is considered intrauterine transport. However, postpartum transport is also inevitable. Developing in neonatal care must also be applied to transport issues. This study aims to evaluate the neonatal transports performed in Ankara province.

**Methods:** We evaluated 7649 newborn transports performed by Ankara Emergency Medical Services (EMS) between 2017 and 2021. We evaluated cases in the EMS database named ASOS. We compared the relationship between transport numbers and the Turkish Statistical Institute(TUİK) annual birth data.

**Results:** Between 2017 and 2021, Ankara EMS performed a total of 7649 newborn transports. Of all transports, 7030 (91.9%) were by ground ambulances, 369 (4.8%) were by neonatal ambulances, 135 (1.8%) were by helicopter ambulances, and 115 (1.5%) were by air ambulances. Of all cases, 1058 (13.8%) occurred between 00:00 and 07:59, 4465 (58.4%) between 08:00 and 15:59, and 2126 (27.8%) between 16:00 and 23:59 hours period. When the birth numbers of the TUİK and the number of transported cases were considered, there was a positive relationship at the  $r=0.714$  level and was statistically significant ( $p<0.05$ ). Approximately 50% ( $R^2=0.509$ ) of the variation in transport numbers can be explained by birth numbers.

**Conclusion:** The number of these transports, their regional distribution, and demand peak hours can be estimated by processing historical data. Estimates will guide more planned and efficient systems.

**Keywords:** Newborn transports, Prehospital emergency medicine, Neonatal intensive care.

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## INTRODUCTION

The newborn period, which is the dynamic and most sensitive phase of human life, refers to the first 28 days after birth, regardless of the baby's gestational week (1). This period contains many risks that will negatively affect mortality and morbidity compared to other stages of life (2). The first hours after birth are the period when newborn babies need the most support in adapting to the world.

The mortality rate of children under five, which has become the main determining factor in the level of development of countries, increases the tendency to work on newborns (3). According to a United Nations (UN) report, the neonatal mortality rate in Europe and North America is 3‰ in 2022 (4). This rate is 5.7‰ in Türkiye (5). Türkiye attaches at least as much importance to neonatal transport as to neonatal intensive care improvements (6). The Turkish Neonatology Association has published a National Transplant Guide on the subject and determined the transplantation standards (7). In Türkiye, neonatal transports are managed by Emergency Medical Services (EMS) and are performed by certified personnel using neonatal-specific ambulances.

Newborn care is different from child and adult care. There are also risks in the transport process. For these reasons, intrauterine transplants are accepted. However, neonatal transplants are also inevitable. Newborn transport requires a multidisciplinary approach (7). Efforts to create transport systems continue around the world. The common suggestion in these studies is to create regional systems according to needs (8). While creating regional systems, the determining factors are past data and future predictions.

Our study aims to examine the demographic and clinical data of the patients and discuss the transport management in Ankara province. It is a retrospective study with the largest data set regarding neonatal transports in Türkiye.

## MATERIALS AND METHODS

### *Study design and Participants*

The study was designed as a retrospective study to evaluate prehospital neonatal transports. The study was approved by the Scientific Research Ethics Committee of Çanakkale Onsekiz Mart University Graduate Education Institute (project no. 2022-YÖNP-0500,

decision no. 12/11 dated 09.06.2022). Our study was also approved by Ankara Provincial Health Directorate (approval number E-75252626-771). This study was produced from a master's thesis. (Turkish National Thesis Center No: 796450) The study universe consists of newborn transports performed by Ankara EMS between 01/01/2017 and 31/12/2021. Data were queried from the EMS database of the Ministry of Health, named ASOS. In this way, 7764 transport case records were obtained from the ASOS database. Of these records, 115 were excluded from the study because they were duplicate records. The study was conducted by evaluating the demographic and clinical data with the remaining 7649 records.

