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A cross-sectional study on resilience and loneliness among nursing students in the virtual era

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ABSTRACT

Aims: As the COVID-19 pandemic necessitated a rapid transition to digital education, nursing students faced a unique intersection of academic pressure and social isolation. The aim was to evaluate the levels of resilience and virtual environment loneliness among nursing students and to identify the predictors of resilience during the pandemic.

Methods: A cross-sectional, descriptive study was conducted with 188 nursing students (94% response rate) at a university in Ankara during the 2020-2021 academic year. Data were collected via an Information Form, the Connor-Davidson Resilience Scale (CD-RISC), and the Virtual Environment Loneliness Scale (VELS).

Results: Students reported moderate levels of virtual loneliness (58.44±11.87) and resilience (65.29±15.38). Correlation analyses revealed a weak positive relationship between total resilience and virtual socialization ($p<0.05$), while the relationship with virtual loneliness was negative but not significant ($p>0.05$). Significant predictors of resilience included the year of study and virtual socialization ($p<0.05$). The regression model explained 19.1% of the total variance in resilience scores.

Conclusion: Nursing students exhibited moderate levels of both resilience and virtual environment loneliness during the pandemic. Resilience among nursing students is influenced by year of study and health-promoting behaviors such as physical exercise. Fostering resilience may enhance students' ability to engage healthily in digital spaces, potentially mitigating the risks of digital isolation.

Keywords: COVID-19, students; nursing, resilience; psychological, education; nursing

INTRODUCTION

The COVID-19 pandemic triggered unprecedented global challenges that necessitated stringent public health interventions. Measures such as mandatory lockdowns, physical distancing, and the closure of educational institutions were vital to curbing viral transmission. However, these disruptions significantly altered the emotional and psychological routines of the population. Young adults, in particular, experienced a marked reduction in social interaction with peers and family (Labrague et al., 2021). For university students, the sudden transition to online distance education exacerbated feelings of social isolation and loneliness, which have been identified as primary catalysts for psychological distress during this period (Pineda et al., 2022; Shankar, 2023).

In the absence of physical interaction, individuals increasingly turned to digital platforms to seek information, maintain social connections, and alleviate the monotony of quarantine. Social media became a primary tool for accessing real-time updates on the pandemic and fulfilling the human need for socialization (Szeto et al., 2024). While these virtual environments provided a necessary bridge for communication, shopping, and entertainment, they also facilitated a shift in how interpersonal needs were met. Many individuals began preferring virtual communication over face-to-face contact to address daily needs, share emotional experiences such as sadness and anxiety, and alleviate feelings of loneliness (Holmes et al., 2020; Li et al., 2022).

The increase in internet usage has popularized the concept of "virtual loneliness," a state that may lead to significant psychological and physical distress (Korkmaz et al., 2014). For young people with limited offline social networks, the expansion of their "virtual world" can lead to a phenomenon known as virtual loneliness. Unlike traditional loneliness, which is often visible through social withdrawal, virtual loneliness can be insidious. It occurs when an individual becomes alienated from physical society while being immersed in a boundaryless digital environment. While these connections offer a temporary escape from negative emotions

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like anger or fear, they may ultimately isolate the individual from authentic social integration. Over time, this detachment can lead to a state where the individual exists within "the senses and emotions of networks," potentially ignoring real-world responsibilities and relationships (Candiotto, 2022; Li et al., 2022; Özsat et al., 2022; Shankar, 2023).

In the face of these adverse conditions, psychological resilience—defined as the capacity to recover from negative affect and adapt to stressors—emerged as a critical factor. During the pandemic, resilience, alongside positive coping mechanisms and social support, was a primary determinant in managing anxiety and depression, particularly among healthcare cohorts (Labrague, 2021). In the context of nursing education, resilience is viewed as an individualized developmental process in which personal protective factors are utilized to navigate stressors and adversities successfully. For nursing students, fostering resilience is essential not only for academic success but also for long-term professional well-being and adaptive coping in high-stakes clinical environments (Walsh et al., 2020; Aryuwat et al., 2023; Park & Choi, 2025).

During the COVID-19 pandemic, nursing education was significantly disrupted due to the transition to online learning, limitations in clinical training opportunities, and reduced face-to-face interactions. While information technology offers clear benefits, an over-reliance on digital spaces among youth struggling with social integration can exacerbate psychological withdrawal. Nursing students represent a unique demographic in this regard, as they faced the dual burden of general pandemic stressors and the specific pressures of their clinical vocation (Labrague, 2021). These challenges may have increased students' reliance on and engagement with social media and virtual platforms. Understanding the interplay between digital habits and psychological fortitude is vital for developing supportive educational curricula. Therefore, this study aims to evaluate the levels of resilience and virtual environment loneliness among nursing students during the COVID-19 pandemic.

The research questions were:

- What are the current levels of psychological resilience and virtual environment loneliness among nursing students?
- What is the relationship between nursing students' resilience and their experience of virtual environment loneliness?
- How do socio-demographic characteristics and patterns of social media usage influence scores on the Connor-Davidson Resilience Scale (CD-RISC) and the Virtual Environment Loneliness Scale (VELS)?

METHODS

Ethics

This study was conducted with the approval of the Başkent University Ethics Committee of the Academic Evaluation Coordination Office (Date: 08.04.2021, Decision No: 2021/25610). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants prior to their inclusion in the study. Permission to use the Turkish version of the CD-RISC and VELS was granted from the authors.

Study Design and Setting

This descriptive and cross-sectional study was conducted in the nursing department of the faculty of health sciences of a foundation university in Turkiye between 2020 and 2021. This study was reported using the 2007 version of the STROBE checklist.

Study Sample

The universe of the study consisted of 200 student nurses studying in the 1st, 2nd, 3rd and 4th grades of the nursing department of the faculty of health sciences of a foundation university. No sample selection was made in the study, and the study was conducted with 188 (94%) students who agreed to participate in the study.

Research Instruments and Data Collection

Data collection forms were given to 188 students who were continuing their education at the university between April 12, 2021 and April 30, 2021 by the researchers, and after filling them out, they were asked to leave them in the box placed by the researcher.

During the data collection period, infection control measures related to the COVID-19 pandemic were implemented in accordance with institutional and national guidelines. First-year students did not participate in clinical practice, while second-, third-, and fourth-year students continued their clinical rotations.

The data of the study were collected using an Information form, the Connor-Davidson Resilience Scale, and the VELS.

The information form consists of 26 questions that include demographic information about the students and information about determining the students' resilience and loneliness during the COVID-19 process (Aryuwat et al., 2023; Holmes et al., 2020; Li et al., 2022; Park & Choi, 2025)

The Connor-Davidson Resilience Scale (CD-RISC); The scale was developed by Connor and Davidson in 2003 and consists of 25 items (Connor & Davidson, 2003). Each item is rated on a 5-point scale (from 0="not true at all" to 4="true nearly all the time"). Scoring of the scale is based on summing the total of all items, each of which is scored from 0-4. The sum scores range from 0 to 100, with higher scores reflecting a higher level of resilience. The CD-RISC was reported to have good internal consistency (α=0.89) and test-retest reliability intraclass correlation coefficient: (0.871). The internal consistency of the scale for this sample was found 0.926 pointing to high internal consistency (Connor & Davidson, 2003). In the Turkish version, the three factors namely tenacity and personal competence, tolerance of negative affect and tendency toward spirituality of the scale obtained 0.93 (15 items), 0.79 (6 items), and 0.50 (3 items), respectively (Karairmak, 2010). In this study, Cronbach's alpha was found to be 0.920 for the subscale of tenacity and personal competence, 0.774 for the subscale of tolerance of negative affect, and 0.566 for the subscale of tendency toward spirituality.

