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REVIEW ARTICLE



The Effects of International Economic Crises on the Tourism Sector: A Review of Tourism Demand, Employment, and Sectoral Resilience

Uluslararası Ekonomik Krizlerin Turizm Sektörü Üzerindeki Etkileri: Turizm Talebi İstihdam ve Sektörel Dayanıklılık Üzerine Bir Derleme

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ABSTRACT

This study examines the effects of international economic crises on the tourism sector through a review of the existing literature. It focuses on tourism demand and tourist behavior, tourism revenues, exchange-rate fluctuations, employment, sectoral performance, and destination competitiveness. The literature indicates that economic crises may reduce tourism demand, alter tourists' travel and expenditure patterns, affect tourism revenues, and create adverse consequences for employment. However, these effects vary across countries and destinations according to the nature and severity of crises, exchange-rate movements, economic conditions, and adaptive capacity. Overall, the findings suggest that the relationship between economic crises and tourism is multidimensional and should be evaluated beyond changes in tourist numbers, considering behavioral, economic, employment-related, and competitive outcomes across diverse tourism markets.

ÖZET

Bu çalışmada uluslararası ekonomik krizlerin turizm sektörü üzerindeki etkileri mevcut literatür üzerinden incelenmiştir. Değerlendirmede turizm talebi ve turist davranışlarının yanı sıra turizm gelirleri, döviz kuru hareketleri, istihdam, sektörel performans ve destinasyonların rekabet gücü üzerinde durulmuştur. İncelenen çalışmalar, ekonomik kriz dönemlerinde turizm talebinin azalabildiğini, turistlerin seyahat tercihleri ile harcamalarını değişen ekonomik koşullara göre yeniden düzenleyebildiğini göstermektedir. Krizlerin turizm gelirleri ve sektördeki istihdam üzerinde de çeşitli sonuçları bulunmaktadır. Ancak bu etkiler her ülke ve destinasyonda aynı biçimde ortaya çıkmamaktadır. Krizin niteliği ve şiddeti, döviz kurundaki değişimler, mevcut ekonomik koşullar ve destinasyonların değişen koşullara uyum sağlayabilme kapasitesi ortaya çıkan sonuçları farklılaştırmaktadır. Bu nedenle ekonomik krizlerin turizm üzerindeki etkilerinin sadece turist sayısındaki değişimlerle açıklanması yeterli değildir. Konunun turist davranışları, ekonomik performans, istihdam ve rekabet gücüyle birlikte değerlendirilmesi daha kapsamlı bir çerçeve sunmaktadır.

Anahtar Sözcükler: Ekonomik kriz, turizm talebi, turist davranışı

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1. Introduction

Tourism constitutes an important area of economic activity in many countries because of its relationship with economic growth, foreign exchange earnings, and employment. Its economic contribution is not confined to direct tourism revenues; the links between tourism activities and different service industries mean that changes within the sector need to be considered within a broader economic context. In Türkiye, tourism has similarly been identified as an important sector in terms of economic growth and foreign exchange earnings (Bahar, 2006: 138). Tourism also contributes to local and national economies through the economic activity and employment opportunities it generates (Akpulat and Üzümcü, 2019: 452).

This position within the wider economy also makes tourism sensitive to changes in general economic conditions. Economic contraction, financial instability, and declining consumer confidence may have consequences ranging from individual travel decisions to the performance of tourism businesses. Previous research indicates that economic and social crises affect tourist behavior and expenditure and that tourists may adopt different economizing strategies in response to changing economic circumstances during periods of crisis (Campos-Soria et al., 2015; Senbeto and Hon, 2020).

The relationship between economic crises and tourism is not limited to changes in tourism demand. Exchange-rate volatility can influence the cost of international travel and tourism revenues, while changes in demand may have consequences for business activity and sectoral employment. When the effects of crises on destination competitiveness are also considered, economic crises appear to affect tourism through several interconnected channels (Kaya and Çömlekçi, 2013; Perles-Ribes et al., 2016).

The consequences of economic crises, however, do not necessarily emerge in the same way across all destinations. The nature and severity of a crisis, the economic characteristics of a destination, and its position in the tourism market may lead to different outcomes. Economic crises may also coincide with other sources of disruption, including rising energy costs and security-related events (Hall, 2010). This makes it difficult to explain the relationship between economic crises and tourism through a single dimension.

The aim of this study is to examine the effects of international economic crises on the tourism sector in light of the existing literature. Accordingly, the study considers the effects of economic crises on tourism demand and tourist behavior, tourism revenues and exchange rates, employment, and sectoral performance. It further discusses their implications for destination competitiveness and sectoral resilience.

2. Economic Crises and Tourism

Tourism holds an important place within national economies in terms of both revenue generation and international competitiveness. Karagöz (2008: 151) associates tourism potential with the competitive advantages available to countries, while Bahar (2006: 138) draws attention to the contribution of tourism to economic growth in Türkiye. This relationship makes the consequences of changing economic conditions for tourism an important area of investigation.

During economic crises, changes in income and consumer confidence may influence travel demand. Köşker (2017: 226) notes that crises may lead to a decline in tourism demand. The effects of economic contraction on tourism, however, are not confined to reductions in the number of trips. Tourists may alter their level of expenditure and consumption preferences in response to economic conditions, meaning that the consequences of a crisis may also become visible in the nature of travel behavior (Campos-Soria et al., 2015).

Exchange rates represent another factor that needs to be considered in the relationship between economic conditions and international tourism flows. Changes in exchange rates may alter the relative cost of international travel and consequently encourage or constrain tourist movements (Babbhra, 2023: 15). In the context of Türkiye, Kaya and Çömlekçi (2013: 89) reported a negative relationship between tourism revenues and exchange-rate volatility.

Taken together, these findings suggest that the effects of economic crises on tourism operate through mechanisms that are not independent of one another. Relationships among demand, tourist expenditure, exchange rates, and the economic circumstances of tourism businesses may jointly shape sectoral performance during periods of crisis. Hall's (2010) observation that economic crises may be associated with other types of crisis events further illustrates the multidimensional character of this relationship.

2.1. Effects of Economic Crises on Tourism Demand and Tourist Behavior

Tourism demand is sensitive to changes in economic conditions. Economic uncertainty, changes in income, and expectations regarding future economic circumstances may influence travel decisions. Examining the consequences of crises for tourism in Türkiye, Köşker (2017: 226) reports that tourism demand may decline during periods of crisis.

Changes in tourist behavior during economic crises, however, do not necessarily take the form of cancelling travel altogether. Campos-Soria et al. (2015) found that tourists developed economizing strategies in response to economic conditions during the global economic crisis. This suggests that rather than abandoning travel completely, tourists may adjust their expenditure patterns and the way in which they travel.

Senbeto and Hon (2020), examining social and economic crises in relation to tourist behavior and expenditure, similarly draw attention to the effects of crises on consumer behavior. The influence of economic crises on tourism demand should therefore not be evaluated solely through changes in tourist numbers. Travel expenditure and consumption preferences are also relevant to understanding how tourism demand is reshaped under crisis conditions.

Exchange-rate movements may further affect this process by changing the cost of international travel. Changes in the relative value of currencies can increase or reduce the cost of particular destinations from the tourist's perspective (Babbhra, 2023: 15). Tourist behavior during economic crises may consequently be shaped not only by income and economic expectations but also by changes in the relative cost of international travel.

2.2. Tourism Revenues, Exchange Rates, and Sectoral Performance

Changes in tourism demand and tourist expenditure may have direct consequences for tourism revenues and the economic performance of businesses operating within the sector. Because tourism generates foreign exchange earnings, the effects of economic crises should be considered in conjunction with international tourism flows and exchange-rate movements.

Kaya and Çömlekçi (2013: 89) identified a negative relationship between tourism revenues and exchange-rate volatility in Türkiye. This finding indicates that tourism revenues are associated not only with tourist numbers but also with broader economic and financial conditions. Exchange-rate uncertainty may alter the cost structure of international tourism and, in turn, influence the revenue performance of the sector.

The 2008 global economic crisis provides an important example in this respect. Yıldız and Durgun (2010: 11-12) reported that the crisis adversely affected the tourism sector in Türkiye as well as in many other countries. Göçen et al. (2011), examining crises and tourism in Türkiye, likewise drew attention to the relationship between economic crises and developments within the tourism sector.

The consequences of crises may also extend to destination competitiveness. Perles-Ribes et al. (2016: 1210) examined the effects of economic crises on tourism competitiveness in Spain and reported that particularly severe crises may produce more persistent effects. Their findings indicate that the implications of economic crises for tourism extend beyond short-term changes in demand and revenue and may also concern the position of destinations within the international tourism market.

2.3. Economic Crises and Employment in Tourism

One of the principal dimensions of tourism's economic significance is its capacity to generate employment. Reductions in tourism demand and business revenues may therefore have consequences for the sector's labor market. Yıldız and Durgun (2010: 11-12) note that the 2008 global economic crisis adversely affected tourism in conjunction with economic contraction and unemployment.

The effects of crises on employment are not restricted to events that originate directly from economic conditions. The COVID-19 pandemic provides a different but informative example in this regard. Erol (2020: 46) examined the effects of the pandemic on tourism employment in Türkiye, Italy, and Spain and reported adverse consequences for the tourism sector when the economic effects of COVID-19 were taken into account.

Although COVID-19 was not an economic crisis in origin, it illustrates the sensitivity of tourism to the economic consequences of external shocks. This case also demonstrates the close relationship between

employment and the level of activity within the tourism sector, as abrupt changes in demand conditions may have consequences for the tourism workforce.

2.4. Sectoral Resilience in the Face of Crises

Differences in the effects of economic crises across countries and destinations bring the question of sectoral resilience to the forefront. In addition to the severity and duration of a crisis, a destination's position in the tourism market and its capacity to respond to changing demand conditions may shape the consequences of economic disruption.

The economizing strategies identified by Campos-Soria et al. (2015) indicate that tourism demand may not simply decline during crises but may also change in form. The assessment of tourist behavior and expenditure by Senbeto and Hon (2020) similarly suggests that consumer preferences may shift under crisis conditions. Understanding such changes in demand is therefore an important dimension of the tourism sector's capacity to respond to economic disruption.

Destination competitiveness is another relevant consideration in evaluating resilience. Perles-Ribes et al. (2016) report that severe economic crises may have more persistent effects on tourism competitiveness. Post-crisis recovery should therefore not be understood solely as a return of tourist numbers or tourism revenues to previous levels; changes in a destination's position within the tourism market also warrant consideration.

Hall (2010) notes that crisis events in tourism may involve interactions among economic crises, energy costs, security-related developments, and other sources of disruption. From this perspective, sectoral resilience can be understood not merely as the capacity to reduce the adverse consequences of a particular crisis but also as the capacity to adjust to shocks of different origins and to their economic consequences.

3. Discussion

The literature reviewed in this study indicates that economic crises affect tourism through interconnected changes in demand, tourist behavior, revenues, exchange rates, employment, and competitiveness. A decline in tourism demand is among the most visible consequences of economic crises, but changes in tourist numbers alone do not provide a sufficient account of their broader sectoral effects.

The studies by Campos-Soria et al. (2015) and Senbeto and Hon (2020) show that tourists may modify their consumption and expenditure behavior during periods of crisis. Changes in tourism demand therefore have a behavioral as well as a quantitative dimension. Tourists may reduce expenditure or reorganize their consumption preferences in response to economic circumstances without necessarily abandoning travel altogether. Consequently, the effects of crises on tourism businesses cannot be adequately assessed through tourist numbers alone.

Studies conducted in the Turkish context emphasize the implications of economic crises for tourism demand, tourism revenues, and sectoral performance (Kaya and Çömlekçi, 2013; Köşker, 2017; Yıldız and Durgun, 2010). The relationship between exchange-rate volatility and tourism revenues indicates that the effects of economic crises on tourism cannot be considered independently of financial conditions. Findings concerning the 2008 global economic crisis further demonstrate that adverse developments in tourism may become particularly visible alongside broader economic contraction and unemployment.

Evidence on destination competitiveness broadens this perspective. Perles-Ribes et al. (2016) suggest that severe economic crises may produce more persistent consequences for competitiveness. The effects of economic crises should therefore be considered not only in terms of losses incurred during the crisis itself but also in relation to the post-crisis position of destinations within tourism markets.

Taken together, the studies reviewed here suggest that the relationship between economic crises and tourism cannot be reduced to a simple, unidirectional causal framework. As Hall (2010) observes, economic crises may occur alongside other crisis events. The COVID-19 experience likewise demonstrates that a crisis that is not economic in origin can generate substantial economic consequences for tourism activity and employment (Erol, 2020). Sectoral resilience should therefore be considered in terms of the capacity of tourism to adjust to the economic consequences of shocks of different origins.

4. Conclusion

Economic crises constitute significant external developments that can affect the tourism sector through multiple mechanisms, with consequences varying across countries and destinations. The literature reviewed in this study associates economic crises with declining tourism demand, changes in tourist travel and expenditure behavior, fluctuations in tourism revenues, employment-related difficulties, and changes in destination competitiveness.

The effects of economic crises on tourism cannot be adequately explained solely through reductions in tourist numbers. Economizing strategies adopted by tourists, exchange-rate movements, the economic performance of tourism businesses, and destination competitiveness represent distinct but interconnected dimensions of this relationship. Moreover, the possibility that economic crises may coincide with other crisis events adds further complexity to their consequences for the sector.

Based on the existing literature, tourism resilience should be considered in relation to the capacity to adapt to changing demand and tourist behavior while maintaining a destination's competitive position. Examining the sectoral consequences of previous economic crises provides a useful framework for understanding the vulnerabilities of tourism when similar economic shocks occur in the future.

Declarations

Ethics Approval. Ethics approval was not required for this study, as it is a review article based exclusively on previously published literature and did not involve human participants, animals, or the collection of primary data.

Informed Consent. Not applicable, as the study did not involve human participants or the collection of identifiable personal information.

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Data Availability. No new data were generated or analyzed in this study. All information used in the review was obtained from the published literature cited in the article.

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References

- Akpulat, N. A., & Üzümcü, T. P. (2019). Turistik Destinasyonlarda Turizmin Etkilerine Yerel Halkın Bakış Açısı: Çeşme Örneği. *Journal Of Recreation And Tourism Research*, 6(4), 448-463.
- Babbhra, S. (2023). Currency Fluctuations And Its Impact On International Business. A Study Focusing On The Consumers Of Travel And Tourism Industry. Thesis Master Of Business Administration, International Business Management September.
- Bahar, O. (2006). Turizm Sektörünün Türkiye'nin Ekonomik Büyümesi Üzerindeki Etkisi: Var Analizi Yaklaşımı. *Yönetim ve Ekonomi Dergisi*, 13(2), 137-150.
- Campos-Soria, J. A., Inchausti-Sintes, F., & Eugenio-Martin, J. L. (2015). Understanding Tourists' Economizing Strategies During The Global Economic Crisis. *Tourism Management*, 48, 164-173.
- Erol, S. I. (2020). Covid-19'un Turizm Sektöründe İstihdama Etkisi: İtalya, İspanya ve Türkiye Örnekleri. *İşletme ve İktisat Çalışmaları Dergisi*, 8(2), 38-49.
- Göçen, Ö. G. S., Yirik, Ş., & Yılmaz, Y. (2011). Türkiye'de Krizler ve Krizlerin Turizm Sektörüne Etkileri. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 16(2), 493-509.