A total of 2402 personnel work at Ankara EMS. There are a total of 173 land ambulances and 2 neonatal ambulances. All healthcare personnel working in neonatal intensive care ambulances have received NRP and Neonatal Transport training. Since there are advanced neonatal intensive care units in Ankara, newborns are transported to this city not only by land but also by helicopter or air ambulance from all over Türkiye.

### *Statistical Analysis*

All data were analyzed using IBM SPSS for Windows version 25.0 (IBM Corp. Released 2020). Descriptive statistics (percentage, mean, standard deviation) were used for general data presentation. The normality of continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. For comparing categorical variables such as ambulance type, transport time intervals, or nationality groups, the Pearson chi-square test was used. Where comparisons of continuous data between two independent groups were made (e.g., year-by-year transport numbers), the Independent Samples t Test was applied. To assess the relationship between annual birth rates and transport numbers, Pearson correlation analysis was used. A significance level of  $p < 0.05$  was considered statistically significant.

## RESULTS

Table 1 shows the data of our study. Of the transports, 1435 (18.8%) were performed in 2017, 1669 (21.8%) in 2018, 1732 (22.6%) in 2019, 1117 (14.6%) in 2020, and 1696 (22.2%) in 2021. There was a decrease in the number of transports in 2020.

Table 1. General transport data

		n=7649	%
Year	2017	1435	18.8
	2018	1669	21.8
	2019	1732	22.6
	2020	1117	14.6
	2021	1696	22.2
Ambulance type	Helicopter Ambulance	135	1.8
	Ground Ambulance	7030	91.9
	Airplane Ambulance	115	1.5
	Neonatal Ambulance	369	4.8
EMS team manager	Paramedic	3454	45.1
	Emergency Medical Technician	1261	16.5
	Doctor	2929	38.3
	Others	5	0.1
By ambulance assignment results	Other Transports	87	1.0
	Transported between hospitals	6449	84.3
	Transported to a hospital	885	11.6
	Patient refused to be transported to a hospital	6	0.1
	Transport for medical Examination	222	2.9
Time interval <sup>a</sup>	00:00-07:59	1058	13.8
	08:00-15:59	4465	58.4
	16:00-23:59	2126	27.8
District of Referrer / Sender hospital <sup>b</sup>	Transfer from peripheral district	622	8.13
Patient's nationality	Turkish	6544	85.6
	Syrian	768	10.0
	Others	337	4.4
Note: a: Ambulance team assignment time b: 13 periphery districts of the city			

Of all transports, 7030 (91.9%) were by ground ambulances, 369 (4.8%) were by neonatal ambulances, 135 (1.8%) were by helicopter ambulances, and 115 (1.5%) were by air ambulances. Most of the transports were carried out by ground ambulances. Team leaders were paramedics in 3454 (45.2%) cases, doctors in 2929 (38.3%) cases, EMTs in 1261 (16.5%) cases, and other healthcare professionals in 5 (0.1%) cases. In most cases, paramedics were team leaders.

**Table 2. District Transports and preferred Ambulance Type**

Districts	Helicopter (n=10)	Ground Ambulance (n=612)	Total (n=622)
Akyurt	--	24	24
Ayaş	--	1	1
Bala	--	2	2
Beypazarı	3	69	72
Çubuk	--	133	133
Elmadağ	--	19	19
Haymana	--	47	47
Kahramankazan	--	49	49
Kalecik	--	3	3
Kızılcahamam	--	28	28
Nallıhan	4	8	12
Polatlı	--	215	215
Şereflikoçhisar	3	14	17