VELS was developed by Korkmaz et al. (2014) to assess the loneliness levels of individuals in virtual environments. The

VELS is a Likert-type scale consisting of 20 items and three sub-dimensions. Each item is answered on a 1-5 scale (1= does not reflect at all, 5= completely reflects). Items 6, 7, 16, 17, 18, 19 and 20 were reverse coded. Either a total score can be calculated to measure virtual loneliness, or 3 different scores can be calculated to measure virtual socialization, virtual sharing and virtual loneliness. Total scores on the scale range from 20 to 100, with higher total scores indicating greater levels of loneliness in virtual environments. In the original study (Korkmaz et al, 2014), internal consistency scores were reported as 0.816 for the total VELS, 0.842 for Virtual Socialization, 0.809 for Virtual Sharing, and 0.614 for Virtual Loneliness. In the present study, Cronbach's alpha was 0.819 for the total VELS, and for the sub-scales virtual socialization: 0.833; virtual sharing 0.907; virtual loneliness 0.710.

Statistical Analysis

The data were analyzed using SPSS for Windows 25.0: SPSS Inc. Descriptive statistics (numbers, percentages, mean, and standard deviation) were used to analyze students' sociodemographic data. Tests of normal distribution, parametric tests, and correlation analyses were performed. The independent test and analysis of variance (ANOVA) were used to examine the presence of statistically significant differences in CD-RISC and VELS scores between the categorical variables. The p-value of <0.05 was considered statistically significant with a 95% confidence interval.

Normality testing revealed that skewness values ranged from -0.27 to 1.16 and kurtosis values ranged from -0.73 to 1.22. Skewness and kurtosis values between -2 and +2 are considered acceptable to demonstrate a normal univariate distribution (George & Mallery, 2010).

To determine the predictors of resilience, a multivariate linear regression analysis was performed using the backward method. In the model, the CD-RISC score was considered the dependent variable. Variables found to be significant in the bivariate analyses, including demographic characteristics (e.g., class level, perceived health status, regular physical exercise, duration of daily social media use, perception of security/reliability of the virtual environment) and VELS subscale scores (virtual socialization, virtual sharing, and virtual loneliness), were included as independent variables.

RESULTS

The demographic characteristics of the participants are summarized in Table 1. The mean age of the nursing students was 20.76±1.77 (min: 18-max: 29) years, with a vast majority being female (86.2%). The sample was distributed across all four years of study: first-year (33.5%), second-year (24.5%), third-year (20.7%), and fourth-year (21.3%). Regarding socioeconomic and living conditions, 69.1% reported an income equal to their expenses, and 73.9% lived with their families during the academic year. Most participants had lived in a province/city center for the longest period (78.7%), and 54.3% had graduated from public high schools.

In terms of health and lifestyle, 54.3% of students reported moderate sleep patterns, with a mean daily sleep duration of 7.32±1.56 hours. Regarding smoking status, 26.6% of students reported smoking. While 53.7% rated their general health status as moderate, only 40.4% engaged in regular physical exercise. Additionally, 15.4% reported having a chronic

Table 1. Sociodemographic and health-related characteristics of nursing students (n=188)

Characteristics	Number	Percent (%)
Mean age: 20.76±1.77 (min: 18–max:29)		
Gender		
Female	162	86.2
Male	26	13.8
School year/class		
First-year	63	33.5
Second year	46	24.5
Third year	39	20.7
Fourth-year	40	21.3
Income status		
Less than income	7	3.8
Income equal to expenses	130	69.1
More than expenses	51	27.1
Location of longest residence		
Village	6	3.2
District	33	17.6
Province/city center	148	78.7
Abroad	1	0.5
Graduated high school		
Public	102	54.3
Private	86	45.7
Place of living during university education		
Family	139	73.9
Alone	9	4.8
Private dorm	22	11.7
Government dorm	12	6.4
At home with friends/other	2	1.1
Daily sleep time: 7.32±1.56 (min:3 max: 15)		
Sleep patterns		
Good	43	22.9
Moderate	104	55.3
Poor	41	21.8
Smoking status		
Yes	50	26.6
No	138	73.4
Self-rated general health status		
Good	80	42.6
Moderate	101	53.7
Poor	7	3.7
Chronic disease condition		
Yes	29	15.4
No	159	84.6
Regular medication use		
Yes	24	12.8
No	164	87.2
Regular physical activity		
Yes	76	40.4
No	112	59.6
Having a hobby		
Yes	117	62.2
No	71	37.8

Min: Minimum, Max: Maximum

disease, and 62.2% participated in hobbies (e.g., reading books, listening to music, painting, and swimming) (Table 1). Additionally, 15.4% of participants reported having a chronic disease, 12.8% reported regular medication use, and 62.2% reported having a hobby.

The findings of the survey revealed that (Table 2) over half of the students (52.7%) perceived the virtual environment as moderately safe. The majority (54.8%) utilized social media for 3-5 hours per day. The primary purposes for internet access were online learning (59.7%) and research (55.9%). Most students (62.2%) used social media to follow friends. Primary motivations for virtual engagement included peer communication (25.7%), fun (20.7%), entertainment (16.5%), and alleviating boredom (16.2%).

Table 2. Virtual environment participation (n=188)

Virtual environment characteristics	Number	Percent (%)
Perception on security/reliability of virtual environment		
Very low	28	14.9
Low	46	24.4
Moderate	99	52.7
Reliable/secure	15	8.0
Using internet for online education		
Always	112	59.6
Generally	67	35.6
Sometimes	8	4.3
Rarely	1	0.5
Using internet for searching in online education		
Always	47	25
Generally	105	55.9
Sometimes	34	18.0
Rarely	2	1.1
Duration of daily usage of social media		
Less than hour	3	1.6
1-2 hour	43	22.9
3-5 hours	103	54.8
Over 6 hours	39	20.7
Reasons to use virtual environments such as social media* (n=246)		
Following fiends	153	62.2
To satisfy my curiosity	60	24.3
Popularity	33	13.5
Behaviors and motivations that are effective in using the virtual environment* (n=989)		
It allows me to communicate with my friends	254	25.7
Amuses me/having a good time	204	20.7
It satisfies my need for entertainment	164	16.5
Helps pass the time especially when I'm bored	162	16.2
It becomes a habit	111	11.3
The opportunity to influence people with my posts (photos etc.)	94	9.6

*Multiple answers were given

Mean scores of the VELS and the CD-RISC and its sub-dimensions were presented in Table 3.

The mean total VELS score was 58.44±11.87, with sub-dimension scores of 26.30±6.39 for virtual socialization, 15.39±7.13 for virtual sharing, and 16.74±4.54 for virtual loneliness. The mean total CD-RISC score was 65.29±15.38. Sub-dimension scores for resilience were: tenacity and personal competence (41.00±10.10), tolerance of negative affect (13.57±4.58), and tendency toward spirituality (10.71±2.74).

Table 3. The mean CD-RISC, VELS and subscale scores (n=188)

	Mean±SD	Range (min-max)	Range of possible scores (min-max)
Total VELS score	58.44±11.87	23-89	20-100
Virtual socialisation	26.30±6.39	8-40	8-40
Virtual sharing	15.39±7.13	7-35	7-35
Virtual Loneliness	16.74±4.54	5-25	5-25
CD-RISC	65.29±15.38	19-100	0-100
Tenacy and personal competence	41.00±10.10	9-60	0-60
Tolerance of negative affect	13.57±4.58	3-24	0-24
Tendency toward spirituality	10.71±2.74	4-16	0-16

CD-RISC: Connor-Davidson Resilience Scale, VELS: Virtual Environment Loneliness Scale, SD: Standard deviation, Min: Minimum, Max: Maximum

The comparison of the VELS and the CD-RISC subscale mean scores according to the socio-demographic characteristics were presented Table 4. No significant relationships were found between demographic variables and total VELS scores ($p>0.05$). However, significant differences were observed in resilience based on class year ($p=0.006$), and across all its sub-dimensions: tenacity ($p=0.022$), tolerance of negative affect ($p=0.002$), and spirituality ($p=0.004$). Furthermore, self-rated general health status was significantly associated with total CD-RISC scores ($p=0.002$), and its sub-dimensions of tenacity ($p=0.003$), and tolerance of negative affect ($p=0.006$).