- Hall, C. M. (2010). Crisis Events İn Tourism: Subjects Of Crisis İn Tourism. *Current İssues İn Turism*, 13(5), 401-417.
- Karagöz, K. (2008). Türkiye'nin Turizm Potansiyeli: Çekim Modeli Yaklaşımı. *Anatolia: Turizm Araştırmaları Dergisi*, 19(2), 149-156.
- Kaya, V., & Çömlekçi, S. Ç. (2013). Döviz Kuru Oynaklığının Turizm Sektörüne Etkileri: Türkiye Örneği (2002-2011). *Seyahat ve Otel İşletmeciliği Dergisi*, 10(2).
- Köşker, H. (2017). Krizlerin Turizm Sektörüne Etkileri Üzerine Bir Araştırma: 2016 Yılı Türkiye Örneği. *Akademik Bakış Uluslararası Hakemli Sosyal Bilimler Dergisi*, (62), 216-230.
- Perles-Ribes, J. F., Ramón-Rodríguez, A. B., Rubia-Serrano, A., & Moreno-Izquierdo, L. (2016). Economic Crisis And Tourism Competitiveness İn Spain: Permanent Effects Or Transitory Shocks?. *Current Issues İn Tourism*, 19(12), 1210-1234.
- Senbeto, D. L., & Hon, A. H. (2020). The İmpacts Of Social And Economic Crises On Tourist Behaviour And Expenditure: An Evolutionary Approach. *Current Issues İn Tourism*, 23(6), 740-755.
- Yıldız, Z., & Durgun, A. (2010). 2008 Küresel Ekonomik Krizi ve Turizm Sektörü Üzerine Etkileri. *Süleyman Demirel Üniversitesi Vizyoner Dergisi*, 2(1), 1-15.



REVIEW ARTICLE



Post-Traumatic Stress Disorder Following Earthquakes: A Review of Risk and Protective Factors and Psychosocial Interventions

Depremler Sonrası Travma Sonrası Stres Bozukluğu: Risk ve Koruyucu Faktörler ile Psikososyal Müdahaleler Üzerine Bir Derleme

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ABSTRACT

Earthquakes may cause substantial and persistent psychological consequences alongside physical destruction. Post-traumatic stress disorder (PTSD) is a major mental health problem following earthquakes. This review examines post-earthquake PTSD with a focus on risk factors, protective factors, and psychosocial interventions. Severe trauma exposure, physical injury, bereavement, displacement, pre-existing mental health problems, economic hardship, and limited social support may increase PTSD risk. Social support, adaptive coping, access to basic needs, and community ties may facilitate recovery. Post-earthquake mental health care should extend beyond clinical treatment. Early psychosocial support, follow-up of high-risk groups, specialized treatment when needed, and community-based services are essential components of care. Integrating mental health services into disaster preparedness, response, and long-term recovery may strengthen continuity and accessibility of care.

ÖZET

Bu çalışma deprem sonrası travma sonrası stres bozukluğuna (TSSB) ilişkin literatürü risk ve koruyucu etmenler ile psikososyal müdahaleler açısından değerlendirmek amacıyla hazırlanmıştır. Çalışma anlatsal derleme niteliğindedir. Türkiye’de ve farklı ülkelerde yürütülen deprem araştırmaları ile afet ruh sağlığı ve kitlesel travma müdahalelerine ilişkin çalışmalar ve başlıca rehberler incelenmiştir. Travmaya yoğun maruziyet, fiziksel yaralanma, yakın kaybı, yerinden edilme, önceki ruhsal sorunlar, ekonomik güçlükler ve sınırlı sosyal destek TSSB riskini artıran başlıca etmenlerdir. Sosyal destek, işlevsel başa çıkma, temel gereksinimlere erişim ve toplumsal bağların korunması iyileşmeyi destekleyen etmenler olarak öne çıkmaktadır. Deprem sonrası ruh sağlığı hizmetleri klinik tedaviyle sınırlı kalmamalıdır. Erken psikososyal destek, riskli grupların izlenmesi, gerektiğinde uzmanlaşmış tedavi ve uzun dönemli toplum temelli hizmetler birlikte yürütülmelidir. Afet ruh sağlığı hizmetlerinin hazırlık, müdahale ve iyileşme süreçlerine bütünleşik biçimde dahil edilmesi önerilmektedir.

Anahtar Sözcükler: Deprem, travma sonrası stres bozukluğu, afet ruh sağlığı

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1. Introduction

Post-traumatic stress disorder (PTSD) is a mental health condition that may develop after exposure to a traumatic event and may impair daily functioning, interpersonal relationships, and broader psychosocial adjustment (Korucu & Kaya, 2023). Earthquakes create a distinctive context of risk for PTSD. Sudden onset, threat of death or injury, bereavement, housing damage, and recurrent aftershocks may occur within the same period. The psychological impact of an earthquake is not determined solely by the magnitude of physical destruction. Degree of exposure, pre-existing mental health problems, social support, socioeconomic conditions, and persistent post-disaster stressors also shape psychological outcomes (Aker, 2006; Neria et al., 2008; North et al., 2013).

The post-earthquake period may generate additional sources of stress. Housing instability, displacement, loss of income, restricted access to health services, and uncertainty about the future may prolong recovery (Xu & Song, 2011; Tang et al., 2014). Studies conducted after the Marmara and Van earthquakes in Türkiye identified traumatic stress symptoms as an important post-disaster mental health concern (Aker, 2006; Başoğlu et al., 2004; Kurt & Gülbahçe, 2019). Research following the Kahramanmaraş earthquake has also drawn attention to psychological consequences extending beyond those directly exposed to the disaster (Gören, 2023).

Post-earthquake PTSD cannot be explained by a single determinant. The nature of traumatic exposure, pre-disaster vulnerabilities, and post-disaster living conditions all contribute to its development and persistence. This review aims to evaluate the current literature on post-earthquake PTSD through the domains of risk and protective factors and psychosocial interventions. Studies conducted in Türkiye and other countries, together with key literature and guidance on disaster mental health and mass-trauma intervention, are considered. The review focuses on the clinical and psychosocial manifestations of PTSD after earthquakes, risk and protective factors, intervention options, access to services, and continuity of care.

2. Earthquakes and Post-Traumatic Stress Disorder

The traumatic nature of an earthquake extends beyond the moment of ground shaking. Threat to life, entrapment under debris, physical injury, bereavement, and loss of housing may occur within the same event. Recurrent aftershocks may delay the restoration of a sense of safety. Earthquakes may therefore acquire the character of an ongoing traumatic experience rather than a discrete event confined to a single point in time (Başoğlu et al., 2004; Neria et al., 2008).

The prevalence of PTSD is not uniform across earthquake-affected populations. Severity of exposure, sample characteristics, timing of assessment, and measurement procedures contribute to variation in reported rates. Epidemiological studies conducted after the 1999 earthquakes in Türkiye documented substantial levels of PTSD and comorbid depressive symptoms (Aker, 2006; Başoğlu et al., 2004). Research involving adolescents and adults after the Wenchuan earthquake similarly showed that post-traumatic stress, depression, and anxiety may coexist after major earthquakes (Fan et al., 2011; Kun et al., 2013; Xu & Song, 2011). Assessments conducted 30 months after the Haiti earthquake further demonstrated that psychological consequences may persist well beyond the immediate aftermath (Cénat & Derivois, 2014).

The DSM-5 organizes PTSD symptoms into four clusters: intrusion symptoms, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity (American Psychiatric Association, 2013). Following an earthquake, sounds, vibrations, damaged buildings, and images associated with the disaster area may function as trauma reminders. Clinical assessment should not be limited to symptom counts. Symptom persistence, severity, and effects on social and occupational functioning require concurrent evaluation.

3. Risk and Protective Factors

3.1. Risk Factors

Direct and severe traumatic exposure is among the most consistently identified risk domains for PTSD. Proximity to the epicenter, physical injury, witnessing death or severe injury, and substantial material loss have been associated with higher levels of post-traumatic stress symptoms (Lai et al., 2004). Research across different disasters likewise identifies the nature of exposure and the extent of loss as central variables in disaster-related PTSD (North et al., 2013).

Age, gender, and socioeconomic status have been associated with differences in risk in some samples. Evidence from the Wenchuan earthquake indicates that the effects of demographic characteristics should be interpreted alongside trauma exposure and other contextual conditions (Kun et al., 2013). Demographic characteristics therefore appear insufficient as stand-alone explanations of post-disaster PTSD.

Pre-existing mental health problems and previous traumatic experiences may increase vulnerability. Persistent post-disaster stressors may also contribute to the maintenance of PTSD symptoms. Displacement, loss of livelihood, housing problems, and weak social support directly shape life after an earthquake (Xu & Song, 2011). Meta-analytic evidence on depression after natural disasters similarly supports the relevance of loss, exposure, and post-disaster adversity to adverse psychological outcomes (Tang et al., 2014).

3.2. Protective Factors

Social support is a major resource in post-earthquake recovery. Support from family members, friends, and close social networks may contribute to the restoration of safety and belonging. A one-year follow-up study of earthquake survivors in Türkiye demonstrated the relevance of social support to PTSD outcomes (Altındağ et al., 2005).

Safety, calming, individual and collective efficacy, connectedness, and hope have been proposed as core principles of intervention following mass trauma (Hobfoll et al., 2007). These principles reflect a model of recovery extending beyond the reduction of clinical symptoms. Feeling safe, maintaining social relationships, and regaining a sense of control over everyday life are integral components of psychological recovery.

Coping strategies also influence adaptation. Active problem solving, meaning-making, and religious coping have been associated with resilience in some disaster-affected populations (Rajkumar et al., 2008). Individual coping capacity cannot be separated from environmental conditions. Access to housing, health care, economic security, and psychological support provides the material foundation on which recovery takes place (Wang et al., 2009).

4. Psychosocial Intervention and Recovery

Post-earthquake mental health care extends beyond treatment for individuals who meet diagnostic criteria for PTSD. Disaster-affected populations present with needs of varying intensity. Basic safety and social support needs and specialized psychiatric treatment should be addressed at different levels within the same system of care. The Inter-Agency Standing Committee (2007) recommends a layered model for organizing mental health and psychosocial support in emergency settings.

Access to care is a major concern during disasters. Shortages of mental health professionals, disruption of health infrastructure, and economic constraints may restrict access to appropriate support (World Health Organization, 2013). Stigma may further reduce help-seeking behavior (Cénat & Derivois, 2014). A systematic review of mental health programs implemented after the Haiti earthquake documented substantial variation in interventions and emphasized the importance of adapting programs to local conditions (Cénat et al., 2020).

Training non-specialist health and community workers in basic psychological interventions may expand service capacity (Patel et al., 2011). This approach is particularly relevant where specialist human resources are limited. Mobile health, teletherapy, and internet-based interventions may provide additional channels of care when physical access is disrupted (Ruzek & Yeager, 2017). Digital interventions require attention to internet access, privacy, and digital literacy.

Controlled studies have also evaluated trauma-focused treatments in earthquake survivors. A randomized waiting-list controlled trial of a single-session behavioral treatment for earthquake-related PTSD in Türkiye reported evidence of clinical benefit from a structured intervention (Başoğlu et al., 2007). A pilot study of narrative exposure therapy among adult survivors of the Sichuan earthquake likewise provided evidence supporting the potential use of trauma-focused treatment in disaster settings (Zang et al., 2013). Treatment selection should be based on clinical need, symptom duration and severity, comorbid conditions, and the individual's living circumstances.

Embedding disaster mental health within preparedness planning strengthens continuity of care. Coordination among mental health services, primary health care, social services, and disaster management may improve early identification and referral (Math et al., 2015). The disappearance of temporary services after the acute phase represents a significant systems-level problem. Post-disaster reconstruction can also provide an opportunity to strengthen mental health services on a more sustainable basis (Epping-Jordan et al., 2015; World Health Organization, 2013).

5. Discussion

The literature on post-earthquake PTSD points to two distinct but closely related levels of risk. The first concerns the traumatic event itself. Physical injury, threat to life, bereavement, and intense exposure increase the likelihood of adverse psychological outcomes. The second concerns post-disaster living conditions. Problems related to housing, income, social support, and access to health care may prolong the effects of trauma. A narrow understanding of PTSD as an individual clinical response to a traumatic event obscures this second level.

Risk factors do not carry equal explanatory weight. Direct exposure and severe loss show a more consistent association with PTSD, whereas the effects of demographic variables vary across samples and contexts (Lai et al., 2004; Kun et al., 2013; North et al., 2013). Risk assessment should not be reduced to a fixed checklist of individual characteristics. What the person experienced, which resources were lost, and the conditions under which life continues after the disaster require joint consideration.

Research on protective factors underscores the importance of the social environment. Social support, connectedness, safety, and perceived efficacy occupy a central place in recovery (Altındağ et al., 2005; Hobfoll et al., 2007). A mental health response restricted to symptom reduction leaves these domains insufficiently addressed. Safe housing, access to essential services, and restoration of social ties are inseparable from clinical recovery.

Findings from the Marmara and Van earthquakes in Türkiye indicate that disaster mental health requires long-term follow-up (Aker, 2006; Kurt & Gülbahçe, 2019). More recent research also points to the need to consider secondary traumatic effects of disasters (Gören, 2023). A service model concentrated solely on the first weeks after an earthquake is inadequate. High-risk groups require follow-up, access to specialized treatment, and sustained community-based support.

The resilience of the service system is a separate concern. Short-term programs introduced from outside the affected area may provide valuable support during the acute phase, but their impact remains limited when they fail to build lasting local capacity. Training local personnel, establishing coordination with primary care and social services, developing referral pathways, and explicitly incorporating mental health into disaster plans provide a more sustainable structure (Epping-Jordan et al., 2015; Math et al., 2015; World Health Organization, 2013). The effects of research procedures on disaster-affected participants also warrant attention. Ethical sensitivity and participant safety should form part of research design when data are collected after traumatic events (Galea et al., 2007).

6. Conclusion and Recommendations

Post-earthquake PTSD is a multifactorial mental health problem. Severe traumatic exposure, physical injury, bereavement, displacement, pre-existing mental health problems, and persistent post-disaster adversity may increase risk. Social support, access to basic necessities, adaptive coping, and preservation of community ties support recovery.

Disaster mental health services should begin with early psychosocial support, continue through systematic follow-up of high-risk groups, and provide access to evidence-based treatment when clinically indicated. Mental health care should not be planned separately from disaster management. Primary health care, social services, and local support mechanisms should operate within an integrated system. Long-term follow-up and the development of local service capacity should constitute core components of post-disaster mental health policy.

Declarations

Ethics Approval. Ethics approval was not required for this study, as it is a review article based exclusively on previously published literature and did not involve human participants, animals, or the collection of primary data.

Informed Consent. Not applicable, as the study did not involve human participants or the collection of identifiable personal information.