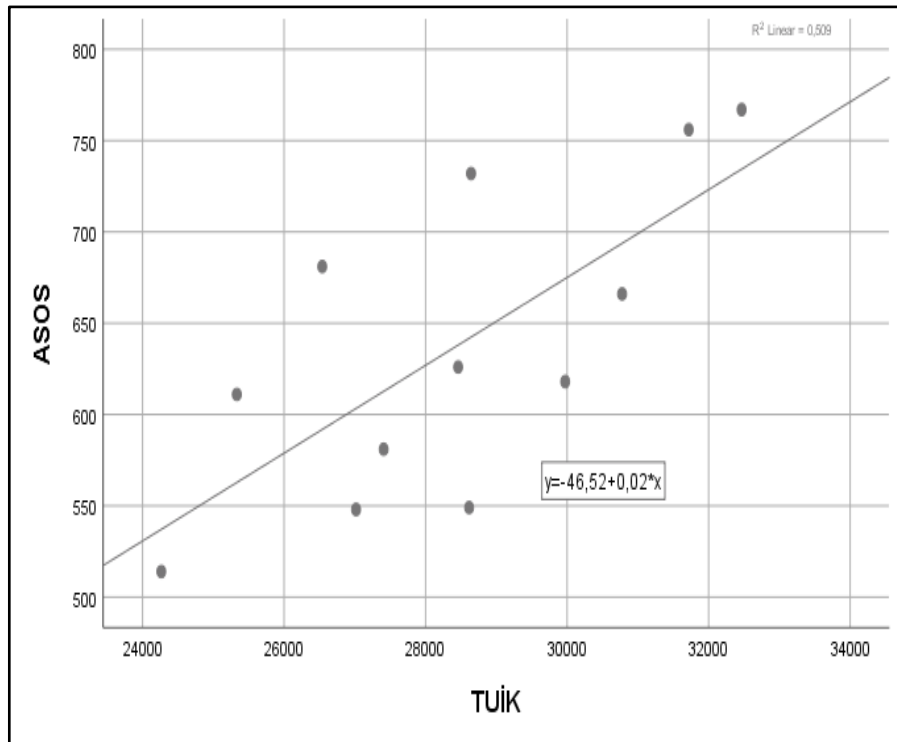
6449 (84.3%) cases were transported between hospitals, 885 (11.6%) were transported from the scene to a hospital, 222 (2.9%) were transported for medical examination, and 87 (1.1%) were other types of transports. The parents of 6 (0.1%) cases refused to be transported. Most cases were transported between hospitals. Six cases in which parents refused the transport resulted in the misuse of the EMS system. Of all cases, 1058 (13.8%) occurred between 00:00 and 07:59, 4465 (58.4%) between 08:00 and 15:59, and 2126 (27.8%) between 16:00 and 23:59 hours period. Peak hours for transports were between 08:00 and 15:59.

**Table 3. : Birth Data of The Turkish Statistical Institute and The Number Of Newborn Transports**

2017 - 2021 TOTAL			
Months	Number of Births	Number of Transport Cases	%
January	28.615	549	1.92
February	24.265	514	2.12
March	27.407	581	2.12
April	27.017	548	2.03
May	29.973	618	2.06
June	30.777	666	2.16
July	32.466	767	2.36
August	31.719	756	2.38
September	28.642	732	2.56
October	28.460	626	2.20
November	26.539	681	2.57
December	25.332	611	2.41
<b>Total</b>	<b>341.212</b>	<b>7.649</b>	<b>2.24</b>

Of all transports, 622 (8.13%) were from the 13 peripheral districts. Of the patients, 6544 (85.6%) were Turkish, 768 (10.0%) were Syrian and 337 (4.4%) were other nationals. Most of the patients were Turkish. The second most common group of patients were Syrians.

When the birth numbers of the Turkish Statistical Institute and the number of transported cases were considered, there was a positive relationship at the  $r=0.714$  level and was statistically significant ( $p<0.05$ ). Approximately 50% ( $R^2=0.509$ ) of the variation in transport numbers can be explained by birth numbers (Figure 1). detected in five patients.