Correlation analysis (Table 5) revealed weak positive correlations between CD-RISC total scores and both VELS total scores ($r = 0.165$, $p = 0.024$) and the virtual socialization subscale ($r = 0.252$, $p < 0.001$). No significant correlations were found between CD-RISC total scores and the virtual sharing or virtual loneliness subscales ($p > 0.05$).

A multivariate linear regression analysis was conducted to identify independent predictors of nursing students' resilience scores (Table 6). The model significantly predicted CD-RISC scores, with class level, regular physical exercise, and virtual socialization identified as significant predictors ($p<0.05$). Collectively, the independent variables in the model explained 19.1% of the total variance in resilience scores ($R^2=0.191$).

DISCUSSION

The Corona outbreak created a world of ambiguity, loss of control and uncertainty for everyone. Nursing students, as a part of society, like all people who experienced the pandemic, were affected by the threat they felt to an extent that would affect their psychological resilience and mental health, as well as the measures taken to protect them from the pandemic. In particular, as young adults, being away from home, social isolation practices, the transition to distance learning, the inability of students to use their face-to-face social support, the lack of leisure activities led students to spend more time in the virtual world (Grande et al., 2021; Pineda et al., 2022). The mobile phone has become an intermediary in interpersonal contacts, and social media has replaced the real world of peer and social relationships (Szeto et al., 2024).

Table 4. Comparison of CD-RISC and VELS total and subscale scores according to sociodemographic characteristics (n=188)

Socio-demographic characteristics	CD-RISC mean±SD	Tenancy & personal competence mean±SD	Tolerance of negative affect mean±SD	Tendency toward spirituality mean±SD	VELS mean±SD	Virtual socialisation mean±SD	Virtual sharing mean±SD	Virtual loneliness
Gender								
Female	64.85±15.40	40.74±10.23	13.34±4.47	10.75±2.73	58.32±12.09	26.37±6.46	15.04±7.00	16.89±4.45
Male	68.03±15.25	42.61±9.28	15.00±5.11	10.42±2.87	59.15±10.57	25.80±6.05	17.53±7.67	15.80±5.03
p-value	0.328	0.383	0.088	0.564	0.74	0.67	0.09	0.25
Class								
First[1]	61.65±14.66	39.65±9.85	12.28±4.30	9.71±2.71	57.87±12.07	26.34±6.43	13.98±6.82	17.53±4.02
Second[2]	62.43±16.53	38.39±11.20	13.04±4.77	11.0±2.78	58.31±9.65	25.54±5.34	16.45±6.68	16.23±4.26
Third[3]	69.07±15.60	43.74±9.68	14.15±4.86	11.17±2.81	60.92±13.46	27.15±7.02	17.43±7.45	16.33±4.95
Fourth[4]	70.62±12.85	43.47±8.61	15.65±4.58	11.50±2.74	57.12±12.30	26.25±6.89	14.40±7.37	16.47±5.17
p-value	0.006 (1<3.4; 2<3.4)	0.022 (1<3; 2<3.4)	0.002 (1<4; 2<4)	0.004 (1<3.4)	0.50	0.72	0.05	0.40
Self-rated general health status								
Good[1]	68.43±16.14	43.06±10.2	14.32±4.72	11.05±3.02	58.55±12.63	27.01±6.66	14.83±7.56	16.90±4.68
Moderate[2]	61.98±14.04	38.88±9.56	12.72±4.25	10.37±2.55	58.19±10.81	25.73±6.00	15.59±6.65	16.86±4.13
Poor[3]	77.14±13.17	48.14±8.00	17.28±4.88	11.71±1.38	60.71±18.38	28.57±6.95	18.85±8.68	13.29±7.48
p-value	0.002 (1<3; 2<3)	0.003 (1<3; 2<3)	0.006 (1<3; 2<3)	0.162	0.858	0.336	0.332	0.121

*p<0.05. CD-RISC: Connor-Davidson Resilience Scale, VELS: Virtual Environment Loneliness Scale, SD: Standard deviation

Table 5. CD-RISC and VELS correlation

Scale and subscales	Test	CD-RISC	Tenacy&personal competence	Tolerance of negative affect	Tendency toward spirituality
VELS	r	0.165*	0.116	0.193**	0.175*
	p	0.024	0.114	0.008	0.016
Virtual socialization	r	0.252**	0.308**	0.180*	0.318**
	p	<0.001	0.000	0.013	0.000
Virtual sharing	r	0.087	0.013*	0.178*	0.141
	p	0.235	0.856	0.014	0.053
Virtual loneliness	r	-0.062	-0.052	-0.030	0.013
	p	0.402	0.477	0.684	0.161

**p<0.001,* p<0.05. CD-RISC: Connor-Davidson Resilience Scale, VELS: Virtual Environment Loneliness Scale

Table 6. Multiple linear regression model predicting CD-RISC Scores

Independent variable: CD-RISC Score						
Predictors	**B**	**SE**	**Beta**	**t**	**p**	**VIF**
Constant	65.584	8.077		8.120	0.000	
Class	3.046*	0.926	0.227	3.290	0.001	1.020
Self-rated general health status	-6.336	3.428	-0.149	-1.848	0.066	1.399
Regular physical exercise	-6.462	2.198	-0.207	-2.940	0.004	1.360
Duration of daily usage of social media	-1.866	1.512	-0.008	-0.106	0.915	1.155
Perception on security/reliability of virtual environment	-0.142	1.339	-0.008	0.116	0.910	1.045
Virtual socialization	0.703*	0.188	0.292	3.732	0.001	1.318
Virtual sharing	-0.078	0.170	-0.036	-0.461	0.646	1.337
Virtual loneliness	-0.272	0.262	-0.080	-1.039	0.300	1.287

*R=0.407; R^2=0.191; Adjusted R^2=0.154; F=4.457; Durbin Watson=1.613. p<0.001. CD-RISC: Connor-Davidson Resilience Scale, SE: Standard error, VIF: Variance inflation factor

Findings revealed that mean scores for virtual environment loneliness across all subscales were at a moderate level. Notably, the "virtual socialization" mean score was higher than other sub-dimensions, suggesting that students actively utilized digital spaces to compensate for physical isolation. While literature specifically addressing "virtual loneliness" in nursing students during COVID-19 is emerging, our results align with broader studies on loneliness. Kupcewicz et al. (2022) found moderate loneliness levels among nursing students in Poland, Spain, and Slovakia during the COVID-19 pandemic, identifying life satisfaction as a primary predictor. Similarly, research in the Middle East and Turkiye has demonstrated a significant correlation between increased internet usage, smartphone addiction, and loneliness (Alheneidi et al., 2021;

Sönmez et al., 2021). Our study supports these findings, as the majority of participants identified peer communication and socialization as their primary motivations for virtual engagement.

It was determined that the mean score of the nursing students' CD-RISC and sub-dimension mean scores which are tenancy and personal competence, tolerance of negative affect and tendency toward spirituality are at moderate level. These results mirror findings from other regions; for example, students in Southeast Turkiye (Dirgar et al., 2022) and the Philippines also reported moderate resilience during the pandemic (Labrague et al., 2021). However, our results contrast with some data from China, where nursing students exhibited higher resilience levels; found that self-directed learning has played a mediating role in the relationship between caring and resilience among Chinese nursing students (Zhou et al., 2022). These variations may stem from differences in regional pandemic severity, cultural coping mechanisms, or the level of institutional support provided during the transition to online learning.

Although students who engaged in regular physical exercise demonstrated higher resilience scores in bivariate analyses, this variable did not remain significant in the multivariate regression model. The relationship between exercise and resilience is well-documented at a biological level. Physical activity promotes the secretion of neurotransmitters and endorphins, which can induce a sense of well-being and act as a buffer against stressful events. Furthermore, regular exercise enhances an individual's self-perception of competence and worth (Lancaster & Callaghan, 2022). The high Tenacity & Personal Competence subscale score observed in the regular physical exercise group supports this conclusion.