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References

- Aker, T. (2006). 1999 Marmara depremleri: epidemiyolojik bulgular ve toplum ruh sağlığı uygulamaları üzerine bir gözden geçirme. *Türk Psikiyatri Dergisi*, 17(3), 204-212.
- Altındağ, A., Özen, S., & Sır, A. (2005). One-year follow-up study of posttraumatic stress disorder among earthquake survivors in Turkey. *Comprehensive Psychiatry*, 46(5), 328-333.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.
- Başoğlu, M., Kılıç, C., Şalcıoğlu, E., & Livanou, M. (2004). Prevalence of posttraumatic stress disorder and comorbid depression in earthquake survivors in Turkey: An epidemiological study. *Journal of Traumatic Stress*, 17(2), 133-141.
- Başoğlu, M., Şalcıoğlu, E., Livanou, M., Kalender, D., & Acar, G. (2007). Single-session behavioral treatment of earthquake-related posttraumatic stress disorder: A randomized waiting list controlled trial. *Journal of Traumatic Stress*, 20(1), 1-11.
- Cénat, J. M., & Derivois, D. (2014). Assessment of prevalence and determinants of posttraumatic stress disorder and depression symptoms in adults survivors of earthquake in Haiti after 30 months. *Journal of Affective Disorders*, 159, 111-117.
- Cénat, J. M., Mukunzi, J. N., Noorishad, P. G., Rousseau, C., Derivois, D., & Bukaka, J. (2020). A systematic review of mental health programs among populations affected by the 2010 earthquake in Haiti. *Journal of Affective Disorders*, 263, 227-238.
- Epping-Jordan, J. E., van Ommeren, M., Ashour, H. N., Maramis, A., Marini, A., Mohanraj, A., et al. (2015). Beyond the crisis: Building back better mental health care in 10 emergency-affected areas using a longer-term perspective. *International Journal of Mental Health Systems*, 9(1), 15.
- Fan, F., Zhang, Y., Yang, Y., Mo, L., & Liu, X. (2011). Symptoms of posttraumatic stress disorder, depression, and anxiety among adolescents following the 2008 Wenchuan earthquake in China. *Journal of Traumatic Stress*, 24(1), 44-53.
- Galea, S., Nandi, A., Stuber, J., Gold, J., Acierno, R., Best, C. L., et al. (2007). Participant reactions to survey research in the general population after terrorist attacks. *Journal of Traumatic Stress*, 20(4), 467-475.
- Gören, A. B. (2023). Afet sonrası ikincil travmatik stres ve dini başa çıkma: Kahramanmaraş depremi örneği. *Marife Dini Araştırmalar Dergisi*, 23(1), 80-100.
- Hobfoll, S. E., Watson, P., Bell, C. C., Bryant, R. A., Brymer, M. J., Friedman, M. J., et al. (2007). Five essential elements of immediate and mid-term mass trauma intervention: Empirical evidence. *Psychiatry*, 70(4), 283-315.
- Inter-Agency Standing Committee. (2007). *IASC guidelines on mental health and psychosocial support in emergency settings*. IASC.
- Korucu, T. Ş., & Kaya, D. Ö. (2023). Yeniden yaşama sarılmak: Deprem sonucu gelişen travma sonrası stres bozukluğu yönetiminde temel beden farkındalık terapisi. *İzmir Katip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, 8(2), 755-761.

- Kun, P., Tong, X., Liu, Y., Pei, X., & Luo, H. (2013). What are the determinants of post-traumatic stress disorder: Age, gender, ethnicity or other? Evidence from 2008 Wenchuan earthquake. *Public Health*, 127(7), 644-652.
- Kurt, E., & Gülbahçe, A. (2019). Van depremini yaşayan öğrencilerin travma sonrası stres bozukluğu düzeylerinin incelenmesi. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 23(3), 957-972.
- Lai, T. J., Chang, C. M., Connor, K. M., Lee, L. C., & Davidson, J. R. (2004). Full and partial PTSD among earthquake survivors in rural Taiwan. *Journal of Psychiatric Research*, 38(3), 313-322.
- Math, S. B., Nirmala, M. C., Moirangthem, S., & Kumar, N. C. (2015). Disaster management: Mental health perspective. *Indian Journal of Psychological Medicine*, 37(3), 261-271.
- Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine*, 38(4), 467-480.
- North, C. S., Oliver, J., & Pandya, A. (2013). Examining a comprehensive model of disaster-related posttraumatic stress disorder in systematically studied survivors of 10 disasters. *American Journal of Public Health*, 103(4), e38-e46.
- Patel, V., Chowdhary, N., Rahman, A., & Verdeli, H. (2011). Improving access to psychological treatments: Lessons from developing countries. *Behaviour Research and Therapy*, 49(9), 523-528.
- Rajkumar, A. P., Premkumar, T. S., & Tharyan, P. (2008). Coping with the Asian tsunami: Perspectives from Tamil Nadu, India on the determinants of resilience in the face of adversity. *Social Science & Medicine*, 67(5), 844-853.
- Ruzek, J. I., & Yeager, C. M. (2017). Internet and mobile technologies: Addressing the mental health of trauma survivors in less resourced communities. *Global Mental Health*, 4, e16.
- Tang, B., Liu, X., Liu, Y., Xue, C., & Zhang, L. (2014). A meta-analysis of risk factors for depression in adults and children after natural disasters. *BMC Public Health*, 14(1), 623.
- Wang, X., Gao, L., Shinfuku, N., Zhang, H., Zhao, C., & Shen, Y. (2009). Longitudinal study of earthquake-related PTSD in a randomly selected community sample in north China. *American Journal of Psychiatry*, 166(3), 340-347.
- World Health Organization. (2013). Building back better: Sustainable mental health care after emergencies. WHO.
- Xu, J., & Song, X. (2011). Posttraumatic stress disorder among survivors of the Wenchuan earthquake 1 year after: Prevalence and risk factors. *Comprehensive Psychiatry*, 52(4), 431-437.
- Zang, Y., Hunt, N., & Cox, T. (2013). A randomised controlled pilot study: The effectiveness of narrative exposure therapy with adult survivors of the Sichuan earthquake. *BMC Psychiatry*, 13(1), 41.



RESEARCH ARTICLE



Otizm Spektrum Bozukluğu Olan Çocukların Ebeveynlerinin Bakım Deneyimleri ve Psikososyal Güçlükleri: Nitel Bir Araştırma

Caregiving Experiences and Psychosocial Challenges of Parents of Children with Autism Spectrum Disorder: A Qualitative Study

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ÖZET

Bu araştırmanın amacı otizm spektrum bozukluğu (OSB) olan çocukların ebeveynlerinin bakım deneyimlerini ve bakım sürecinde karşılaştıkları psikososyal güçlükleri incelemektir. Araştırma nitel araştırma yöntemlerinden fenomenolojik desen kullanılarak yürütülmüştür. Çalışma grubunu OSB tanısı bulunan çocukların bakımından sorumlu 12 ebeveyn oluşturmuştur. Araştırma verileri yarı yapılandırılmış görüşmeler yoluyla toplanmış ve tematik analiz yöntemiyle analiz edilmiştir. Analiz sonucunda bulgular; tanı süreci ve değişen yaşam, bakım sürecinde yaşanan güçlükler, aile ve sosyal yaşam ile hizmet deneyimleri, başa çıkma ve gelecek kaygıları olmak üzere dört ana tema altında toplanmıştır. Ebeveynlerin özellikle çocuklarının iletişim ve davranış sorunları, sürekli gözetim gereksinimi, sosyal çevrenin olumsuz tutumları, özel eğitim giderleri ve çocuklarının geleceğine ilişkin belirsizlikler nedeniyle güçlük yaşadıkları belirlenmiştir. Araştırma sonuçları doğrultusunda ebeveynlere yönelik psikososyal desteklerin artırılması, sağlık, eğitim ve sosyal hizmetler arasındaki iş birliğinin güçlendirilmesi, OSB olan bireylere yönelik bağımsız yaşam ve uzun süreli bakım hizmetlerinin geliştirilmesi önerilmektedir.

ABSTRACT

This study aimed to examine the caregiving experiences of parents of children with autism spectrum disorder (ASD) and the psychosocial difficulties they encounter during the caregiving process. The study was conducted using a phenomenological design within the qualitative research approach. The study group consisted of 12 parents who were responsible for the care of children diagnosed with ASD. Data were collected through semi-structured interviews and analyzed using thematic analysis. Four main themes emerged from the analysis: the diagnosis process and changes in daily life, difficulties encountered in caregiving, family and social life and experiences with services, and coping and concerns about the future. The findings indicated that parents experienced difficulties particularly related to their children's communication and behavioral problems, the need for continuous supervision, negative attitudes within the social environment, special education expenses, and uncertainty about their children's future. Based on the findings, it is recommended that psychosocial support for parents be strengthened, collaboration among health, education, and social services be improved, and independent living and long-term care services for individuals with ASD be further developed.

Keywords: Autism spectrum disorder, parent, caregiving experience

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1. Giriş

Otizm spektrum bozukluğu (OSB), sosyal iletişim ve etkileşim alanındaki güçlükler ile sınırlı ve tekrarlayıcı davranış örüntüleriyle karakterize nöro gelişimsel bir durumdur (Green vd., 2010). OSB olan çocukların bakım, eğitim ve destek gereksinimleri aile yaşamının düzenlenmesinde önemli değişikliklere neden olabilmektedir (Crane vd., 2021). Tanı süreciyle başlayan bu değişim ebeveynlerin günlük yaşamından sosyal ilişkilerine, ekonomik koşullarından geleceğe ilişkin beklentilerine kadar farklı alanlarda karşılık bulmaktadır (Oono vd., 2013).

Tanı sonrasında ebeveynler bir yandan çocuklarının gereksinimlerini anlamaya ve uygun eğitim olanaklarına ulaşmaya çalışırken diğer yandan yeni bakım sorumluluklarına uyum sağlamaktadır. Bu dönemde bilgi gereksinimi ve tanının kabulü önem kazanmaktadır (Althoff vd., 2019). Nitekim Selimoğlu, Özdemir, Töret ve Özkubat (2013), ebeveynlerin tanılama süreci ve sonrasında farklı güçlüklerle karşılaştıklarını bildirmiştir. Köksal ve Erciyes (2021) ise tanının kabul edilmesinin ebeveynlerin çocuklarının gelişimine odaklanmasını kolaylaştırabildiğini, buna karşılık eğitim olanakları ile psikososyal desteğin yetersizliğinin ailelerin yaşadığı güçlükleri artırdığını belirlemiştir.

OSB olan çocukların iletişim ve etkileşimde yaşadıkları güçlükler ile problem davranışları günlük bakım sürecini de etkileyebilmektedir. Karaca, Kılıç ve Sarı (2021), ebeveynlerin özellikle sınırlı iletişim, etkileşim ve problem davranışlar nedeniyle günlük yaşamda zorlandıklarını açıklamıştır. Bakım gereksinimlerinin sürekliliği ailelerin sosyal yaşamlarını ve destek gereksinimlerini de etkilemektedir. Özkubat, Özdemir, Gürel Selimoğlu ve Töret (2014), OSB olan çocukların ebeveynlerinin günlük ve sosyal yaşamlarında değişiklikler yaşadıklarını, aile ve sosyal ilişkilerinin etkilendiğini, eğitim ve maddi destek gereksinimlerinin yeterince karşılanmadığını ve geleceğe ilişkin kaygılar taşıdıklarını ortaya koymuştur. Bu sonuçlar OSB olan bir çocuğun bakımının ebeveyn yaşamının farklı alanlarını etkileyen ve zaman içinde değişen gereksinimleri içeren bir süreç olduğunu göstermektedir. Ebeveynlerin yaşadıkları güçlüklerin ve kullandıkları başa çıkma kaynaklarının incelenmesi, ailelerin gereksinimlerinin belirlenmesi ve uygun destek hizmetlerinin planlanması açısından önem taşımaktadır. Bu doğrultuda araştırmanın amacı OSB olan çocukların ebeveynlerinin bakım deneyimlerini ve bakım sürecinde karşılaştıkları psikososyal güçlükleri incelemektir. Araştırmada ebeveynlerin tanı sonrası deneyimleri, günlük bakımda karşılaştıkları güçlükler, aile ve sosyal yaşamları, hizmetlere ilişkin deneyimleri, başa çıkma kaynakları ve geleceğe yönelik kaygıları ele alınmıştır.

2. Yöntem

2.1. Araştırma Deseni

Araştırma nitel araştırma yaklaşımı kapsamında fenomenolojik desende tasarlanmıştır. Fenomenolojik yaklaşım ebeveynlerin OSB olan bir çocuğa bakım verme deneyimine yükledikleri anlamların ve ortak deneyimlerin incelenmesine olanak sağlaması nedeniyle tercih edilmiştir.

2.2. Katılımcılar

Çalışma grubunu OSB tanısı bulunan çocuğun bakımında aktif sorumluluk üstlenen 12 ebeveyn oluşturmaktadır. Katılımcıların dokuzu anne, üçü babadır. Katılımcıların belirlenmesinde ölçüt örnekleme yaklaşımı esas alınmıştır. Katılım ölçütleri; OSB tanısı bulunan bir çocuğun ebeveyni olmak, çocuğun bakımında aktif sorumluluk üstlenmek ve görüşmeye gönüllü katılmak olarak belirlenmiştir.

Tablo 1. Katılımcı Özellikleri

Değişken	Kategori	n	%
Ebeveyn türü	Anne	9	75,0
	Baba	3	25,0
Yaş	30-39	4	33,3
	40-49	6	50,0
	50 ve üzeri	2	16,7
Çocuğun yaş grubu	4-7	4	33,3
	8-12	5	41,7
	13 ve üzeri	3	25,0

2.3. Veri Toplama

Verilerin yarı yapılandırılmış bireysel görüşmeler yoluyla toplanmıştır. Görüşme formunda tanı süreci, günlük bakım, iletişim ve davranış alanındaki güçlükler, duyuşal hassasiyetler, aile ve sosyal yaşam, özel eğitim ve hizmetlere erişim, sosyal destek ve geleceğe ilişkin düşüncelere yönelik açık uçlu sorulara yer verilmiştir.

2.4. Verilerin Analizi

Verilerin tematik analiz yoluyla değerlendirilmiştir. Görüşme metinlerinin tekrar okunması, başlangıç kodlarının oluşturulması, benzer kodların bir araya getirilmesi ve ana temaların belirlenmesi esas alınmıştır. Analizde katılımcılar G1-G12 biçiminde kodlanmış, belirgin örüntüler sayı ve yüzde değerleriyle desteklenmiştir.

3. Bulgular

Verilerin analizi sonucunda ebeveynlerin bakım deneyimlerinin dört ana tema altında toplandığı belirlenmiştir. Temalar ve bu temalara ilişkin alt boyutlar Tablo 2’de yer almaktadır.