**Figure 1:** Correlation Analysis of Birth and Transport Cases Between 2017-2021

## DISCUSSION

Our study is the first to examine neonatal transports using the largest available dataset. In line with the study's objective, we have reached findings that we believe may contribute to future planning efforts

Social events such as pandemics can have an impact on human behavior. There was a decrease in the number of transports in 2020. We suggest that this is related to the Covid-19 pandemic that emerged worldwide in April of the same year (9). Studies have shown that emergency room visits have decreased significantly during this period (10). Studies on EMS, on the other hand, show that overall ambulance demand has decreased (11). Although there is no study specific to neonatal transport, the decrease in overall ambulance demand confirms our data.

Most of the transports were by ground ambulances. Studies recommend a separate type of ambulance with specific standards for neonatal transport (12). The use of specially equipped neonatal ambulances started in Türkiye in 2021. This explains the low use of neonatal

ambulances in transports. There is a need for additional research to comprehensively assess the effects of neonatal ambulance utilization.

In most cases the team leaders were Paramedics. With the goal of quality, team configurations need to be standardized (8). The neonatal transport guide recommends a team of 5 people, including a doctor (preferably a neonatologist), respiratory therapist, healthcare professional, technical staff, and driver (7). Considering the physical structure of ambulances in Türkiye, this is not possible (13). Therefore, telemedicine applications should be taken into consideration (14). The presence or absence of a doctor during transport does not affect the mortality rate or the success of invasive procedures (15). The same study reports a similar first-attempt intubation success rate in both physician and non-physician groups. Furthermore, no significant differences were found between the two groups in the pre- and post-transport score assessments. Such studies suggest that properly trained personnel may be able to carry out transports with the support of telemedicine. However, a neonatal resuscitation program (NRP) course and neo-

natal transport training are required for healthcare professionals in the resuscitation program.

In our study, 6 transports could not be performed because the parents refused the transport. The issue of stabilization, which includes patient/relative consent, is one of the most essential elements of inter-hospital transports (16). The stabilization issue needs to be followed with the help of a checklist (7). The sending center, transport management unit, and ambulance team must check the list. By doing so, overload of the system can be prevented, transportation safety can be increased and complications that may occur can be significantly reduced (17).

Of all transports, 4465 (58.4) occurred between 08:00 and 15:59. The guide recommends 24-hour uninterrupted transport service (18). There are teams in Zurich that provide 24-hour uninterrupted transport service (19). Ankara EMS provides 24-hour transportation service. Different service plans may be required during busy hours. For efficiency, variables other than hours need to be considered (20). These other variables may be birth expectations, service inadequacies of the centers, transport distances, service occupation times, and demographic conditions.

Of all cases, 622 (8.13%) were transported from peripheral districts. Details are given in Table 2. The guide recommends helicopter transport for distances over 80 km (7). Ankara EMS has utilized helicopter transport appropriately based on distance. However, ground ambulance transfers continue to be employed. A multi-level decision-making process is involved in determining the mode of transport. The transport coordination system is operated under the leadership of emergency medicine specialists, and when necessary, the transport method is determined with the consultation of neonatology experts.

Of the transport patients, 10% were Syrians. Syrians fleeing the civil war in their country have been under temporary protection in Türkiye since 2011. Language barriers and lack of medical background knowledge create problems in providing healthcare services to Syrians (21). In Türkiye, language barriers are addressed with the support of the Ministry of Health's interpreter hotline service. In this context, EMS personnel should be informed about the interpreter communication center. A study comparing the birth status of Turkish and

Syrian pregnant women in Türkiye shows that Syrian pregnant women are not followed up and Syrian babies are born with a worse prognosis (22). This explains why Syrian citizens benefit from newborn transport services at a rate of 10%, even though their population share in Ankara province is below 2% on average (23).

The number of newborn transports was compared with the birth data of the Turkish Statistical Institute (Table 3). When the birth numbers and the number of transported cases were considered, there was a positive relationship and was statistically significant (Figure 1). Healthcare decision makers need to identify needs in advance to manage time and resources and make necessary purchases (24). This needs planning is achieved by processing past data and making future application predictions. Future prediction, which is important for plans and programs, also allows for the reduction of possible risks (25). There are studies on emergency call predictions and ambulance team positioning (26-28). However, there are no studies on estimating inter-hospital transports and the number and positioning of specialized teams (such as neonatal transport teams). Our study may provide guidance in this regard. For example, service delivery can be expanded by deploying teams during peak hours. Establishing teams in districts with high numbers of transfers may help reduce response times.