In this study, correlation analysis revealed a weak but significant positive relationship between resilience and total VELS scores. Among the VELS subscales, virtual socialization showed a significant positive correlation with resilience, whereas virtual sharing and virtual loneliness were not significantly correlated with resilience. These findings suggest that students who actively participate in online social interactions may benefit from increased social support and a sense of belonging, which may positively contribute to their resilience levels. Previous studies have reported that social support and interpersonal interaction are important factors that strengthen resilience (Holmes et al., 2020; Li et al., 2022). Similarly, studies conducted with nursing students have indicated that digital social connections may support psychological well-being and facilitate coping with stress (Aryuwat et al., 2023; Park & Choi, 2025).

In the regression analysis, class level, regular physical exercise, and virtual socialization were identified as significant predictors of resilience. Higher class levels were associated with greater resilience. This finding may be explained by students' increasing clinical experience, the development of more effective coping strategies, and improved adaptation to academic challenges over time. Previous studies have similarly reported that resilience tends to increase with academic progression and clinical exposure among nursing students, as senior students often develop stronger coping skills and greater professional confidence (Aryuwat et al., 2023; Labrague, 2021; Reyes et al., 2015).

Limitations

This study has several limitations that should be considered when interpreting the results. First, the data were collected from a single nursing school, which may limit the generalizability of the findings to students in different geographic or institutional contexts. Second, the use of self-report instruments introduces the possibility of social desirability bias or subjective interpretation of the questions. Finally, due to the cross-sectional design, we cannot establish a definitive causal relationship between virtual habits and resilience over time.

CONCLUSION

This study underscores the intricate relationship between digital engagement, virtual loneliness, and psychological resilience among nursing students during a global crisis. While virtual environments served as essential tools for education and social continuity during the COVID-19 pandemic, they also introduced the risk of virtual loneliness. Our findings indicate that resilience among nursing students appears to be influenced by year of study and positive virtual socialization behaviors.

The moderate levels of virtual loneliness observed suggest that while digital platforms facilitate a sense of connection, they may not fully replace the protective effects of traditional social integration. Ultimately, fostering resilience must be viewed as a systemic necessity rather than an individual responsibility. Given that resilience scores varied significantly by school year, nursing curricula should include longitudinal resilience-building programs. Early-stage students may require more intensive support as they adapt to the rigors of the profession, while senior students can benefit from mentorship roles that reinforce their personal competence. Furthermore, as nursing students transition into high-pressure clinical environments, understanding these psychological dynamics is crucial for ensuring their long-term professional success and well-being. Given that regular physical exercise was a significant predictor of resilience, nursing programs should actively promote physical health. Educators should address "virtual loneliness" by teaching students how to use digital tools mindfully. Incorporating discussions on the difference between "virtual sharing" and "authentic social support" can help students avoid the pitfalls of digital withdrawal.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was conducted with the approval of the Başkent University Ethics Committee of the Academic Evaluation Coordination Office (Date: 08.04.2021, Decision No: 2021/25610).

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights-including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

The authors received no financial support for the conduct or publication of this research.

Author Contributions

Concept: SK, İÖ, EAÇ, MŞ, ÖD, BÇ; Design: SK, İÖ; Control: SK, İÖ, MŞ, ÖD; Data Collection and/or Processing: İÖ, MŞ, ÖD; Analysis and/or Interpretation: SK, BÇ, EAÇ; Literature Review: SK, EAÇ, MŞ, İÖ; Article Writing: SK, BÇ, EAÇ; Critical Review: SK, BÇ, EAÇ.

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Postoperative shivering: a bibliometric study

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ABSTRACT

Aims: This study aimed to systematically review the current literature on postoperative shivering, analyze scientific publications on the subject, identify knowledge gaps in the field, and offer new perspectives that may guide clinical practice.
Methods: A descriptive and bibliometric analysis method was employed. The search was performed using the keywords "postoperative shivering*", "postoperative chills", and "postoperative." The study population consisted of 90 articles written on postoperative shivering in the "Web of Science" database. The study data were analyzed and illustrated using "VOSviewer".
Results: The first study on postoperative shivering was conducted in 1981. According to the Web of Science Citation Report, the average number of citations per publication was 18.27 for the 90 articles included in the analysis, with a total of 200 contributing authors. The author who published the highest number of articles on this subject was "Kazuhiro Shirozu" (n=5 article), the author who received the highest number of citations was "Kranke P" (188 citations), and the journals with the highest number of publications were "Anaesthesia" and "Anesthesia & Analgesia", with four articles each. The most frequently used keywords in publications on this subject were "shivering" (occurrences 79), "pethidine" (occurrences 25), and "postoperative" (occurrences 25).
Conclusion: In this study, it was determined that the number of publications on postoperative shivering has increased over the years and that there has been a significant increase in the number of citations in line with this increase. The growing interest in the clinical importance of postoperative shivering reveals the increasing demand for and awareness of scientific research in this field.
Keywords: Shivering, postoperative period, bibliometrics

INTRODUCTION

Postoperative shivering is a common complication following surgical interventions and can have clinically significant consequences. Postoperative shivering is defined as the re-elevation of the shivering threshold following the elimination of thermoregulatory inhibition caused by anesthesia and its return to normal levels (Lopez, 2018). Postoperative shivering depends on the type of anesthesia, perioperative care, and surgical procedure, and it has been reported to occur in 5% to 65% of cases of general anesthesia and 30% to 55% of cases of regional anesthesia (Abo-Zeid Salim et al., 2023; Liu et al., 2024). Although its etiology has not been fully elucidated (Hoshijima et al., 2016) it has been reported that numerous other causes and factors, such as cold-induced thermoregulation, reduced sympathetic activity, pain, elevated blood pressure and intracranial pressure, type of surgery and anesthesia, blood loss, respiratory alkalosis, and individual differences, may also contribute to postoperative shivering (Gupta et al., 2018; Khan et al., 2020; Rattanapittayaporn & Oofuvong, 2021; Shirozu et al., 2024). Furthermore, several studies have demonstrated that low body temperature significantly increases the risk of postoperative shivering (Aloysius et al., 2023; Rattanapittayaporn & Oofuvong, 2021). This finding is consistent with the increased incidence of postoperative shivering in patients for whom adequate intraoperative warming cannot be provided (Adinehmehr et al., 2018; Rattanapittayaporn & Oofuvong, 2021; Tu et al., 2023).

Postoperative shivering may appear as a thermoregulatory response to hypothermia or as clonic or tonic muscle contractions at different frequency ranges. Although this condition is a protective mechanism to increase body temperature, it can trigger various complications such as myocardial ischemia by increasing oxygen consumption and the risk of hypoxemia, increased wound pain, delayed wound healing, and impaired monitoring (Lopez, 2018; Tu et al., 2023; Zhang & Van Poucke, 2017). In addition, it can cause tension in surgical incisions, resulting in increased postoperative pain, increased intracranial pressure, and increased heart rate and arterial blood pressure. As a result, these pathophysiological changes increase the frequency of complications such as postoperative infection, bleeding, and pain, delay the recovery process, negatively affect patient comfort, and may prolong the length of hospital stay (Adinehmehr et al., 2018; Lopez, 2018).