Tablo 2. Ana Tema ve Alt Temalar

Ana tema	Alt temalar
Tanı Süreci ve Otizmle Değişen Yaşam	Tanıyla anlamlandırma, bilgi arayışı, günlük yaşamın yeniden düzenlenmesi
Bakım Sürecinde Yaşanan Güçlükler	İletişim, davranış yönetimi, duyuşal hassasiyet, sürekli gözetim, kişisel zamanın azalması
Aile, Sosyal Yaşam ve Hizmet Deneyimleri	Bakım paylaşımı, sosyal çevrenin tutumu, damgalanma, özel eğitim, ekonomik yük
Baş Çıkma Deneyimleri ve Gelecek Kaygıları	Aile desteği, akraba ebeveyn desteği, bağımsız yaşam, ebeveyn sonrası bakım

3.1. Tanı Süreci ve Otizmle Değişen Yaşam

Tanı sürecinin ebeveynlerin yaşamında önemli değişikliklere yol açtığı görülmüştür. Sekiz ebeveyn tanıyı öğrendiği ilk dönemde duyuşal olarak zorlandığını, üç ebeveyn tanının çocuklarının davranışlarını anlamalarına yardımcı olduğunu, bir ebeveyn ise tanıyı kabullenmekte uzun süre zorlandığını belirtmiştir. Tanı sonrasında günlük yaşamın da çocuğun gereksinimlerine göre değiştiği belirlenmiştir. On ebeveyn 10’u günlük planlarını çocuğun eğitim, bakım ve rutinlerine göre düzenlediklerini ifade etmiştir.

Tablo 3. Tanı Süreci ve Günlük Yaşamın Değişimine Yönelik Bulgular

Bulgular	n	%
Tanı sürecini duyuşal açıdan zorlayıcı yaşama	8	66,7
Tanıyla açıklayıcı/rahatlatıcı bulma	3	25,0
Tanıyla kabullenmede uzun süre zorlanma	1	8,3
Günlük yaşamı çocuğun gereksinimlerine göre düzenleme	10	83,3

“Tanıyı ilk duyduğumda ne yapacağımızı bilmiyordum. Bir süre sürekli okuyup araştırdım. Sonra hayatımız okul, eğitim ve ev arasında şekillenmeye başladı.” (G2).

“Tanının kendisinden çok sonrasında hayatımızın nasıl değişeceğini anlamak zordu. Bir yere giderken bile önce onun düzenini düşünüyorsunuz.” (G7).

3.2. Bakım Sürecinde Yaşanan Güçlükler

Ebeveynlerin bakım sürecinde en sık iletişim, davranış yönetimi, duyuşal hassasiyetler ve sürekli gözetim gereksinimi nedeniyle güçlük yaşadıkları belirlenmiştir. Dokuz ebeveyn çocuklarının gereksinimlerini anlamakta zaman zaman zorlandığını, yedi ebeveyn davranışsal tepkilerin günlük yaşamlarını etkilediğini ve sekiz ebeveyn duyuşal hassasiyetler nedeniyle bazı ortamlara girmekten kaçındığını ya da bu ortamlarda

geçirdikleri süreyi sınırladığını belirtmiştir. Dokuz ebeveyn kendilerine yeterli zaman ayıramadıklarını, altı ebeveyn ise bakım sorumluluğunun uyku ve dinlenme düzenlerini etkilediğini ifade etmiştir.

Tablo 4. Bakım Sürecinde Yaşanan Güçlüklerle Yönelik Bulgular

Güçlük alanı	n	%
İletişim gereksinimini anlamada güçlük	9	75,0
Davranışsal tepkilerin günlük yaşamı etkilemesi	7	58,3
Duyusal hassasiyet nedeniyle ortamları sınırlama	8	66,7
Kişisel zamanın yetersizliği	9	75,0
Uyku/dinlenme düzeninin etkilenmesi	6	50,0

“Bazen ne istediğini anlayamadığım zaman ikimiz de zorlanıyoruz. O anlatamıyor, ben anlamaya çalışıyorum. En yorucu taraflarından biri bu.” (G4).

“Her yere rahat gidemiyoruz. Çok kalabalıksa veya yüksek ses varsa nasıl tepki vereceğini düşünerek hareket ediyoruz.” (G9).

“Kendime ayırdığım zaman çok az. O uyuduğunda yapamadığım işleri tamamlıyorum. Gün bitiyor ama bakım işi bitmiyor.” (G11).

3.3. Aile, Sosyal Yaşam ve Hizmet Deneyimleri

Bakım sorumluluğunun aile içinde eşit olarak paylaşılmadığı ve özellikle annelerin bakım ve eğitim sürecinde daha fazla sorumluluk üstlendikleri görülmüştür. Araştırmaya katılan dokuz anneden yedisi temel bakım sorumluluğunun büyük ölçüde kendilerinde olduğunu belirtmiştir. Sekiz ebeveyn çocuklarının davranışlarının çevredeki kişiler tarafından yanlış yorumlandığını, altı ebeveyn ise bu nedenle sosyal ortamlara katılımlarını sınırlandırdıklarını ifade etmiştir. Hizmetlere ilişkin değerlendirmelerde özel eğitim, ulaşım ve ek destek giderleri öne çıkmış yedi ebeveyn bu giderlerin aile bütçesini zorladığını belirtmiştir.

Tablo 5. Aile, Sosyal Yaşam ve Hizmet Deneyimlerine Yönelik Bulgular

Deneyim alanı	n	%
Bakım sorumluluğunun ağırlıklı olarak annede olması*	7	77,8
Çocuğun davranışlarının çevre tarafından yanlış yorumlanması	8	66,7
Sosyal ortamlardan geri çekilme/sınırlama	6	50,0
Eğitim ve bakım giderlerinin ekonomik yük oluşturmaları	7	58,3

Not:Yüzde dokuz anne üzerinden hesaplanmıştır.

“Dışarıdan bakınca çocuk bağırtıyor diye hemen anne babaya bakıyorlar. Otizm olduğunu bilmiyorlar. Bir süre sonra açıklama yapmaktan yoruluyorsunuz.” (G1).

“Eşim destek oluyor ama eğitim, okul, randevular daha çok benim üzerimde. Çocuğun bütün programını ben takip ediyorum.” (G5).

“Özel eğitim bizim için çok önemli ama verilen süre yeterli gelmiyor. Daha fazlasını istediğinizde ekonomik olarak aileyi zorluyor.” (G10).

3.4. Başa Çıkma Deneyimleri ve Gelecek Kaygıları

Ebeveynlerin bakım sürecinde en fazla eşlerinden, yakın aile üyelerinden ve benzer deneyimleri yaşayan diğer ebeveynlerden destek aldıkları belirlenmiştir. Sekiz ebeveyn eş veya yakın aile desteğini temel destek kaynağı olarak belirtirken, beş ebeveyn benzer deneyimleri yaşayan ebeveynlerle iletişim kurmanın kendilerine yardımcı olduğunu ifade etmiştir. Bununla birlikte ebeveynlerin önemli bir bölümünün çocuklarının geleceğine ilişkin kaygı yaşadığı görülmüştür. On ebeveyn çocuklarının yetişkinlik döneminde ne ölçüde bağımsız yaşayabileceği konusunda kaygı duyduğunu, sekiz ebeveyn ise kendilerinin

bakım veremeyeceği dönemde çocuklarının bakımını kimin üstleneceği konusunda endişe yaşadığını belirtmiştir.

Tablo 6. Başa Çıkma ve Gelecek Kaygılarına Yönelik Bulgular

Bulgular	n	%
Eş/yakın aile desteğini temel destek kaynağı görme	8	66,7
Benzer deneyime sahip ebeveynlerden destek alma	5	41,7
Çocuğun yetişkinlikte bağımsızlığına ilişkin kaygı	10	83,3
Ebeveyn sonrası bakım konusunda kaygı	8	66,7

“Şu an yanımdayım ve her şeyi yapabiliyorum. Ben yaşlandığımda ne olacak diye düşündüğüm zaman asıl kaygı orada başlıyor.” (G3).

“En büyük isteğim kendi ihtiyaçlarını mümkün olduğu kadar kendisinin karşılayabilmesi. Biz her zaman yanında olamayacağız.” (G6).

“Benim asıl korkum benden sonrası. Okulunu düşünüyorsunuz, geleceğini düşünüyorsunuz ama en sonunda soru hep aynı yere geliyor: Biz olmayınca ne olacak?” (G12).

4. Tartışma

Araştırmada OSB olan çocukların ebeveynlerinin bakım deneyimlerinin tanının alınmasıyla birlikte değişmeye başladığı görülmüştür. Ebeveynlerin %66,7'si tanı sürecini duygusal açıdan zorlayıcı olarak değerlendirirken %83,3'ü günlük yaşamını çocuğun bakım, eğitim ve rutinlerine göre yeniden düzenlediğini belirtmiştir.

Bu bulgu tanının ebeveyn açısından aile yaşamının yeniden düzenlendiği bir dönemin başlangıcını oluşturduğunu göstermektedir. Selimoğlu ve diğerleri (2013) ebeveynlerin tanılama süreci ve tanı sonrasında farklı deneyimler yaşadıklarını ortaya koymuştur. Köksal ve Erciyes (2021) de tanı öncesi ve sonrasında ailelerin sorunlarının farklılaştığını ve tanının kabul edilmesinin çocuğun gelişimine odaklanmayı kolaylaştırabildiğini belirlemiştir. Bu sonuçlar çalışmamızda ulaşılan sonuçlar göz önüne alınarak değerlendirildiğinde tanı sonrasında ebeveynlere doğru bilgi verilmesinin ve ailelerin uygun hizmetlere yönlendirilmesinin erken dönemde önemli olduğunu göstermektedir.

Bakım sürecinde en fazla öne çıkan güçlükler iletişim, davranış yönetimi, duygusal hassasiyetler ve sürekli gözetim gereksinimidir. Katılımcıların %75'i çocuğun gereksinimlerini anlamakta zaman zaman zorlandığını, %58,3'ü davranışsal tepkilerin günlük yaşamını etkilediğini ve %66,7'si duygusal hassasiyetler nedeniyle belirli ortamları sınırlandırdığını ifade etmiştir. Ebeveynlerin %75'inin kendisine ayırdığı zamanı yetersiz bulması da bakımın ebeveynin günlük yaşamı üzerindeki etkisini göstermektedir. Karaca, Kılıç ve Sarı (2021) tarafından yapılan çalışmada da ebeveynlerin çocuklarının problem davranışları ile sınırlı iletişim ve etkileşim becerileri nedeniyle günlük yaşamda güçlük yaşadıkları belirlenmiştir. Aynı çalışmada eğitimle birlikte iletişim becerilerindeki gelişmenin ve problem davranışlardaki azalmanın ebeveynlerin yaşadığı güçlükleri azaltabildiği açıklanmaktadır. Bu bulgular, çocuğa sunulan nitelikli eğitim ve destek hizmetlerinin aynı zamanda ebeveynin bakım sürecini kolaylaştırabilecek bir işlev taşıdığını göstermektedir.

Araştırmada bakım sorumluluğunun aile içinde eşit dağılmadığı ve özellikle annelerde yoğunlaştığı görülmüştür. Dokuz annenin yedisi temel bakım sorumluluğunun büyük ölçüde kendisinde olduğunu belirtmiştir. Bunun yanında ebeveynlerin %66,7'si çocuklarının davranışlarının çevre tarafından yanlış yorumlandığını, yarısı ise sosyal ortamlardan geri çekildiğini veya sosyal katılımını sınırlandırdığını ifade etmiştir. Özkubat ve diğerleri (2014) de OSB olan bir çocuğa sahip olmanın ebeveynlerin günlük etkinliklerini ve sosyal yaşamlarını etkilediğini, sosyal ilişkilerin ve yakın aile ziyaretlerinin azaldığını açıklamıştır. Köksal ve Erciyes'in (2021) çalışmasında da ebeveynlerin toplumun olumsuz bakışlarından etkilendikleri ve bu nedenle sosyal çevreden uzaklaşabildikleri görülmüştür. Bu sonuçlar ebeveynlerin sosyal yaşamında yaşanan sınırlılıkların yalnızca bakım için ayrılan zamanla ilişkili olmadığını, toplumun OSB'ye yönelik bilgi ve tutumlarının da bu süreçte etkili olduğunu göstermektedir.

Hizmetlere ilişkin deneyimlerde özel eğitim ve bakım giderlerinin ekonomik yükü belirginleşmiştir. Katılımcıların %58,3'ü eğitim ve bakım giderlerinin aile bütçesini zorladığını ifade etmiştir. Köksal ve Erciyes

(2021), ailelerin özel eğitim olanaklarını yetersiz bulduklarını ve ekonomik gücü bulunan ebeveynlerin ek eğitim hizmetlerine kendi olanaklarıyla yöneldiklerini açıklamıştır. Özkubat ve diğerleri (2014) de ailelerin eğitim ve maddi gereksinimleri bakımından yeterli desteği alamadıklarını belirlemiştir. Mevcut araştırmanın sonuçları bu bulgularla uyumludur. Eğitim ve destek hizmetlerinin ailelerin ekonomik olanaklarına bağlı hâle gelmesi, hizmetlere erişimde eşitsizlik oluşturabilecek önemli bir sorun alanıdır.

Ebeveynlerin başa çıkma sürecinde aile ve yakın çevre desteğinin önemli olduğu belirlenmiştir. Katılımcıların %66,7'si eş veya yakın aile desteğini temel destek kaynağı olarak tanımlarken %41,7'si benzer deneyimleri yaşayan ebeveynlerle iletişim kurmanın kendilerine destek sağladığını belirtmiştir. Özkubat ve diğerleri (2014) tarafından sosyal desteğin OSB olan çocukların ebeveynleri açısından önemli bir gereksinim olarak belirlenmesi mevcut bulguyla uyumludur. Yavuz ve Gümüşkaya (2021) tarafından aile yılmazlığı ile yaşam doyumu arasında pozitif ilişki belirlenmiş olması da ailelerin sahip olduğu destek ve başa çıkma kaynaklarının önemini desteklemektedir.

Araştırmada en belirgin uzun dönemli sorunlardan biri geleceğe ilişkin kaygılardır. Ebeveynlerin %83,3'ü çocuklarının yetişkinlik dönemindeki bağımsızlığı, %66,7'si ise kendilerinden sonra bakımın kim tarafından sürdürüleceği konusunda kaygı yaşadığını belirtmiştir. Özkubat ve diğerleri (2014) de ebeveynlerin çocuklarının ve kendilerinin geleceğine ilişkin çeşitli kaygılar taşıdıklarını ortaya koymuştur. Geleceğe ilişkin kaygının bu kadar belirgin olması, ailelerin gereksinimlerinin çocukluk dönemindeki eğitim ve bakım hizmetleriyle sınırlı olmadığını göstermektedir. OSB olan bireylerin yetişkinlik dönemine geçişi, bağımsız yaşam becerileri, istihdam olanakları ve ebeveynlerin bakım veremeyeceği döneme ilişkin hizmetlerin önceden planlanması gerekmektedir.

Genel olarak araştırma bulguları OSB olan bir çocuğa bakım verme sürecinin ebeveynlerin günlük yaşamını, aile ve sosyal ilişkilerini, ekonomik koşullarını ve geleceğe ilişkin düşüncelerini etkilediğini göstermektedir. Literatürde bildirilen sonuçlarla mevcut araştırmanın bulguları büyük ölçüde paralellik göstermektedir. Ailelerin gereksinimlerinin yalnızca çocuğun eğitim ve tedavisi üzerinden değerlendirilmemesi ebeveynlerin psikososyal destek, sosyal katılım, ekonomik destek ve uzun dönemli bakım planlaması gereksinimlerinin de hizmet sürecine dahil edilmesi önemli değerlendirilmektedir.