In conclusion, safest and most economical transport method accepted worldwide is intrauterine transport. Therefore, the first goal is for the birth to take place in a center where the newborn can receive the most appropriate care. However, due to various variables, neonatal transports become inevitable. The number of these transports, their regional distribution, and demand peak hours can be estimated by processing historical data. Estimates will guide more planned and efficient systems. There is a need for studies on this subject in Türkiye.

## REFERENCES

- Zenciroğlu A. Doğum odasında yenidoğan bakımı ve yenidoğanın ilk muayenesi. In: Zenciroğlu A, Özbaşı S, editors. Temel yenidoğan bakımı. Ankara: T.C. Sağlık Bakanlığı; 2019 p. 11-33.
- Salihoğlu Ö, Akkuş CH, Hatipoğlu S. Yenidoğan yoğun bakım ünitesi standartları. Med J Bakırköy, 2011;7:45-2
- Eskiocak M, Selçuk G.E. Türkiye’de Sağlık Bakanlığı tarafından bildirilen bebek ölüm hızları üzerine eleştirel bir değerlendirme. Turk J Public Health. 2014; p.207-216.
- UNICEF & World Health Organization. Levels and trends child mortality-report 2023. Estimates Developed by the United Nations Inter-Agency Group for Child Mortality Estimation. USA: UNICEF. 2023
- Halk Sağlığı Genel Müdürlüğü. Bebek ve çocuk ölümleri. 2023. Available at: [https://hsgm.saglik.gov.tr/depo/birimler/cocukergensagligidb/Dokumanlar/Istatistikler/Bebek\\_ve\\_Cocuk\\_Olumlari.pdf](https://hsgm.saglik.gov.tr/depo/birimler/cocukergensagligidb/Dokumanlar/Istatistikler/Bebek_ve_Cocuk_Olumlari.pdf). Accessed March 20, 2025.
- Tarı AK. Dünyada ve Türkiye’de yenidoğan transportu. J Nurs Res Dev. 2006;3:24-2
- Narlı N, Kırımı E, Uslu S. Yenidoğan bebeğin güvenli nakli rehberi. Ankara: Türk Neonatoloji Derneği. Turk Arch Pediatr. 2018;53:18-1.
- García del Real N. Et al. Importancia del transporte pediátrico y neonatal especializado. Situación actual en España: Hacia un futuro más equitativo y universal. An Pediatr. (English Edition), 2021;95:485-6.
- World Health Organization (WHO). 2024. Coronavirus disease (COVID-19) pandemic. Available at: <https://www.who.int/europe/emergencies/situations/covid-19> Accessed December 28, 2024
- Çatal Y, Altıntop İ. COVID-19 Pandemisi’nin acil servis başvuruları üzerine etkisi. J Ankara Üniv Fac Med. 2022;75:421-3.
- Vuilleumier S, Spichiger T, Dénéreaz S, Fio A. Not only COVID-19 disease impacts ambulance emergency demands but also lockdowns and quarantines. BMC Emerg Med J., 2023;23:1-4
- Bellini C, Biasi M, Gente M, Ramenghi L, Aufieri R, Minghetti, D. Rethinking the neonatal transport ground ambulance. Ital J Pediatr, 2019;45:1-97
- T.C. Resmî Gazete, Ambulanslar ve Acil Sağlık Araçları ile Ambulans Hizmetleri Yönetmeliği, 2025. Available at: <https://www.resmigazete.gov.tr/eskiler/2025/01/20250108-2.htm>. Accessed January 20, 2025.
- Curfman A, Groenendyk J, Markham C, Quayle K, Turmelle M, Tiekens B, et al. Implementation of telemedicine in pediatric and neonatal transport. Air Med. J., 2020;39:271-4.
- Abdelmawla M, Hansen G, Narvey M, Whyte H, Ilodigwe D, Lee K. Evaluation of transport-related outcomes for neonatal transport teams with and without physicians. Paediatr Child Health. 2021;26:290-7.