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Various pharmacological and nonpharmacological methods are used for the prevention of postoperative shivering (Lopez, 2018; Nair et al., 2023). Heating the operating room, pressurized air heating systems, heating blankets, radiant devices, and infusion fluid warmers are considered the most effective approaches among nonpharmacological methods (Jain et al., 2018; Tu et al., 2023). In the "National Institute for Health and Care Excellence (NICE)" clinical guidelines, it has been emphasized that all patients undergoing surgical procedures should be warmed with a pressurized air heating system or heating blanket starting from anesthesia induction until the end of the operation (NICE, 2016). The pharmacological treatment often involves the use of opioid drugs, analgesics, and magnesium sulfate (Adinehmehr et al., 2018; Jain et al., 2018; Lopez, 2018). Although current practices and pharmacological treatments are effective in reducing shivering, their effectiveness may vary depending on the patient's characteristics, the type of surgery, and the anesthesia technique. Furthermore, the side effects of pharmacological agents and the inapplicability of nonpharmacological methods in every clinical condition pose a significant problem in this field. Therefore, identifying the subjects on which research is intensified, the relatively less studied areas, and the current knowledge gaps regarding postoperative shivering is of great importance in approaching the subject from a broad perspective. Although there is a considerable body of knowledge in the current literature regarding postoperative shivering, the lack of bibliometric analysis on the subject is noteworthy. This study aimed to systematically evaluate scientific publications related to postoperative shivering, fill gaps in the literature, and offer new perspectives that may guide clinical practice.

Research questions:

- What is the change in the number of publications on the subject over the years, and which journals publish the highest number of articles?
- Which countries, journals, and authors are the most effective in terms of the number of publications and citations?
- What are the most used keywords and collaborations?
- What are the fundamental research issues and thematic studies regarding the subject?

METHODS

In this study, the data were obtained from articles published in a database, and a bibliometric analysis of the articles was performed. Therefore, no ethics committee approval was necessary. All resources benefited from in the study are listed in the references section. The study was conducted in accordance with the relevant ethical principles and publication ethics standards.

The bibliometric data were analyzed, and bibliometric networks were constructed and visualized using VOSviewer software (version 1.6.19), developed by Nees Jan van Eck and Ludo Waltman at the Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands.

Analysis Process and Data Analysis

One of the first and most critical stages of bibliometric analysis is the choice of an appropriate database. In this study, the Web of Science (WoS) database was preferred due to its comprehensive and high-quality collection of literature. WoS has a wide range of content, including numerous peer-reviewed journals, scientific books, and other academic publications, and offers fast and reliable access to bibliometric metrics such as h-indexes and citation counts of authors. Due to these features, WoS is commonly used for bibliometric analyses and is recognized for its reliability (Çobanoğlu, 2024).

In the second stage of the analysis, data relevant to the research were selected from WoS and filtered according to specific criteria. Since bibliometric studies usually require the use of large data sets, the data set was limited to a specific time frame to ensure both the efficiency and validity of the search process. Such a limitation contributes to focused and manageable analysis results. The following search strategy was applied in the database using the Boolean keyword combination: ((TS=(postoperative shivering*) OR TS=(postoperative chills) AND TS=(postoperative)).

The bibliometric analysis included publication productivity, citation analysis, country and institutional contributions, collaboration networks, and keyword co-occurrence and temporal overlay analyses. VOSviewer (version 1.6.19) was used to construct and visualize the bibliometric networks. The analyses were based on bibliographic information, including authors, affiliations, publication years, citations, and keywords, retrieved from the Web of Science database. The resulting maps were interpreted according to the occurrence, citation, and link strength of the corresponding bibliometric units.

The step-by-step data collection process is presented in **Figure 1**, in which the inclusion and exclusion criteria used in the process are also illustrated. In the first step, a systematic search was performed in the database using keywords determined within the scope of the study (**Figure 1**). In this study, a search was conducted in the Web of Science (WoS) database using the predefined keywords, and a total of 145 publications were identified. The document type included in the scope of the research was limited to "article." Moreover, the language of the publications was specified as English, and the year of publication was limited to the range "1981-2025". According to the predefined inclusion and exclusion criteria applied during the filtering process, 90 publications were included in the analysis. The abstracts of the 90 publications were examined in detail, and the content containing the relevant keywords in the title and abstract of these studies was exported in .txt format on September 11, 2025. This file was uploaded to VOSviewer, one of the software programs for bibliometric analysis, to provide a visual representation of the analysis results. New studies added to the database after the data collection date were excluded from the evaluation. This approach is important in terms of ensuring consistency in the analysis and the validity of the study in terms of its timeframe.

RESULTS

A bibliometric analysis was performed on a total of 90 articles published between 1981 and 2025. It was determined that the first article on the subject was published in 1981. The mean

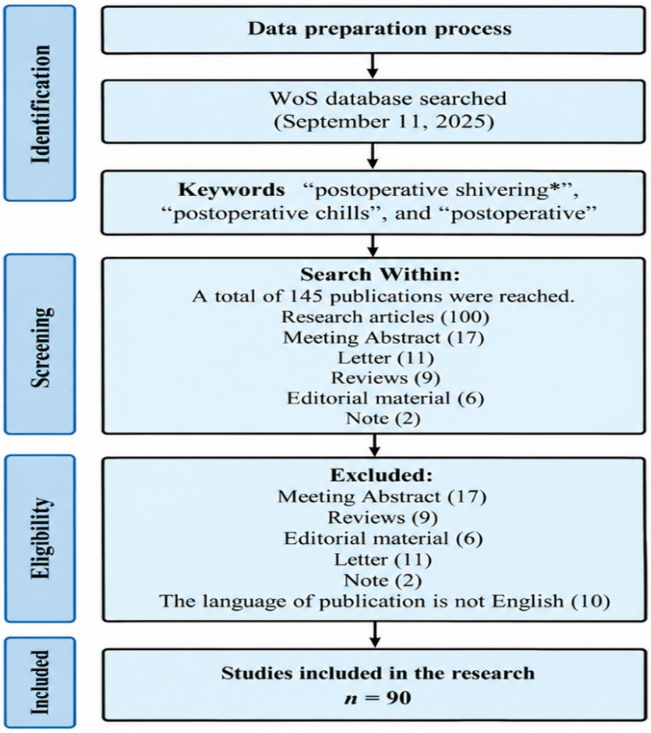

Figure 1. Publication selection flow diagram Web of Science
WoS: Web of Science

number of citations for the 90 articles included in the analysis was 18.27, and the total number of authors was 200 (Figure 2). Based on the publications examined, the mean number of co-authors per article was 5.14. In addition, the total number of keywords used in these articles was 80.

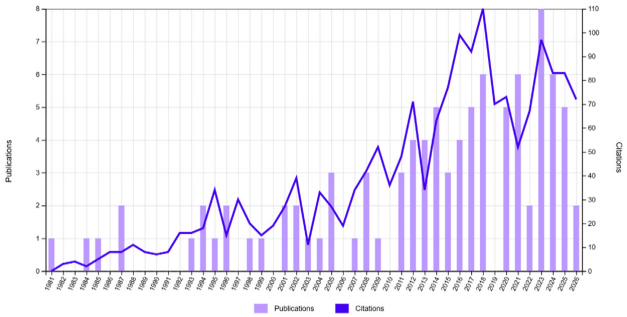

Figure 2. Number of publications and citations by years (1981-2025)

The number of articles published was 5 between 1981 and 1989, 8 between 1990 and 1999, 14 between 2000 and 2009, 34 between 2010 and 2019, and 29 between 2020 and 2025. The highest number of articles was determined in 2023, with a total of 8 articles. This was followed by 6 articles published in 2018, 2021, and 2024, and 5 articles published in 2014, 2017, and 2020 (Figure 2).

Most of the articles on the subject have been published in the journals "Anaesthesia" and "Anesthesia & Analgesia". The authors with the most publications and the top 10 journals in which the articles were published are listed in Table 1.

In Table 2, the top 10 countries with the highest number of publications and citations are listed. The author with the highest number of articles in the field was Kazuhiro Shirozu, with a total of 5 articles, who was followed by Ken Yamaura with 4 articles, and Di Sessler, Awa Crossley, and Kaoru Umehara, each with 3 articles (Table 1).