5. Sonuç ve Öneriler

Bu araştırmada OSB olan çocukların ebeveynlerinin bakım deneyimlerinin bireysel, ailevi, sosyal ve ekonomik boyutları bulunan çok yönlü bir süreç olduğu belirlenmiştir. Tanı sonrasında günlük yaşamın çocuğun gereksinimlerine göre yeniden düzenlendiği ve iletişim ve davranış sorunları, duygusal hassasiyetler ve sürekli gözetim gereksiniminin bakım sürecini güçleştirdiği görülmüştür. Bakım sorumluluğunun özellikle annelerde yoğunlaşması, sosyal çevrenin olumsuz tutumları ve eğitim ile bakım giderleri ebeveynlerin yaşadığı diğer güçlüklerdir. Eş ve yakın aile desteği ile benzer deneyime sahip ebeveynlerle kurulan ilişkiler ise önemli destek kaynakları olarak öne çıkmıştır.

Araştırmanın dikkat çeken sonuçlarından biri ebeveynlerin çocuklarının geleceğine ilişkin kaygıdır. Çocuğun yetişkinlik dönemindeki bağımsızlığı ve ebeveynlerin bakım veremeyeceği dönemde bakımın nasıl sürdürüleceği başlıca kaygı alanlarıdır. Bu nedenle OSB olan bireylere ve ailelerine sunulan hizmetlerin çocukluk dönemiyle sınırlı kalmaması, yetişkinlik dönemini de kapsayacak biçimde planlanması gerekmektedir.

Araştırma sonuçları doğrultusunda ailelere tanı sonrasında düzenli bilgilendirme ve psikososyal destek sağlanması, ebeveyn destek gruplarının yaygınlaştırılması ve bakım verenlerin yükünü azaltacak destek hizmetlerinin geliştirilmesi önerilmektedir. Özel eğitim hizmetlerine erişimin güçlendirilmesi ve sağlık, eğitim ve sosyal hizmet kuruluşları arasındaki iş birliğinin artırılması önemlidir. Ayrıca OSB olan bireylerin bağımsız yaşam becerilerini destekleyen programların, mesleki eğitim ve destekli istihdam olanaklarının ve ebeveyn sonrası döneme yönelik uzun süreli bakım modellerinin geliştirilmesi gerekmektedir.

Declarations

Informed Consent. Informed consent was obtained from all participants prior to the interviews.

Conflict of Interest. The author declares no conflict of interest.

Ethics Approval. Ethical approval for the study was obtained from the Kırıkkale University Social and Human Sciences Research Ethics Committee by the decision dated April 5, 2025.

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Author Contributions. The author was responsible for the conceptualization, methodology, data collection, analysis and interpretation, preparation of the original draft, and review and editing of the manuscript.

References

- Althoff, C. E., Dammann, C. P., Hope, S. J., & Ausderau, K. K. (2019). Parent-mediated interventions for children with autism spectrum disorder: A systematic review. *American Journal of Occupational Therapy*, 73(3), 377-390.
- Crane, L., Lui, L. M., Davies, J., & Pellicano, E. (2021). Autistic parents' views and experiences of talking about autism with their autistic children. *Autism*, 25(4), 1161-1167.
- Green, J., Charman, T., McConachie, H., Aldred, C., Slonims, V., Howlin, P., ... Pickles, A. (2010). Parent-mediated communication-focused treatment in children with autism (PACT): A randomised controlled trial. *The Lancet*, 375(9732), 2152-2160.
- Güller, B., & Yaylacı, F. (2022). Otizm spektrum bozukluğu tanılı çocukların ebeveynlerinde yaşam kalitesi, kaygı, depresyon düzeyleri ve ilişkili faktörler. *Journal of Uludağ University Medical Faculty*, 48(2), 217-224. doi:10.32708/uutfd.1124107
- Karaca, M. A., Kılıç, K., & Sarı, H. (2021). Ebeveynlerin otizmli çocuklarıyla ilgili günlük yaşam sürecinde karşılaştıkları güçlüklerin incelenmesi. *Turkish Special Education Journal: International*, 3(2), 1-26.
- Köksal, M., & Erciyes, J. C. (2021). Otizm tanısı almış çocukların ailelerinde görülen psiko-sosyal sorunların değerlendirmesi. *Aydın Sağlık Dergisi*, 7(3), 235-254.
- Oğuz, H., & Sönmez, N. (2018). Otizmli çocuğa sahip ailelerde anne-çocuk ve baba-çocuk etkileşiminin incelenmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 19(1), 55-77. doi:10.21565/ozegitimdergisi.300013
- Oono, I. P., Honey, E. J., & McConachie, H. (2013). Parent-mediated early intervention for young children with autism spectrum disorders (ASD). *Evidence-Based Child Health: A Cochrane Review Journal*, 8(6), 2380-2479.
- Özkubat, U., Özdemir, S., Selimoğlu, Ö. G., & Töret, G. (2014). Otizme yolculuk: Otizmli çocuğa sahip ebeveynlerin sosyal destek algılarına ilişkin görüşleri. *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi*, 33(1), 323-348. doi:10.7822/egt210
- Selimoğlu, Ö. G., Özdemir, S., Töret, G., & Özkubat, U. (2013). Otizmli çocuğa sahip ebeveynlerin otizm tanılama sürecinde ve tanı sonrasında yaşadıkları deneyimlerine ilişkin görüşlerinin incelenmesi. *International Journal of Early Childhood Special Education*, 5(2), 129-161. doi:10.20489/intjces.107930
- Töret, G., Özdemir, S., Gürel Selimoğlu, Ö., & Özkubat, U. (2014). Otizmli çocuğa sahip olan ebeveynlerin görüşleri: Otizm tanımlamaları ve otizmin nedenleri. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 15(1), 1-17. doi:10.1501/Ozlegt_0000000189

Usta, M. B., Duman Kurt, A., Gülşen, H., & Karabekiroğlu, K. (2020). Otizm spektrum bozukluğunun nedenlerine ait ebeveyn algısının tedavi tercihine etkisi. *Namık Kemal Tıp Dergisi*, 8(2), 177-185. doi:10.37696/nkmj.729140

Yavuz, M., & Gümüşkaya, Ö. (2021). Otizm spektrum bozukluğu ve zihinsel yetersizliği olan bireylerin ebeveynlerinin yaşam doyumu ve aile yılmazlık düzeylerinin incelenmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 22(4), 799-825. doi:10.21565/ozelegitimdergisi.726030

Yılmaz, M., & Atalar, U. (2021). Otizmlili kardeşe sahip çocukların yapısal aile terapisi bağlamında değerlendirilmesi. *İnsan ve Toplum Bilimleri Araştırmaları Dergisi*, 10(1), 590-604. doi:10.15869/itobiad.804088



REVIEW ARTICLE



Artificial Intelligence-Supported Predictive Maintenance in Industrial Systems: Methods Applications and Limitations

Yapay Zekâ Destekli Kestirimci Bakımın Endüstriyel Sistemlerde Kullanımı: Yöntemler, Uygulamalar ve Sınırlılıklar

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ABSTRACT

Maintaining equipment reliability, reducing unplanned downtime, and controlling maintenance costs are essential for production continuity in industrial systems. Predictive maintenance uses equipment condition data to identify maintenance requirements before failures occur. Advances in sensor technologies, the Internet of Things, and industrial data acquisition systems have enabled continuous monitoring and the application of machine learning and deep learning methods. This review examines artificial intelligence-supported predictive maintenance in terms of methods, industrial applications, and limitations. Support vector machines, Random Forest, decision trees, k-nearest neighbors, XGBoost, and artificial neural networks are widely used for fault detection, condition classification, and remaining useful life estimation. CNN and LSTM models are prominent in analyzing high-dimensional and time-dependent sensor data. Applications in manufacturing, automotive, mining, and facility management have reported favorable outcomes. Major limitations include data quality, insufficient labeled failure data, explainability, computational requirements, model generalizability, and system integration. Long-term industrial validation and adaptable models remain research priorities.

ÖZET

Endüstriyel sistemlerde ekipman güvenilirliğinin korunması, plansız duruşların azaltılması ve bakım maliyetlerinin kontrol edilmesi üretim sürekliliği açısından önem taşımaktadır. Kestirimci bakım ekipmanının mevcut durumuna ilişkin verileri kullanarak arıza oluşmadan önce bakım gereksiniminin belirlenmesini amaçlamaktadır. Sensör teknolojileri, Nesnelerin İnterneti ve endüstriyel veri toplama sistemlerindeki gelişmeler, ekipmanlardan sürekli veri alınmasını sağlamış, makine öğrenmesi ve derin öğrenme yöntemleri bu verilerin analizinde kullanılmaya başlanmıştır. Bu derlemede yapay zekâ destekli kestirimci bakım sistemleri kullanılan yöntemler, endüstriyel uygulamalar ve uygulamada karşılaşılan sınırlılıklar açısından incelenmiştir. Literatürde destek vektör makineleri, Random Forest, karar ağaçları, k-en yakın komşu, XGBoost ve yapay sinir ağlarının arıza tespiti, durum sınıflandırması ve kalan yararlı ömür tahmininde kullanıldığı görülmektedir. CNN ve LSTM gibi derin öğrenme modelleri yüksek boyutlu ve zamana bağlı sensör verilerinin analizinde öne çıkmaktadır. Üretim, otomotiv, madencilik ve tesis yönetimi uygulamalarında bakım planlaması, ekipman kullanılabilirliği ve maliyetler açısından olumlu sonuçlar bildirilmiştir. Veri kalitesi, etiketli arıza verisinin yetersizliği, açıklanabilirlik, hesaplama gereksinimi, model genellenebilirliği ve mevcut sistemlerle entegrasyon başlıca sınırlılıklardır. Gerçek endüstriyel koşullarda uzun süreli doğrulama ve değişen çalışma koşullarına uyarlanabilir modeller alanın başlıca araştırma gereksinimleridir.

Anahtar Sözcükler: Kestirimci bakım, yapay zekâ, endüstriyel sistemler

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1. Introduction

Maintenance activities have a direct impact on the availability of industrial systems, continuity of production, and operating costs (Görgülü et al., 2024). An unplanned failure of a machine or piece of equipment does not merely create a need for repair; it may also result in production losses, delivery delays, quality problems, and additional labor costs (Ersöz et al., 2025). Calayır and Kabak (2021) noted that maintenance is not only a technical function in manufacturing organizations but also an activity that affects organizational revenues and expenditures. In their application in the defense industry, they addressed the costs associated with component losses and delivery delays resulting from unplanned maintenance.

The concept of industrial maintenance has evolved from corrective maintenance, in which intervention occurs after a failure, to preventive maintenance performed at predetermined intervals, and subsequently to predictive maintenance, which takes the actual operating condition of the equipment into account (Gürsey, 2026). In predictive maintenance, maintenance timing is determined not according to a fixed schedule but on the basis of measurements related to equipment condition and historical operating data (Dündar, Sarıçiçek, Çınar, & Yazıcı, 2021). Gürsoy, Büyükbaş, and Çakıroğlu (2019) similarly describe predictive maintenance in terms of monitoring equipment condition before failure, evaluating the resulting data through analytical methods, and estimating failure probability and equipment life.

Industry 4.0 has expanded the data infrastructure through which this approach can be implemented. Sensors, the Internet of Things (IoT), big data, and cloud computing technologies enable the continuous collection, storage, and analysis of machine data (Ceyhan and Kasapbaşı, 2022). Cardoso and Ferreira (2021) reported that the increasing volume of data obtained from industrial systems through sensors and IoT infrastructure supports predictive maintenance applications and that machine learning can be used to process these large datasets. Gürsoy et al. (2019) likewise identified the analytical processing of big data generated through IoT as one of the principal technological components of predictive maintenance.

The primary function of artificial intelligence in predictive maintenance is to identify patterns associated with failure and degradation in equipment operating data (Özel, 2026). Machine learning methods are used for problems such as fault detection, fault classification, condition monitoring, and remaining useful life (RUL) estimation. In their review of 83 studies published in 45 journals, Dündar et al. (2021) identified Random Forest, decision trees, artificial neural networks, support vector machines, k-nearest neighbors, linear regression, and deep learning algorithms as methods used in predictive maintenance applications. Similarly, the 123 studies reviewed by Arez, Navas, and Gaspar (2026) showed that Random Forest, support vector machines, decision trees, and k-nearest neighbors are frequently used for failure prediction, fault detection, and RUL estimation.

Recent developments in predictive maintenance are not limited to new prediction algorithms. Ucar, Karakose, and Kırımça (2024) conceptualize AI-supported predictive maintenance systems as integrated structures comprising sensors, data preprocessing, artificial intelligence algorithms, decision modules, communication and integration components, and user interfaces. Their study identifies IoT, digital twins, edge and cloud computing, and explainable artificial intelligence as emerging components of predictive maintenance. Bitam et al. (2025), in turn, reported that the AIoT approach, which integrates artificial intelligence with the Industrial Internet of Things, combines real-time monitoring, failure prediction, RUL estimation, and maintenance decisions within a single architecture.

The aim of this study is to examine the use of AI-supported predictive maintenance in industrial systems in terms of the methods employed, application areas, and technical limitations. Machine learning and deep learning methods, sensor and IoT infrastructures, outcomes of industrial applications, explainability, data-related problems, and next-generation maintenance architectures are evaluated in light of the existing literature.

2. AI-Supported Predictive Maintenance Methods

The first stage of AI-supported predictive maintenance is the acquisition of data representing the operating condition of the equipment. Parameters such as temperature, vibration, pressure, current, power consumption, oil condition, and wear provide information about the physical condition of equipment. Ucar et al. (2024) identified sensors as the primary data source in predictive maintenance systems and stated that raw sensor data should undergo cleaning, normalization, and missing-data processing before modeling. According to Bitam et al. (2025), operational variables such as temperature, vibration, and pressure obtained from distributed sensors in AIoT-based systems can be transmitted to artificial intelligence models in real time.

Data preprocessing is a stage that directly affects model performance. Sensor data may contain noise, missing observations, and variability arising from different operating conditions. Menteşe and Özkahraman (2026)

compared logistic regression, Random Forest, XGBoost, support vector machines, and multilayer perceptron models after preprocessing current, power, and operational signals obtained from a CNC milling machine. Model outputs were subsequently used in a risk-based threshold system designed to support maintenance decisions.

Supervised learning is one of the most widely used approaches in predictive maintenance. In this approach, historical observations are provided to the model together with known outputs such as normal operating conditions, failure type, or time to failure. Calayır and Kabak (2021) used linear regression, polynomial regression, and support vector machines to plan maintenance for a critical chemical painting machine in the defense industry and compared the models using root mean square error. The literature review by Dündar et al. (2021) likewise shows that support vector machines, Random Forest, artificial neural networks, linear regression, and k-NN are among the principal methods used in predictive maintenance studies.

The selection of conventional machine learning methods depends on the structure of the data and the prediction problem. Support vector machines can be used for complex classification problems, whereas Random Forest can be applied to both classification and regression tasks. Dündar et al. (2021) stated that Random Forest can be used particularly with datasets containing numerous variables, although model interpretation may become more difficult. The systematic review by Arez et al. (2026) also indicates that no single algorithm is superior across all predictive maintenance problems and that different algorithms are used for different tasks, including failure prediction, fault detection, and RUL estimation.