- Joose P. Impact of secondary transfer on patients with severe traumatic brain injury. J Trauma Acute Care Surg, 2012;72:487-2
- Dunn M, Gwinnutt C, Gray A. Critical care in the emergency department: patient transfer. Emerg Med J., 2007;24:40-1.
- Insoft R, Schwartz, H. Air and Ground Transport of Neonatal and Pediatric Patients. Illinois: American Academy of Pediatrics(AAP). 2015
- Tanja L, Vera B, Beate G, Cornelia H. Neonatal transport in Switzerland: a retrospective single-centre analysis - quo vadis?. Swiss Med Wkly, 2020;150:1-20308.
- Setzler H, Saydam C, Park S. EMS call volume predictions: A comparative study. Comput Oper Res. 2009;36:1843-6.
- Nijman R, Krone J, Mintegi S, Bidlingmaier C, Maconochia I, Lyttle M, Both U. Emergency care provided to refugee children in Europe: RefuNET: a cross-sectional survey study. Emerg Med J. 2021;38:5-1
- Şirin B, Ersoy S, Pala E. Suriyeli Geçici Sığınmacılar ve Türkiye Cumhuriyeti Vatandaşlarının Gebelik ve Doğum Sonuçlarının Karşılaştırılması: 3. Basamak Bir Hastanede Yapılmış Vaka Kontrol Çalışması. Smyrna Tıp Derg. 2019;24:25-1
- T.C. Göç İdaresi Başkanlığı. Geçici Koruma 2024. Available at <https://www.goc.gov.tr/gecici-koruma5638> Accessed December 22, 2024.
- Celalpur M, Gel Y, Levin S. Forecasting demand for health services: Development of a publicly available toolbox. Oper. Res. Health Care, 2015;5:1-1
- Esen H, Kaya Ü. Bir Eğitim Araştırma Hastanesi Acil Servis Birimine Başvuran Hasta Sayısı Tahmini. Verimlilik Derg. 2021;3:129
- Aydemir E, Karaatlı M, Yılmaz G, Aksoy S. 112 Acil Çağrı Merkezine Gelen Çağrı Sayılarını Belirleyebilmek İçin Bir Yapay Sinir Ağları Tahminleme Modeli Geliştirilmesi. PAJES. 2014;20:145-5.
- Nickel S, Oppermann M, Gama F. Ambulance location under stochastic demand: A sampling approach. Oper. Res. Health Care. 2016;8:24.
- Leknes H, Aartun E, Andersson H, Christiansen M, Granberg T. Strategic ambulance location for heterogeneous regions. Eur. J. Oper. Res. 2017;260:122-1.

## Abbreviations list

EMS: Emergency Medical Services  
ASOS: Emergency Medicine Automation System  
TUIK: Turkish Statistical Institute  
NRP: Neonatal Resuscitation Program

## Ethics approval and consent to participate

This study was approved by Çanakkale Onsekiz Mart University Graduate Education Institute ethics committee (project no. 2022-YÖNP-0500, decision no. 12/11 dated 09.06.2022)

## Consent for publication

Our study is retrospective. It does not contain any personal data.

## Availability of data and materials

Data from the study were not stored digitally or physically.

## Competing interests

The authors have no commercial associations or sources of support that might pose a conflict of interest.

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## Authors’ contributions

Idea/Concept and Design: HC. Control/Supervision: EP. Data Collection And/Or Processing: İŞ, SK. Analysis And/Or Interpretation: HC, EP. Literature Review: HC, SK. Writing The Article: HC, EP. Critical Review: SK, İŞ. References And Fundings: İŞ. Materials: EP.

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