Table 2. Most productive and cited countries

Country name	Number of articles published n	Country name	Total citation
Iran	7	USA	410
Turkiye	6	Germany	233
Japan	6	Turkiye	221
USA	5	England	121
China	5	Switzerland	119
India	4	France	102
Germany	3	India	70
England	2	Austria	64
France	2	South Korea	52
South Korea	2	Iran	43

USA: United States of America

According to the table, Iran (7 articles) had the highest productivity, which was followed by Japan (6 articles), Turkiye (6 articles), China (5 articles), and the United States (5 articles). According to the citation rates among these countries, the United States had the highest number of citations (410 citations), which was followed by Germany (233 citations), Turkiye (221 citations), the United Kingdom (121 citations), and Switzerland (119) (Table 2).

Co-occurrence Keyword Analysis

In Figure 3, different colors were used to represent different words. The colors indicate the average publication year

Table 1. Top 10 journals in which the studies were published and the most productive authors

Journal name	Number of articles published n	Author name	Number of articles published n
Anaesthesia	4	Kazuhiro Shirozu	5
Anesthesia & Analgesia	4	Ken Yamaura	4
Therapeutic Hypothermia and Temperature Management	3	Di Sessler	3
International Journal of Advanced Biotechnology and Research	2	Awa Crossley	3
Southern African Journal of Anaesthesia and Analgesia	2	Kaoru Umehara	3
Journal of International Medical Research	2	Mahajan Rp	2
Journal of Anesthesia	2	Yu Zhu	2
European Journal of Anaesthesiology	2	Chengmao Zhou	2
British Journal of Anaesthesia	2	Emine Arzu Kose	2
Medicine	1	Didem Dal	2

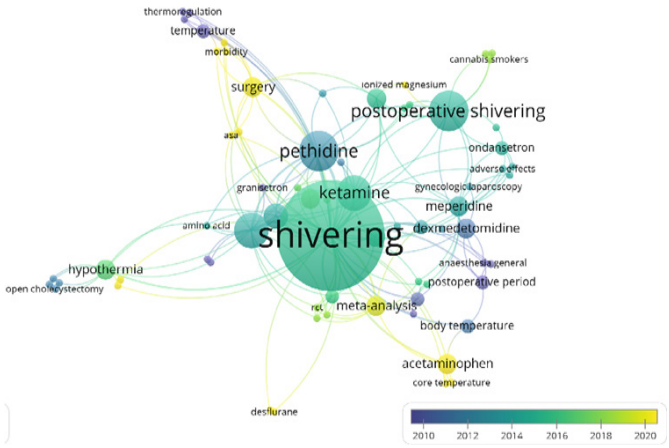

Figure 3. Keyword analysis

associated with each keyword. Among these circles, the four most important clusters determined by the number of elements they contained were "shivering" (cluster 79), "pethidine" (cluster 25), "postoperative" (cluster 25), and "ketamine" (Figure 3).

The "Overlay Visualization" technique was used in the VOSviewer software to display keywords in different colors corresponding to their publication year. The colors of the keywords were determined based on the time elapsed since their publication. In Figure 3, 2020 and later years are shown in yellow, earlier years darken from yellow to green, and 2010 is blue. Keywords used in articles published after 2020 were "acetaminophen, surgery, core temperature, ASA, desflurane, morbidity, recovery from anesthesia, meta-analysis, breast surgery, and flap" (Figure 3).

Citation Analysis (Journal, Author, Article, and Country)

Direct citations from one document to another are presented in the citation network analysis. An increase in the number of citations made to a document increases the strength of the citation network (Çobanoğlu, 2024). According to the Web of Science Citation Report, the total number of citing articles for the publications included in the bibliometric analysis was 1.088. According to the number of citations per year, the highest number of citations in the field was determined in 2018 (110 citations), followed by 2016 (99 citations) and 2023 (97 citations) (Figure 2).

The article titled "Postoperative hypothermia in adults: relationship of age, anesthesia, and shivering to rewarming" by Vaughan et al. in the journal "Anesthesia & Analgesia" was the most cited article in the field so far (176 citations). The second article was "Pharmacological treatment of postoperative shivering: a quantitative systematic review of randomized controlled trials" by Kranke et al. in the journal "Anesthesia & Analgesia" in 2002 (119 citations). The third article was The intensity of postoperative shivering is unrelated to axillary temperature by Crossley et al. in the journal "Anaesthesia" in 1994 (117 citations) (Table 3).

In bibliometric analysis, according to the citation analysis of journals by limiting the criteria to a minimum of one publication and one citation, it was determined that 32 out of 36 references met the threshold value. According to this analysis, the journal with the highest number of citations regarding postoperative shivering was the journal "Anesthesia & Analgesia" (4 articles and 391 citations). The second most cited journal was "Anaesthesia" (4 articles and 230 citations), and the third journal was "British Journal of Anaesthesia" (2 articles and 104 citations) (Table 3).

According to the citation analysis of publications related to postoperative shivering by limiting the criteria to at least one publication per author and at least one citation per publication, 180 out of 200 authors met the threshold value. The author with the highest number of citations was "Kranke P" from Duke University (2 articles and 188 citations), followed by "Vaughan RW" (1 article and 176 citations), "Vaughan MS" (1 article and 176 citations), "Cork RC" (1 article and 176 citations), and "Sessler Di" (3 articles and 171 citations) (Figure 4).

Table 3. The top 10 most cited articles, author, and journals

Article (author, year)	Total citation	Author	Total Citation	Journal	Total citation
Postoperative hypothermia in adults-relationship of age, anesthesia, and shivering to rewarming (Vaughan et al., 1981)	176	Kranke, P.	188	Anesthesia and Analgesia	391
Pharmacological treatment of postoperative shivering: a quantitative systematic review of randomized controlled trials (Kranke et al., 2002)	119	Vaughan, R. W.	176	Anaesthesia	230
The intensity of postoperative shivering is unrelated to axillary temperature (Crossley & Mahajan, 1994)	117	Vaughan, M. S.	176	British Journal of Anaesthesia	104
Effect of pethidine, fentanyl and morphine on postoperative shivering in man (Pauca et al., 1984)	102	Cork, R. C.	176	Acta Anaesthesiologica Scandinavica	102
Efficacy of prophylactic ketamine in preventing postoperative shivering (Dal et al., 2005)	83	Sessler, D. I.	171	European Journal of Anaesthesiology	90
Dexmedetomidine and postoperative shivering in patients undergoing elective abdominal hysterectomy (Elvan et al., 2008)	75	Crossley, A. W. A.	142	Anesthesiology	64
Independent risk factors for postoperative shivering (Eberhart et al., 2005)	69	Mahajan, R. P.	138	Annals of Thoracic Surgery	63
The effects of meperidine and sufentanil on the shivering threshold in postoperative patients (Alfonsi et al., 1998)	64	Tramèr, M. R.	119	Anaesthesia and Intensive Care	49
Suppression of shivering decreases oxygen-consumption and improves hemodynamic stability during postoperative rewarming (Zwischenberger et al., 1987)	63	Roewer, N.	119	International Journal of Medical Sciences	27
Tramadol for postoperative shivering: a double-blind comparison with pethidine (Bhatnagar et al., 2001)	49	Eberhart, L. H.	119	Korean Journal of Anesthesiology	25

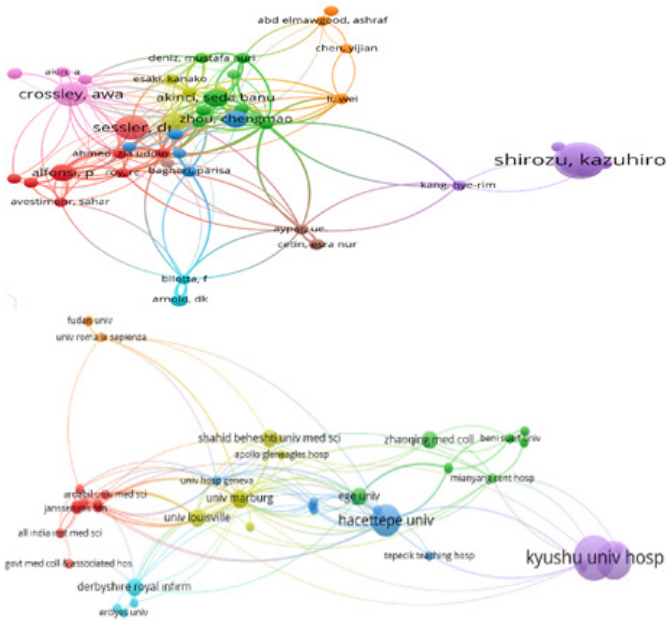

Figure 4. Citation analysis (author and organization)

According to the citation analysis of publications related to postoperative shivering by limiting the criteria to at least one publication per institution and at least one citation per publication, 52 institutions out of 64 met the threshold value. The institution with the highest number of citations was "Hacettepe University" (190 citations), followed by "Wurzburg University" (188 citations), "Marburg University" (188 citations), and "Arizona University" (176 citations) (**Figure 4**).