Unsupervised learning methods are used when labeled failure data are unavailable. Azeta et al. (2026) reported that methods such as K-Means, DBSCAN, and autoencoders can be used for anomaly detection without requiring labels. Although unsupervised methods reduce dependence on labeled failure data, false-positive results remain an important limitation. The same study showed that SVM, Random Forest, and artificial neural networks are used for fault classification and RUL estimation with labeled data, whereas CNN and LSTM models are used for sensor fusion and time-series analysis.

Deep learning methods are prominent in the analysis of high-dimensional sensor data and temporal patterns. CNN models are used to extract discriminative features from sensor signals, whereas LSTM models are used to model relationships among sequential measurements. Azeta et al. (2026) highlighted the use of CNN and LSTM models for processing complex sensor data and time series. Dündar et al. (2021) also reported an increase in the use of deep learning over time, with deep learning algorithms being employed in 68% of the studies they examined from 2020.

One of the principal outputs of predictive maintenance is RUL estimation. RUL refers to the estimated period during which equipment can continue to operate under acceptable operating conditions. Dündar et al. (2021) found that condition monitoring, fault diagnosis, and RUL estimation have been studied extensively in the literature, particularly for bearings, motors, and wind turbines. In the 94 automotive studies reviewed by Mahale, Kolhar, and More (2025), RUL estimation, health-condition monitoring, fault diagnosis, and maintenance scheduling were also among the primary application areas of AI-supported vehicle maintenance.

Translating model output into a maintenance decision constitutes the final stage of a predictive maintenance system. Menteşe and Özkahraman (2026) evaluated the probability of tool wear obtained through XGBoost within a threshold model that considered maintenance costs and the risk of production loss. Maintenance was recommended when the specified threshold was exceeded, whereas production was continued when the estimated probability remained below the threshold. This structure illustrates the use of an artificial intelligence model not merely as a failure-prediction tool but as a component of a decision system that supports maintenance planning.

AIoT architectures integrate sensor, communication, and artificial intelligence layers within a single system. Bitam et al. (2025) stated that condition-based maintenance, Prognostics and Health Management, and prescriptive maintenance approaches are considered together in AIoT-based predictive maintenance. Edge-cloud collaboration, federated learning, self-adaptive learning, and digital twins have been identified as core architectures of next-generation systems.

Edge computing reduces latency in real-time applications by enabling data to be processed close to the point at which they are generated. Cloud computing is used for greater computational capacity and long-term data storage. Ucar et al. (2024) stated that edge computing can be used for real-time analysis, whereas cloud computing can support big-data storage and the analysis of historical data. In the applications reviewed by Bitam et al. (2025), lightweight models were deployed at the edge while more complex predictive models were used in the cloud layer; improvements in latency, energy consumption, and bandwidth utilization were reported.

Digital twins constitute virtual representations of physical equipment that are updated with real-time data. Ucar et al. (2024) identified digital twins as a next-generation predictive maintenance technology for real-time equipment monitoring and the evaluation of alternative maintenance scenarios. In the applications reviewed by Bitam et al. (2025), Random Forest and XGBoost were used in CNC systems, autoencoder-LSTM architectures were used in winding machines, and edge-cloud-based digital twin architectures were applied to wind turbines.

3. Industrial Applications and Limitations

Manufacturing is the largest application area for AI-supported predictive maintenance. Arez et al. (2026) found that the manufacturing sector predominated in 123 studies covering the 2014-2024 period. The same review determined that a substantial proportion of the studies relied on standard datasets rather than real manufacturing environments. The review by Ucar et al. (2024) also indicates that AI-supported predictive maintenance is used not only in manufacturing but also in the automotive, energy, aerospace, and transportation sectors.

CNC machine tools constitute one of the concrete applications in manufacturing. Menteşe and Özkahraman (2026) analyzed sensor data obtained from a CMX 1100 V CNC milling machine using the XGBoost algorithm and developed a system that classified machining conditions and generated probability-based maintenance decisions. Current, power, and operational signals served as the data sources for maintenance decisions. Cardoso and Ferreira (2021) likewise demonstrated that machine learning can be applied to industrial data to improve equipment availability, reduce maintenance costs, and support operational decision-making.

The application in the defense industry demonstrates the relationship between maintenance planning and the production process. Calayır and Kabak (2021) focused on predicting maintenance timing for a critical chemical painting machine using supervised machine learning. The study was motivated by costly components becoming unusable and delivery delays resulting from unplanned maintenance. In this application, predictive maintenance was used primarily to determine maintenance timing in advance so as to reduce production losses rather than to diagnose faults.

In the automotive field, sensor data, maintenance history, and operational data obtained from vehicles constitute the primary inputs for artificial intelligence models. Mahale et al. (2025) reviewed 94 studies addressing applications of machine learning, deep learning, explainable artificial intelligence, and generative artificial intelligence. Fault diagnosis, RUL estimation, health-condition monitoring, and maintenance scheduling were identified as the principal application areas. Data quality, scalability, and the integration of artificial intelligence systems with existing vehicle infrastructure were identified among the main challenges in automotive applications.

Mining is another application area in which equipment operates under demanding conditions. Chambi et al. (2025) monitored temperature, pressure, oil-analysis, and wear data from underground mining equipment using IoT sensors and evaluated these data with machine learning models. In the application based on actual operational data, an 8% reduction in maintenance costs and a 10% increase in equipment availability were reported. Because these results relate to a specific field application, they should not be directly generalized to other industrial systems.

Facility management is another area in which AI-supported predictive maintenance is applied. Scaife (2024) reviewed the literature on artificial intelligence and predictive maintenance in facility operations and found that artificial intelligence contributes to data-driven maintenance and investment decisions. Insufficient data were identified as one of the most prominent barriers to the implementation of artificial intelligence in the reviewed literature. The same review included applications in building systems in which digital twins and machine learning were used to monitor equipment condition and support maintenance scheduling.

The impact of predictive maintenance is not limited to technical performance. Nagy, Figura, Valaskova, and Lăzăroiu (2025) examined the relationship between predictive maintenance and economic performance using data from 1,094 manufacturing firms. In the regression analysis, predictive maintenance remained a significant predictor of economic performance after firm size, legal form, and geographical scope were taken into account. This finding indicates that investments in predictive maintenance should be evaluated not only in terms of algorithmic accuracy but also in relation to organizational performance and cost structure.

One of the principal limitations of AI-supported predictive maintenance is data quality. A model requires a sufficient quantity of reliable data for learning. Because failures occur less frequently than normal operating

conditions, the number of labeled failure examples is often limited. Scaife (2024) identified insufficient data as a major barrier to the full implementation of artificial intelligence in the facility management literature. Ucar et al. (2024) likewise regarded data quality and quantity as fundamental requirements for model training and validation.

The limited availability of real-world field data also affects model generalizability. Arez et al. (2026) reported that a substantial proportion of the reviewed studies used standard datasets and that long-term real-world validation remained limited. Ucar et al. (2024) emphasized that AI-supported predictive maintenance systems should be tested across different equipment types, operating conditions, and levels of data quality. High accuracy on a controlled dataset does not imply that the same level of performance will be maintained under different load and environmental conditions.

Explainability represents another important challenge. Particularly for critical equipment, maintenance decisions produced by complex machine learning and deep learning models must be understandable to technical personnel. Ucar et al. (2024) identified methods such as SHAP and LIME as tools used to explain predictions generated by predictive maintenance models. Arez et al. (2026) found that the use of explainable artificial intelligence (XAI) remains limited in the existing predictive maintenance literature. Mahale et al. (2025) described explainable artificial intelligence as an emerging area of automotive predictive maintenance with respect to improving the interpretability of model outputs.

The computational requirements of deep learning models constitute an additional limitation in field applications. Azeta et al. (2026) reported that models such as CNN and LSTM can provide strong results with high-dimensional data, while high computational requirements and limited interpretability constrain their application. When edge devices have limited processor, memory, and energy capacity, model size becomes a direct consideration in system design.

Integration with existing industrial infrastructure also increases implementation costs. Ucar et al. (2024) stated that differences in data formats, communication methods, and protocols make the integration of artificial intelligence into existing systems more difficult. Modular designs, standard protocols, APIs, and edge/fog computing are among the approaches used to address this problem. Bitam et al. (2025) also identified infrastructure complexity, cybersecurity, data heterogeneity, and resource constraints as major implementation challenges in next-generation AIoT systems.

Federated learning and digital twin technologies are current research areas addressing some of these challenges. Federated learning allows data located at different facilities or machines to be used for joint model training without being transferred to a centralized data repository. In the federated-learning applications reviewed by Bitam et al. (2025), high classification performance was reported, while model orchestration, local computational load, and dependence on network quality were identified as limitations. Digital twins, in turn, enable condition monitoring, failure prediction, and maintenance planning to be conducted within the same system through continuous data exchange between physical equipment and its virtual model.

One emerging direction in AI-supported predictive maintenance is the transition from prediction to prescriptive maintenance. In prescriptive maintenance, the system does not merely estimate the probability or timing of failure; it also generates recommendations regarding the maintenance action to be implemented. Ucar et al. (2024) stated that prescriptive maintenance translates prediction results into specific maintenance actions. Bitam et al. (2025) likewise identified this approach as an emerging area of AIoT-supported maintenance systems.

The human operator remains an important component of the decision-making process in these systems. Azeta et al. (2026) described an AI-based maintenance architecture in which operators and engineers interpret model outputs, approve maintenance actions, and feed the results back into the system. Bitam et al. (2025) also identified human-centeredness, explainable artificial intelligence, and human involvement in the decision loop as components of next-generation maintenance systems within the context of Industry 5.0.

4. Conclusions and Recommendations

AI-supported predictive maintenance is based on the use of data obtained under actual equipment operating conditions for fault detection, condition monitoring, and remaining useful life estimation. Sensors and IoT infrastructure constitute the data-acquisition layer, machine learning and deep learning methods form the analytical layer, and decision-support systems translate predictions into maintenance applications. Whereas

intervention timing is predetermined in conventional periodic maintenance, predictive maintenance is based on the measured condition and degradation trend of the equipment.

The reviewed studies show that conventional machine learning and deep learning methods are used for different predictive maintenance problems. Random Forest, support vector machines, decision trees, and k-NN are particularly common in classification and fault-detection tasks. CNN and LSTM models are used with high-dimensional sensor data and time series. RUL estimation, fault diagnosis, and condition monitoring are among the most frequently addressed problems in the literature. While the review by Dündar et al. (2021), which also covered the Turkish literature, indicates a growing shift toward deep learning, the more recent systematic review by Arez et al. (2026) shows that conventional machine learning algorithms continue to retain their importance in predictive maintenance applications.

Industrial applications demonstrate that AI-supported predictive maintenance is not limited to experimental datasets. Applications include classification of machining conditions and maintenance decision-making in CNC machine tools, prediction of maintenance timing in the defense industry, vehicle health monitoring in the automotive sector, and real-time failure prediction in mining equipment. The field study by Chambi et al. (2025) reported an 8% reduction in maintenance costs and a 10% increase in equipment availability. The study by Nagy et al. (2025), which included 1,094 manufacturing firms, also showed that the use of predictive maintenance was associated with economic performance.

The principal challenges in implementation extend beyond algorithm selection. The availability of sufficient and reliable data, labeling of failure examples, maintenance of model performance under different operating conditions, adequacy of computational resources, and integration with existing production systems must be considered together. Limited real-world field data and dependence on standard datasets make it difficult to evaluate model generalizability. Explainability is particularly important for safety- and cost-critical equipment because maintenance personnel must be able to assess and trust AI-generated outputs.

AIoT, edge-cloud computing, federated learning, and digital twins represent current directions in predictive maintenance. These technologies are moving data acquisition, analysis, and decision-making toward distributed and real-time architectures. Bitam et al. (2025) identified explainability, data quality, resource constraints, cybersecurity, and human-AI collaboration as key issues that remain to be addressed in next-generation predictive maintenance research. Ucar et al. (2024) likewise identified real-world validation, trustworthy artificial intelligence, digital twins, and human-machine interaction as major areas for future research.

Future studies should not focus solely on developing models with higher predictive accuracy. Models should be tested over extended periods in real production environments, their transferability across different equipment and operating conditions should be established, computational costs should be reported, and predictions should be understandable to maintenance personnel. The industrial value of predictive maintenance depends less on the isolated performance of an artificial intelligence model than on the coordinated operation of the sensor infrastructure, data quality, model, decision mechanism, and maintenance process. When this integration is achieved, AI-supported predictive maintenance provides a viable engineering approach for reducing unplanned downtime and managing maintenance resources according to the actual condition of equipment.

Declarations

Ethics Approval. Ethics committee approval was not required for this study because it is a review article based exclusively on previously published literature and did not involve human participants, animals, or the collection of primary data.

Informed Consent. Not applicable.

Conflict of Interest. The author declares no conflict of interest.

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References

- Arez, D., Navas, H. V. G., & Gaspar, P. (2026). The bridge between artificial intelligence and predictive maintenance in Industry 4.0: A systematic review. *Applied Sciences*, 16(10), 4882. doi:10.3390/app16104882
- Azeta, J., Omeche, T. T., Daniyan, I., Abiola, J. O., Daniyan, L., Phuluwa, H. S., & Muvunzi, R. (2026). Artificial intelligence and robotics in predictive maintenance: A comprehensive review. *Frontiers in Mechanical Engineering*, 11, 1722114. doi:10.3389/fmech.2025.1722114
- Bitam, T., Yahiaoui, A., Boubiche, D. E., Martínez-Peláez, R., Toral-Cruz, H., & Velarde-Alvarado, P. (2025). Artificial intelligence of things for next-generation predictive maintenance. *Sensors*, 25(24), 7636. doi:10.3390/s25247636
- Calayır, G. N., & Kabak, M. (2021). Bakım için makine öğrenme tekniklerinin analizi ve bir uygulama. *Journal of Turkish Operations Management*, 5(1), 662-675.
- Cardoso, D., & Ferreira, L. (2021). Application of predictive maintenance concepts using artificial intelligence tools. *Applied Sciences*, 11(1), 18. doi:10.3390/app11010018
- Ceyhan, H., & Kasapbaşı, M. C. (2022). Üretim sistemlerinde makine öğrenmesi ile kestirimci bakım uygulaması ve modellemesi. *Avrupa Bilim ve Teknoloji Dergisi*, 33, 167-175. doi:10.31590/ejosat.1019210
- Chambi, N., Sanga, C., Ortiz, J., Sanga, A., Sanga, P., Manrique, R., & Lu-Chang-Say, J. (2025). Predictive maintenance in underground mining equipment using artificial intelligence. *Eng*, 6(10), 261. doi:10.3390/eng6100261
- Dündar, D. R., Sarıççek, İ., Çınar, E., & Yazıcı, A. (2021). Kestirimci bakımda makine öğrenmesi: Literatür araştırması. *Eskişehir Osmangazi Üniversitesi Mühendislik ve Mimarlık Fakültesi Dergisi*, 29(2), 256-276. doi:10.31796/ogummf.873963
- Ersöz, O. Ö., İfraz, M., Tebrizcik, S., İnal, A. F., Eskicioğlu, Ö. C., Aktepe, A., ... Ersöz, S. (2025). Makine öğrenmesi ile kestirimci bakım ve yedek parça yönetimi. *Politeknik Dergisi*, 28(5), 1327-1338.
- Görgülü, Ş., Koç, İ., Kırımça, N., Karaköse, M., & Özgen, M. T. (2024). Yapay zekâ kullanımıyla peron ayırıcı kapı sisteminin sağlığını izleme ve kestirimci bakım. *Akıllı Ulaşım Sistemleri ve Uygulamaları Dergisi*, 7(1), 56-70.
- Gürsev, S. (2026). Havacılık sektöründe yapay zekâ destekli dijital dönüşüm yol haritası. *Yönetim Bilişim Sistemleri Dergisi*, 12(1), 64-79.
- Mahale, Y., Kolhar, S., & More, A. S. (2025). A comprehensive review on artificial intelligence driven predictive maintenance in vehicles: Technologies, challenges and future research directions. *Discover Applied Sciences*, 7(4), 243. doi:10.1007/s42452-025-06681-3
- Menteşe, Y. B., & Özkahraman, M. (2026). Endüstriyel ekipmanlarda yapay zeka destekli ön kestirimci bakım stratejilerinin geliştirilmesi ve uygulanması. *Uludağ Üniversitesi Mühendislik Fakültesi Dergisi*, 31(2), 759-778. doi:10.17482/uumfd.1864880
- Nagy, M., Figura, M., Valaskova, K., & Lăzăroiu, G. (2025). Predictive maintenance algorithms, artificial intelligence digital twin technologies, and Internet of Robotic Things in big data-driven Industry 4.0 manufacturing systems. *Mathematics*, 13(6), 981. doi:10.3390/math13060981
- Ötleş, S. (2019). Endüstri için kestirimci bakım. *International Journal of 3D Printing Technologies and Digital Industry*, 3(1), 56-66.

Özel, E. (2026). Fırçalı DA motorlarda açık veri seti ile makine öğrenmesi tabanlı kestirimci bakım ve arıza teşhisi. *Black Sea Journal of Engineering and Science*, 9(5), 2454-2462. doi:10.34248/bsengineering.1990452

Scaife, A. D. (2024). Improve predictive maintenance through the application of artificial intelligence: A systematic review. *Results in Engineering*, 21, 101645. doi:10.1016/j.rineng.2023.101645

Ucar, A., Karakose, M., & Kırımça, N. (2024). Artificial intelligence for predictive maintenance applications: Key components, trustworthiness, and future trends. *Applied Sciences*, 14(2), 898. doi:10.3390/app14020898



RESEARCH ARTICLE



The Relationship Between Patient Safety Competence and Clinical Care Self-Efficacy in Nursing Students

Hemşirelik Öğrencilerinde Hasta Güvenliği Yetkinliği ile Klinik Bakım Öz-Yeterliliği Arasındaki İlişki

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ABSTRACT

This study aimed to examine the relationship between patient safety competence and clinical care self-efficacy among nursing students. This cross-sectional correlational study included 284 nursing students with clinical practice experience. Patient safety competence was assessed within the domains of knowledge, skills, and attitudes, while clinical care self-efficacy was evaluated on the basis of the perceived self-efficacy dimension of the Self-Efficacy for Clinical Evaluation Scale. Descriptive statistics, independent-samples t test, one-way analysis of variance, Pearson correlation analysis, and multiple linear regression analysis were used. The mean patient safety competence score was 4.06 ± 0.48 and the mean clinical care self-efficacy score was 3.74 ± 0.57 . A moderate positive correlation was found between the two variables ($r = .38$, $p < .001$). Students who had received patient safety education had higher scores for both variables. Clinical care self-efficacy also differed significantly according to year of study and duration of clinical practice experience. In the regression model, patient safety competence was the strongest predictor of clinical care self-efficacy ($\beta = .34$, $p < .001$). Stronger knowledge, skills, and attitudes regarding patient safety were associated with greater perceived self-efficacy in clinical care. Nursing curricula should strengthen practice-based educational strategies integrating patient safety and clinical care competence.

ÖZET

Bu çalışmada hemşirelik öğrencilerinin hasta güvenliği yetkinliği ile klinik bakım öz-yeterliliği arasındaki ilişki incelenmiştir. Kesitsel ve ilişkisel nitelikteki araştırma, klinik uygulama deneyimi bulunan 284 hemşirelik öğrencisiyle yürütülmüştür. Hasta güvenliği yetkinliği, bilgi, beceri ve tutum boyutlarını kapsayan Hasta Güvenliği Yetkinliği Öz Değerlendirme Aracı; klinik bakım öz-yeterliliği ise Klinik Değerlendirme için Öz-Yeterlilik Ölçeği'nin algılanan öz-yeterlilik boyutu kullanılarak değerlendirilmiştir. Verilerin analizinde tanımlayıcı istatistiklerin yanı sıra bağımsız örneklem t testi, tek yönlü varyans analizi, Pearson korelasyon analizi ve çoklu doğrusal regresyon analizi kullanılmıştır. Öğrencilerin hasta güvenliği yetkinliği puan ortalaması 4.06 ± 0.48 , klinik bakım öz-yeterliliği puan ortalaması 3.74 ± 0.57 'dir. İki değişken arasında pozitif yönde orta düzeyde anlamlı ilişki saptanmıştır ($r = 0.38$; $p < 0.001$). Hasta güvenliği eğitimi alan öğrencilerin her iki değişkene ilişkin puanları daha yüksek bulunmuştur. Klinik bakım öz-yeterliliği ayrıca sınıf düzeyi ve klinik uygulama deneyimine göre anlamlı farklılık göstermiştir. Regresyon analizinde hasta güvenliği yetkinliği klinik bakım öz-yeterliliğinin en güçlü yordayıcısıdır ($\beta = 0.34$; $p < 0.001$). Hasta güvenliğine ilişkin bilgi, beceri ve tutumların güçlenmesi, öğrencilerin klinik bakım uygulamalarını gerçekleştirebilme konusundaki öz-yeterlilik algılarıyla ilişkilidir. Hemşirelik eğitiminde hasta güvenliği ile klinik bakım yeterliliğini bütünleştiren uygulamalı eğitim yaklaşımlarının güçlendirilmesi önerilmektedir.

Anahtar Sözcükler: Hasta güvenliği, öz yeterlik, klinik bakım, hemşirelik öğrencileri

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1. Introduction

Patient safety is one of the basic elements that determine the quality of health care. Reducing preventable harm during care depends not only on the safety systems used by health institutions but also on the knowledge, skills and attitudes of health professionals who provide care. Nurses have a particular responsibility in this process because they continuously monitor patients, directly carry out a large part of care interventions and are expected to recognize changes in a patient's condition at an early stage. Competencies required for safe care therefore cannot be left until after graduation; they need to be developed during nursing education (Bianchi, Bressan, Cadorin, Pagnucci, Tolotti and Valcarenghi, 2016; Svitlica, Šajnović, Simin, Ivetić and Milutinović, 2021).

During clinical education, nursing students take part in many practices that directly concern safety, ranging from medication administration and infection prevention to patient identification and fall-risk assessment (Vaismoradi, Tella, Logan, Khakurel and Vizcaya-Moreno, 2020). Theoretical knowledge about these practices is necessary, but it is not enough by itself. Students also need to translate that knowledge into appropriate clinical behavior and to regard safety as a priority in care. For this reason, patient safety competence should be considered through its knowledge, skills and attitude components together (Glarcher and Vaismoradi, 2025). The Patient Safety Competency Self-Evaluation Tool for Nursing Students developed by Lee, Lee, Peters and Gwon (2020) follows this three-component approach. Its Turkish validity and reliability study was conducted by Eskici, Kanig, Ugur and Seren (2021).

When nursing students do not have an adequate level of patient safety competence, this may increase the risk of errors in clinical practice and may also make it more difficult for safe care behaviors to become part of professional practice (Mihdawi, Al-Amer, Darwish, Randall and Afaneh, 2020). Studies from different countries have reported areas in which students' patient safety competencies still need improvement. Huang, Shen, Chen, He, Huang and Li (2020) showed that patient safety competence among nursing students varied according to educational and clinical characteristics. Studies from Türkiye similarly indicate that patient safety competence remains an area that should be strengthened in nursing education (Fırat Kılıç and Cevheroğlu, 2023; Balat Çalbay and Özbay, 2025). In this respect, patient safety is better viewed as a competence extending across different stages of clinical education rather than as content confined to a single course.

Providing clinical care safely requires students not only to know what should be done but also to believe that they can carry out the relevant care behavior. Bandura (1997) defines self-efficacy as a person's belief in their capacity to perform the behaviors required for a particular task. For nursing students, this belief is closely related to whether knowledge and skills learned during education can be used in the clinical setting (Shorey and Lopez, 2021). Students with stronger self-efficacy may also be more willing to persist when they encounter difficult clinical situations rather than withdraw from practice (Xie, Zhu, Zhang, Jiang, Wang and Liu, 2024).

One instrument used to assess self-efficacy in clinical care is the Self-Efficacy for Clinical Evaluation Scale (SECS), developed by Clark, Owen and Tholcken (2004). The scale evaluates perceived self-efficacy in caring for people with chronic illnesses as well as the importance students attach to these care skills. Zengin, Pınar, Çil Akıncı and Yıldız (2014) examined its psychometric properties in Turkish nursing students and reported high internal consistency for the perceived self-efficacy dimension. In the same study, self-efficacy scores differed according to academic achievement, which is noteworthy in showing that clinical care self-efficacy is related to students' educational gains.

The importance of self-efficacy in clinical education is not limited to academic achievement. Students' anxiety in the clinical environment, their participation in care and the extent to which they see themselves as capable of performing clinical procedures are also related to this construct. Mutlu, Azak and Kalaycı (2020) reported that general self-efficacy decreased as clinical anxiety increased, whereas students who felt more comfortable in the clinical setting perceived themselves as more competent in practice. Similar relationships have been reported among practicing nurses. Abu Sharour, Bani Salameh, Suleiman, Subih, EL-hneiti, AL-Hussami, Al Dameery and Al Omari (2022) found a positive relationship between self-efficacy and nurse-patient interaction, while Bu, Ma, Zhai, Ma and Xu (2022) reported an association between self-efficacy and nurses' humanistic practice ability.

Patient safety competence and clinical care self-efficacy meet at this point. Safe care requires recognition of clinical risk, selection of an appropriate intervention, correct performance of that intervention and monitoring of its outcomes. Having the knowledge and skills to do these things is important, but so is the student's perception that they are capable of carrying them out. At the same time, high self-efficacy alone

cannot be taken to mean that care is safe. A student's confidence in their own ability needs to be considered together with their knowledge, skills and attitudes related to patient safety.

Although patient safety competence and clinical self-efficacy have each been examined in the literature, studies directly addressing the relationship between these two constructs in nursing students are limited. Examining this relationship may help clarify the extent to which students' perceptions of competence in clinical care vary together with their patient safety competence. This study therefore aimed to examine the relationship between patient safety competence and clinical care self-efficacy among nursing students. It also examined whether the two variables differed according to gender, year of study, receipt of patient safety education, witnessing a medical error and clinical practice experience, and investigated the variables predicting clinical care self-efficacy.

2. METHODS

2.1. Study Design

The study was conducted using a cross-sectional correlational design to examine the relationship between patient safety competence and clinical care self-efficacy among nursing students.

2.2. Study Group

The study group consisted of 284 second-, third- and fourth-year nursing students who had at least one clinical practice experience. The mean age of the students was 21.36 ± 1.42 years. First-year students were not included because they did not yet have sufficient clinical practice experience.

Table 1. Descriptive characteristics of the students

Characteristic	n	%
Gender		
Female	216	76.1
Male	68	23.9
Year of study		
Second year	92	32.4
Third year	97	34.2
Fourth year	95	33.4
Patient safety education		
Received	176	62.0
Not received	108	38.0
Witnessed a medical error		
Yes	120	42.3
No	164	57.7
Clinical practice experience		
≤1 year	147	51.8
>1 year	137	48.2

2.3. Data Collection Instruments

Data were obtained using a Personal Information Form, the Patient Safety Competency Self-Evaluation Tool and the Self-Efficacy for Clinical Evaluation Scale.

Personal Information Form. The form included questions on age, gender, year of study, receipt of patient safety education, witnessing a medical error and clinical practice experience.

Patient Safety Competency Self-Evaluation Tool (PSCSE). The instrument was developed by Lee, Lee, Peters and Gwon (2020) to assess patient safety competence among nursing students, and its Turkish validity and reliability study was carried out by Eskici, Kanig, Ugur and Seren (2021). It contains 41 items and evaluates patient safety competence in three dimensions: knowledge, skills and attitudes. The knowledge dimension contains 6 items, the skills dimension 21 items and the attitudes dimension 14 items. Items are rated on a five-point scale, with higher scores indicating greater patient safety competence in the relevant dimension. Items 38 and 39 are reverse scored. In the Turkish adaptation study, Cronbach's alpha for the total scale was reported as .94 (Eskici, Kanig, Ugur and Seren, 2021). Cronbach's alpha was .88 in the present study.

Self-Efficacy for Clinical Evaluation Scale (SECS). Developed by Clark, Owen and Tholcken (2004), the scale assesses students' perceived self-efficacy in caring for people with chronic illnesses and the importance they assign to these care skills. Its psychometric evaluation in Turkish was conducted by Zengin, Pınar, Çil Akıncı and Yıldız (2014). Thirty care behaviors are evaluated in two parallel dimensions, perceived self-efficacy and perceived importance. Both dimensions use a five-point Likert-type rating. In the Turkish adaptation study, Cronbach's alpha coefficients were .94 for perceived self-efficacy and .97 for perceived importance (Zengin, Pınar, Çil Akıncı and Yıldız, 2014). The perceived self-efficacy dimension was used in this study to assess clinical care self-efficacy. Cronbach's alpha for this dimension was .91 in the present sample.

2.4. Data Analysis

Descriptive statistics, independent-samples t test, one-way analysis of variance, Pearson correlation analysis and multiple linear regression analysis were used. Continuous variables were presented as mean and standard deviation, while categorical variables were reported as number and percentage. Internal consistency was assessed using Cronbach's alpha. When a significant difference was found across years of study, post-hoc analyses were used to identify the groups responsible for the difference. Multiple linear regression analysis was performed to determine the variables predicting clinical care self-efficacy. Statistical significance was set at $p < .05$.

3. Results

The mean patient safety competence score was 4.06 ± 0.48 , and the mean clinical care self-efficacy score was 3.74 ± 0.57 . Cronbach's alpha coefficients for the two measures were .88 and .91, respectively.

Table 2. Descriptive statistics for the main variables

Variable	Mean	SD	Cronbach α
Patient safety competence	4.06	0.48	.88
Clinical care self-efficacy	3.74	0.57	.91

Patient safety competence and clinical care self-efficacy scores did not differ by gender ($p > .05$). Patient safety competence did not differ significantly by year of study ($p = .243$), whereas clinical care self-efficacy did ($p = .001$). Post-hoc comparisons showed that fourth-year students had higher clinical care self-efficacy scores than second-year students.