DISCUSSION

In this study, a bibliometric analysis of the 90 articles published between 1981 and 2025 was performed to reveal the current research on postoperative shivering. It was found that the first study on postoperative shivering was conducted in 1981, and that the number of studies on postoperative shivering has shown an increasing trend, especially in recent years. This suggests that this subject is attracting increasing interest and attention worldwide and that shivering is being recognized not only as a simple postoperative side effect but also as a clinical problem with significant effects on patient comfort, hemodynamic stability, and the recovery process. It can be suggested that the increase in research on postoperative shivering results from advances in surgical interventions, practices focused on patient comfort, patient satisfaction, education, and increased awareness.

According to the bibliometric findings, Iran, Japan, Türkiye, China, and the United States were among the most productive countries in postoperative shivering research. Differences in publication productivity may be associated with research capacity, institutional support, clinical priorities, and the availability of resources for perioperative care. However, publication volume should not be interpreted as a direct indicator of clinical burden or treatment preferences. In resource-limited settings, restricted access to equipment-intensive warming technologies and temperature-monitoring systems may influence research priorities, potentially increasing interest in pharmacological interventions (World Health Organization, 2018). Furthermore, the widespread use of spinal anesthesia in cesarean delivery may contribute to research focusing on the prevention and management of shivering in this patient population (Afzal et al., 2024). Nevertheless, these explanations remain hypothetical, as the bibliometric design does not establish causal relationships between national healthcare characteristics and research productivity.

Research findings revealed that the research networks between Germany and Iran and between Turkiye and South Korea were more collaborative than those between other pairs of countries. This indicates that these countries share a common interest in specific research areas and are mutually dependent, and that their scientific collaboration networks are relatively stronger and more productive. Such intense academic interactions enhance countries' research capacity and global scientific impact by increasing information exchange, joint publications, and international scientific visibility.

Research findings indicate that the highest number of publications on postoperative shivering were published in the journal "Anaesthesia". This demonstrates that the impact of postoperative shivering on anesthetic practices and its significance have been frequently emphasized in the literature. In addition, it reveals that the journal is a pioneering source in the field, attaching particular importance to relevant research. The contributions of the journal "Anaesthesia" to current literature on perioperative care and anesthetic practice clearly demonstrate its central role in the generation of knowledge in the field. The studies with the highest number of citations on postoperative shivering have been published in journals with high impact factors in the field, such as "Anesthesia & Analgesia" and "Anaesthesia". The study conducted by Vaughan et al. (1981) provided clinically important information by examining the relationship between postoperative hypothermia and age, type of anesthesia, and shivering, and it laid the foundation for the subsequent research (Vaughan et al., 1981). In the systematic review performed by Kranke et al. (2002), the results of randomized controlled trials on pharmacological treatments for postoperative shivering were presented comprehensively, guiding both clinical practice and further research (Kranke et al., 2002). In the study of Crossley & Mahajan (1994), it was demonstrated that the severity of shivering is not associated with axillary temperature, indicating that shivering cannot be reduced solely to body temperature (Crossley & Mahajan, 1994). The high number of citations for these three studies indicates that postoperative shivering is not only a clinical symptom but has also been addressed as a multidisciplinary issue concerning anesthetic practice and patient safety. In addition, it demonstrates that researchers have used the pathophysiological dimension (Vaughan et al., 1981) and treatment approaches (Kranke et al., 2002) as well as measurement and assessment methods (Crossley & Mahajan, 1994) as fundamental reference points. These findings therefore demonstrate that research on postoperative shivering has evolved from descriptive studies to evidence-based treatment recommendations.

According to research findings, the most frequently used keywords in studies on postoperative shivering were 'shivering', 'pethidine', and 'postoperative'. This indicates that postoperative shivering has been considered a clinically significant problem in the relevant literature, and pethidine has been highlighted as a treatment approach. The abundance

of studies in which the effectiveness of pethidine and other analgesics on shivering in the postoperative period has been examined (Geresu & Betelihem, 2021; KamailPour & AvestiMehr, 2019; Khan et al., 2020; Saheban Maleki et al., 2021), and the fact that pethidine has been intensively preferred in studies aimed at preventing shivering seen after spinal anesthesia (Afzal et al.,2024; Girma et al., 2022; Ramanathan et al., 2022; Rao & Shankar, 2019) and childbirth (Afzal et al., 2024; Agamia et al., 2020; Gholami et al., 2018; Gupta et al., 2018), has led to the emergence of this drug as a key concept in the relevant literature. The prominent occurrence of 'pethidine' in the co-occurrence network may underscore a notable gap between clinical practice in resource-limited settings and contemporary evidence-based guidelines advocating opioid-sparing recovery strategies. Furthermore, the temporal overlay analysis indicates a distinct shift after 2020, with research attention progressively moving away from conventional opioid monotherapy toward non-opioid pharmacological options, such as intravenous acetaminophen, proactive core temperature monitoring, and systematic meta-analyses. This evolution reflects a growing emphasis on multidisciplinary and preventive thermal care rather than reactive symptom management.

In the literature, the use of drugs such as pethidine, fentanyl, tramadol, ketamine, and acetaminophen has been shown to be beneficial as pharmacological treatment for preventing postoperative shivering (Amsalu et al., 2022; Hameed et al., 2022; Shirozu et al., 2024; Zhou et al., 2019). Therefore, this finding indicates that research has focused on both symptom management and the development of clinical practices. Nevertheless, the bibliometric prominence of pethidine should not be interpreted as evidence that it represents the preferred contemporary strategy for perioperative shivering management. This distinction is important because research trends may reflect historical clinical practice and the continued investigation of an established drug rather than current guideline priorities. Evidence indicates that intrathecal pethidine can reduce the incidence and severity of post-spinal shivering during cesarean delivery, but it is also associated with increased risks of adverse effects such as pruritus and vomiting (Afzal et al., 2024). Contemporary perioperative recommendations increasingly emphasize normothermia, active warming, and multimodal, opioid-sparing approaches rather than reliance on a single opioid-based intervention (NICE, 2016; Oodit et al., 2022). At the same time, resource-limited settings may face barriers to the routine implementation of equipment-dependent warming strategies, and pharmacological options therefore remain relevant in clinical research and practice (Amsalu et al., 2022; World Health Organization, 2018). Thus, the high frequency of pethidine in the literature may represent a tension between an established, readily studied pharmacological intervention and the evolving emphasis of contemporary perioperative care on multimodal and opioid-sparing strategies. Future research should therefore evaluate pethidine alongside non-pharmacological warming and opioid-sparing alternatives, with particular attention to effectiveness, adverse effects, feasibility, and resource requirements across different healthcare settings.

Limitations

The study may not cover all studies related to postoperative shivering published in other databases, as it was based only on articles indexed in the WoS database. In addition, the search of the database on September 11, 2025, may have caused a temporal bias, as studies published or indexed later than this date were not included in the analysis. Another limitation of the study was the inclusion of articles with the document type of "article," publication language of "English," and publication year of "1981-2025." Therefore, the results of the study may not reflect all studies conducted in this field.