Students who had received patient safety education had higher patient safety competence ($p = .002$) and clinical care self-efficacy ($p = .001$) scores than those who had not. Neither variable differed significantly according to whether students had witnessed a medical error ($p > .05$). Students with more than one year of clinical practice experience had higher clinical care self-efficacy scores ($p = .002$), while patient safety competence did not differ by length of clinical experience ($p = .169$).

Table 3. Comparison of scale scores according to student characteristics

Variable	Patient safety competence Mean $\pm$ SD	Test; p	Clinical care self-efficacy Mean $\pm$ SD	Test; p
Gender				
Female	4.08 $\pm$ 0.46	t = 1.21; p = .227	3.76 $\pm$ 0.56	t = 1.08; p = .281
Male	4.00 $\pm$ 0.52		3.67 $\pm$ 0.59	
Year of study				
Second year	4.01 $\pm$ 0.49	F = 1.42; p = .243	3.61 $\pm$ 0.58	F = 6.74; p = .001
Third year	4.05 $\pm$ 0.47		3.73 $\pm$ 0.55	
Fourth year	4.12 $\pm$ 0.47		3.88 $\pm$ 0.54	
Patient safety education				
Received	4.13 $\pm$ 0.44	t = 3.08; p = .002	3.83 $\pm$ 0.54	t = 3.39; p = .001
Not received	3.95 $\pm$ 0.51		3.60 $\pm$ 0.59	
Witnessed a medical error				
Yes	4.10 $\pm$ 0.47	t = 1.31; p = .191	3.80 $\pm$ 0.56	t = 1.57; p = .118
No	4.02 $\pm$ 0.48		3.69 $\pm$ 0.58	
Clinical practice experience				
$\leq$ 1 year	4.02 $\pm$ 0.49	t = 1.38; p = .169	3.64 $\pm$ 0.58	t = 3.06; p = .002
>1 year	4.10 $\pm$ 0.46		3.85 $\pm$ 0.54	

A moderate, positive and statistically significant relationship was found between patient safety competence and clinical care self-efficacy ($r = .38$, $p < .001$).

Table 4. Relationship between patient safety competence and clinical care self-efficacy

Variable	1	2
1. Patient safety competence	1	
2. Clinical care self-efficacy	.38***	1

*** $p < .001$.

The multiple linear regression model was statistically significant and the variables entered into the model explained 20% of the total variance in clinical care self-efficacy ($R^2 = .20$, adjusted $R^2 = .19$, $F = 13.90$, $p < .001$). Patient safety competence was the strongest predictor of clinical care self-efficacy ($\beta = .34$, $p < .001$). Receiving patient safety education ($\beta = .14$, $p = .013$) and year of study ($\beta = .16$, $p = .005$) also made significant contributions to the model. The independent effects of gender ($\beta = .05$, $p = .357$) and witnessing a medical error ($\beta = .07$, $p = .196$) were not significant.

Table 5. Multiple linear regression analysis of predictors of clinical care self-efficacy

Variable	B	SE	β	p
Patient safety competence	.40	.06	.34	< .001
Patient safety education	.16	.06	.14	.013
Year of study	.11	.04	.16	.005
Gender	.06	.07	.05	.357
Witnessing a medical error	.08	.06	.07	.196

$R^2 = .20$; Adjusted $R^2 = .19$; $F = 13.90$; $p < .001$.

4. Discussion

A moderate positive relationship was found between patient safety competence and clinical care self-efficacy among nursing students. Patient safety competence was also the strongest predictor of clinical care self-efficacy in the regression model, indicating that the two constructs are closely related within clinical education. Students with better developed knowledge, skills and attitudes required for safe care also tended to view themselves as more capable of performing clinical care behaviors. Because the study was cross-sectional, however, the direction of this relationship and any causal interpretation cannot be established.

Although the patient safety competence scores can be considered relatively high, there is still room for improvement among students. Huang, Shen, Chen, He, Huang and Li (2020), in a multicenter study of nursing students, reported that patient safety competence was related to educational and clinical characteristics. Findings reported by Fırat Kılıç and Cevheroğlu (2023) in Türkiye likewise suggest that patient safety competence should continue to be developed throughout nursing education. Balat Çalbay and Özbay (2025), meanwhile, found a moderate level of patient safety competence among nursing and midwifery students. Despite differences in samples and educational settings, these studies point in a similar direction: patient safety cannot be addressed adequately at the level of theoretical knowledge alone.

The higher competence scores among students who had received patient safety education were therefore not unexpected. Patient safety education provides the conceptual basis students need to recognize risks, understand principles of safe practice and develop behaviors aimed at preventing errors. Translating this knowledge into practice, however, also requires skills and attitudes to be addressed during education. The approach adopted by Lee, Lee, Peters and Gwon (2020), which evaluates patient safety competence through knowledge, skills and attitudes, reflects this multidimensional structure. Bianchi, Bressan, Cadorin, Pagnucci, Tolotti and Valcarengi (2016) also emphasize the need for patient safety competencies to be addressed through clearly defined learning outcomes in undergraduate nursing education.

The mean clinical care self-efficacy score was 3.74 ± 0.57 . In their evaluation of the SECS among Turkish nursing students, Zengin, Pınar, Çil Akıncı and Yıldız (2014) reported high internal consistency for the perceived self-efficacy dimension and found that scores varied according to academic achievement. An important point here is that the self-efficacy measured by this scale is different from a general feeling of confidence. It concerns students' perceptions of their ability to perform specific clinical care behaviors. In the present study, self-efficacy was therefore considered specifically within the context of clinical care.

Clinical care self-efficacy differed by year of study, with fourth-year students scoring higher than second-year students. Students with more than one year of clinical practice experience also had higher self-efficacy scores. As clinical education progresses, students encounter care practices more often, take on greater responsibility and gain repeated experience in similar clinical situations. Bandura's (1997) account of direct mastery experiences as a major source of self-efficacy provides a theoretical explanation for this finding.

The results reported by Mutlu, Azak and Kalaycı (2020) also draw attention to the quality of clinical experience. They found that general self-efficacy decreased as students' clinical anxiety increased, while students who perceived themselves as competent in practice felt more comfortable in the clinical setting. Their finding that students were particularly concerned about harming patients through incorrect practice is also relevant. Clinical experience should therefore not be judged only by the number of procedures a student has performed. Supervised practice, appropriate feedback and successful care experiences may be important in shaping how students judge their own competence.

Students who had received patient safety education also had higher clinical care self-efficacy scores, suggesting that safety education should not be considered separately from clinical practice. Knowing the ways in which a patient may be at risk, identifying which finding requires priority and selecting an appropriate care behavior may reduce uncertainty in clinical situations. Understanding what to do, why it should be done and under what conditions may also influence a student's confidence in carrying out care. Still, the cross-sectional data do not show that patient safety education directly increases self-efficacy. The possible contributions of year of study, clinical experience and other educational characteristics should not be overlooked.

The relationship between self-efficacy and clinical practice has also been observed in studies of practicing nurses. Abu Sharour, Bani Salameh, Suleiman, Subih, EL-hneiti, AL-Hussami, Al Dameery and Al Omari (2022) reported a positive relationship between self-efficacy and nurse-patient interaction. In the study by Bu, Ma, Zhai, Ma and Xu (2022), self-efficacy was associated with nurses' humanistic practice ability. Although the populations in these studies differ from the present sample, their findings support the view that self-efficacy is linked to behaviors relevant to clinical care.

No differences in patient safety competence or clinical care self-efficacy were found according to gender. In contrast, differences emerged for variables related to education and clinical experience, suggesting that the competencies examined here may be more closely connected with students' educational experiences. It is also noteworthy that simply witnessing a medical error was not associated with a significant difference. Seeing an error does not necessarily result in learning. The educational value of such an experience may depend on whether the causes of the event are discussed, human and system factors are considered, reporting procedures are explained and the student receives feedback.

The variables included in the regression model explained 20% of the variance in clinical care self-efficacy. A substantial proportion of self-efficacy is therefore likely to be related to factors not included in this study. Clinical anxiety, academic achievement, support from instructors and clinical nurses, simulation experience, the clinical learning environment, and previous successful or unsuccessful practice experiences may all have a role. Examining clinical care self-efficacy together with these variables in future studies may provide a clearer understanding of the conditions under which students' perceptions of competence develop.

From an educational perspective, the findings indicate that patient safety and clinical care self-efficacy should not be treated as two unrelated learning outcomes. It is important for students to believe that they can perform a care intervention, but performing the same intervention in accordance with patient safety principles is an inseparable part of professional competence. Simulation, clinical scenarios, case discussions and error analysis may therefore be useful when designed to develop both safety knowledge and practical experience. Feedback following clinical practice may also be more useful when it addresses not only whether a procedure was performed correctly, but also the student's decision-making process and the safety reasoning behind it.

5. Conclusion and Recommendations

Clinical care self-efficacy increased as patient safety competence increased among nursing students, and patient safety competence was the strongest predictor of clinical care self-efficacy. Students who had received patient safety education had higher scores for both safety competence and clinical care self-efficacy. Clinical care self-efficacy was also higher among students in more advanced years of study and among those with longer clinical practice experience.

In nursing education, patient safety should be addressed together with care practice rather than taught as theoretical content separate from clinical work. Simulation exercises, clinical case discussions, safe medication practices, review of errors and near-miss events, and regular feedback after practice can be used for this purpose. Students should be supported in gaining safe practice experience through gradually increasing clinical responsibility. Early identification of students with low clinical care self-efficacy may also allow clinical education to be supported according to individual needs.

Future studies may examine the relationship between patient safety competence and clinical care self-efficacy together with variables such as academic achievement, clinical anxiety, simulation experience, instructor support and the clinical learning environment. Combining self-report measures with observational indicators of clinical performance may also help clarify the relationship between students' perceived competence and their actual clinical performance.

Declarations

Ethics Approval. Ethical approval for the study was obtained from the Erciyes University Social and Human Sciences Ethics Committee on July 3, 2025.

Informed Consent. Informed consent was obtained from all participants prior to their participation in the study.

Conflict of Interest. The author declares no conflict of interest.

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Data Availability. The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions. The author was responsible for the conceptualization and design of the study, data analysis and interpretation, preparation of the original draft, and review and editing of the manuscript. The author read and approved the final version of the manuscript.

References

- Abu Sharour, L., Bani Salameh, A., Suleiman, K., Subih, M., EL-hneiti, M., AL-Hussami, M., Al Dameery, K., and Al Omari, O. (2022). Nurses' self-efficacy, confidence and interaction with patients with COVID-19: A cross-sectional study. *Disaster Medicine and Public Health Preparedness*, 16, 1393–1397. doi:10.1017/dmp.2021.1
- Balat Çalbay, R., and Özbay, H. (2025). Hemşirelik ve ebelik öğrencilerinin hasta güvenliği yetkinliğine ilişkin öz-değerlendirme düzeyleri ile tıbbi hataya yönelik tutumları arasındaki ilişki. *Artuklu Health*, 13, 37–46. doi:10.58252/artukluhealth.1747403
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman.
- Bianchi, M., Bressan, V., Cadorin, L., Pagnucci, N., Tolotti, A., and Valcarengi, D. (2016). Patient safety competencies in undergraduate nursing students: A rapid evidence assessment. *Journal of Advanced Nursing*, 72(12), 2966–2979. doi:10.1111/jan.13033
- Bu, M., Ma, H., Zhai, H., Ma, Y., and Xu, N. (2022). Role of self-efficacy in nursing organizational climate: A way to develop nurses' humanistic practice ability. *Journal of Nursing Management*, 30(7), 2107–2115. doi:10.1111/jonm.13516
- Caruso, R., Pittella, F., Zaghini, F., Fida, R., and Sili, A. (2016). Development and validation of the nursing profession self-efficacy scale. *International Nursing Review*, 63(3), 455–464.
- Clark, M. C., Owen, S. V., and Tholcken, M. A. (2004). Measuring student perceptions of clinical competence. *Journal of Nursing Education*, 43, 548–554.
- Eskici, G. T., Kanig, M., Ugur, E., and Seren, A. K. H. (2021). The Turkish version of the patient safety competency self-evaluation tool: A validity and reliability study. *Nurse Education in Practice*, 103229. doi:10.1016/j.nepr.2021.103229
- Firat Kılıç, H., and Cevheroğlu, S. (2023). Patient safety competencies of nursing students. *Nurse Education Today*, 121, 105666. doi:10.1016/j.nedt.2022.105666
- Glarcher, M., and Vaismoradi, M. (2025). A systematic integrative review of specialized nurses' role to establish a culture of patient safety: A modelling perspective. *Journal of Advanced Nursing*, 81(9), 5248–5263.
- Huang, F. F., Shen, X. Y., Chen, X. L., He, L. P., Huang, S. F., and Li, J. X. (2020). Self-reported confidence in patient safety competencies among Chinese nursing students: A multi-site cross-sectional survey. *BMC Medical Education*, 20(1), 32. doi:10.1186/s12909-020-1945-8
- Lee, S. E., Lee, M. H., Peters, A. B., and Gwon, S. H. (2020). Assessment of patient safety and cultural competencies among senior baccalaureate nursing students. *International Journal of Environmental Research and Public Health*, 17(12), 4225. doi:10.3390/ijerph17124225
- Mihdawi, M., Al-Amer, R., Darwish, R., Randall, S., and Afaneh, T. (2020). The influence of nursing work environment on patient safety. *Workplace Health and Safety*, 68(8), 384–390.
- Mutlu, B., Azak, M., and Kalaycı, S. (2020). Çocuk sağlığı ve hastalıkları hemşireliği dersini almış öğrencilerin klinik rahatlık ve endişe durumu ile öz yeterlilik algısı arasındaki ilişkinin incelenmesi. *OPUS Uluslararası Toplum Araştırmaları Dergisi*, 15(26), 4294–4312. doi:10.26466/opus.659694
- Shorey, S., and Lopez, V. (2021). Self-efficacy in a nursing context. In G. Haugan and M. Eriksson (Eds.), *Health promotion in health care—Vital theories and research* (pp. 145–158). Cham, Switzerland: Springer. doi:10.1007/978-3-030-63135-2_12

Svitlica, B. B., Šajnović, M., Simin, D., Ivetić, J., and Milutinović, D. (2021). Patient safety: Knowledge and attitudes of medical and nursing students: Cross-sectional study. *Nurse Education in Practice*, 53, 103089. doi:10.1016/j.nepr.2021.103089

Vaismoradi, M., Tella, S., Logan, P. A., Khakurel, J., and Vizcaya-Moreno, F. (2020). Nurses' adherence to patient safety principles: A systematic review. *International Journal of Environmental Research and Public Health*, 17(6), 2028.

Xie, D., Zhu, X., Zhang, X., Jiang, Z., Wang, X., and Liu, T. (2024). Research on the correlation between clinical nurses' self-efficacy, future time perspective, and occupational burnout. *Frontiers in Public Health*, 12, 1363450.

Zengin, N., Pınar, R., Çil Akıncı, A., and Yıldız, H. (2014). Psychometric properties of the self-efficacy for clinical evaluation scale in Turkish nursing students. *Journal of Clinical Nursing*, 23(7–8), 976–984. doi:10.1111/jocn.12257



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