CONCLUSION

This bibliometric study provides an overview of the scientific literature on postoperative shivering published between 1981 and 2025, identifying major publication trends, influential authors, journals, countries, and emerging research themes. The findings indicate increasing research activity over time, with particular emphasis on pharmacological interventions and anesthesiology-related studies. The prominence of pethidine in the keyword analysis reflects its substantial representation in the literature, while more recent research themes highlight growing attention to non-opioid interventions, core temperature monitoring, and evidence synthesis.

The findings also suggest opportunities for future research focusing on nursing-led interventions, non-pharmacological warming strategies, and interdisciplinary approaches to postoperative shivering prevention and management. Further multicenter and methodologically rigorous studies are needed to evaluate the effectiveness, feasibility, and safety of these interventions across different clinical settings. Integrating evidence-based temperature monitoring, early assessment of shivering, and preventive warming measures into perioperative nursing protocols and professional education may contribute to improved patient comfort, safety, and postoperative recovery.

ETHICAL DECLARATIONS

Ethics Committee Approval

In this study, the data were obtained from articles published in a database, and a bibliometric analysis of the articles was performed.

Informed Consent

Since this study is a bibliometric study, informed consent is not required.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The author declares no conflicts of interest related to this study.

Financial Disclosure

The author received no financial support for the conduct or publication of this research.

Author Contributions

The author is solely responsible for the conception, data collection, analysis, and writing of this manuscript.

Data Availability Statement

The bibliometric data analyzed In this study were retrieved from the Web of Science Core Collection on September 11, 2025. The dataset comprises bibliographic records of 90 articles published between 1981 and 2025. The bibliometric data used for the analyses may be made available by the corresponding author upon reasonable request, subject to the data-sharing and licensing conditions of Web of Science.

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Problematic internet use in adolescents: associations with sociodemographic and clinical characteristics

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ABSTRACT

Aims: This study aimed to examine problematic internet use, as assessed by the Young's Internet Addiction Test-Short Form (YIAT-SF), and its associations with sociodemographic and clinical characteristics among adolescents presenting for the first time to a child and adolescent psychiatry outpatient clinic for various reasons.

Methods: This descriptive cross-sectional study included 156 adolescents aged 12-17 years who presented for the first time to the child and adolescent psychiatry outpatient clinic of a training and research hospital in Kırşehir, Turkiye, between November 2018 and May 2019. Participants were recruited using purposive sampling. Psychiatric diagnoses were established by a psychiatrist following clinical psychiatric assessment, based on DSM-5 diagnostic criteria. Data were collected using a Descriptive Information Form and the YIAT-SF. YIAT-SF scores were compared using the Mann-Whitney U test and Kruskal-Walli's test, with Bonferroni post hoc tests for significant Kruskal-Wallis results.

Results: The mean YIAT-SF score was 29.6±9.9 (median=28.0, IQR=22.0-37.0). Although excessive internet use was the presenting complaint in only 3.8% of adolescents, 62.2% reported difficulty controlling their internet use. YIAT-SF scores did not differ significantly according to gender, education level, economic status, place of residence, psychiatric diagnosis, person deciding to seek professional help, or activity (all $p>0.05$). Technology/internet/online gaming was reported by 34.0% of adolescents, smoking by 21.8%, alcohol use by 3.8%, and other substance/behavioural use by 11.5%. These addictive behaviours were based on self-report and did not represent clinically established addiction diagnoses.

Conclusion: YIAT-SF scores indicated varying levels of problematic internet use among adolescents presenting to child and adolescent psychiatry services for various psychiatric concerns, although excessive internet use was infrequently reported as the primary presenting complaint. The findings support the consideration of internet-use patterns as part of a comprehensive psychiatric assessment. However, given the cross-sectional design, single-center sample, self-reported addictive behaviours, and the fact that data were collected in 2018-2019, the findings should not be interpreted as a current estimate of clinically diagnosed internet addiction. Further studies using contemporary, multicenter, and longitudinal designs are warranted.

Keywords: Adolescent, internet addiction disorder, mental disorders, adolescent psychiatry

INTRODUCTION

Internet use has become an integral part of adolescents' daily lives, but problematic patterns of internet use may negatively affect their psychological and social well-being. Problematic internet use may involve difficulties in controlling internet use despite negative consequences and may be associated with psychological distress, social withdrawal, family conflict, and other emotional and behavioral difficulties (Cerniglia et al., 2017; Durkee et al., 2012; Wang et al., 2022; Young, 2009). Problematic internet use has also been associated with other risk behaviors, including substance use and behavioral difficulties, particularly among adolescents (Evren et al., 2014; Liu et al., 2019).

From a clinical perspective, problematic internet use shows considerable heterogeneity in symptom severity, clinical presentation, psychopathological comorbidities, and treatment needs (Saatçioğlu et al., 2023; So et al., 2019; Ye et al., 2023; Kuss & Lopez-Fernandez, 2016). Its complex etiology and the lack of universally accepted diagnostic and assessment approaches further complicate clinical management (Lozano-Blasco et al., 2022; Kuss et al., 2021; Musetti et al., 2016). Therefore, identifying factors associated with problematic internet use may contribute to its early recognition and appropriate assessment among adolescents presenting to healthcare settings.

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Most studies investigating problematic internet use among adolescents have been conducted in community- or school-based samples, whereas evidence from clinical populations remains comparatively limited (Pan et al., 2020; Hekim et al., 2019; Karaer & Akdemir, 2019). Existing clinical studies have predominantly focused on adolescents presenting with internet-related complaints, clinically identified internet-related problems, or treatment-seeking behaviors, while fewer studies have examined adolescents presenting to child and adolescent psychiatry services for various reasons (Kuss & Lopez-Fernandez, 2016; Hekim et al., 2019; Karaer & Akdemir, 2019). This gap is particularly relevant in Turkiye, where evidence regarding problematic internet use and related technology-use problems among adolescents attending psychiatric services remains limited (Fırat et al., 2018; Hekim et al., 2019; Karaer & Akdemir, 2019).

Therefore, this study aimed to examine problematic internet use, as assessed by the Young's Internet Addiction Test-Short Form (YIAT-SF), and its associated sociodemographic and clinical characteristics among adolescents presenting to a child and adolescent psychiatry outpatient clinic for various reasons. By focusing on a general clinical sample rather than adolescents specifically seeking help for internet-related problems, this study may provide clinically relevant evidence regarding the recognition and assessment of problematic internet use in routine child and adolescent psychiatric practice.

Research questions:

- What is the level of problematic internet use among adolescents presenting to a child and adolescent psychiatry outpatient clinic?
- Do YIAT-SF scores differ according to sociodemographic and clinical characteristics among these adolescents?

METHODS

Ethics

This study was conducted with the approval of the Ethics Committee of Nevşehir Hacı Bektaş Veli University (Date: 27.09.2018, Decision No: 11). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Prior to the interview, the adolescents participating in the study and their families were informed about the purpose of the study, the benefits to be derived from it, and the time they would spend on the interview, and their consent was obtained. Written informed consent was obtained from both the adolescents and their parents or legal guardians. All consent procedures were conducted in accordance with the ethics committee's approval.

Design and Setting

This cross-sectional study was conducted in the child psychiatry outpatient clinic of a training and research hospital in Kırşehir province, located in the Central Anatolia Region of Turkiye. This was the only child and adolescent psychiatry clinic in the city.

Sampling Frame and Sample

The clinic sampling frame consisted of 300 adolescents aged 12-17 years who presented to the child and adolescent psychiatry outpatient clinic for various reasons during the study period (2018 November- 2019 May). The required sample size was calculated using a finite population sample size calculation for a known sampling frame, with a 95% confidence level and a 5% margin of error. Based on these parameters, the minimum required sample size was determined to be 168 participants.

Eligible participants were recruited using purposive sampling. The final sample size was below the calculated minimum of 168 participants due to the exclusion of 10 adolescents involved in preliminary testing and two adolescents with incomplete or incorrectly completed questionnaires. Thus, the final analytical sample consisted of 156 adolescents, all of whom were included in the statistical analyses.

Inclusion criteria: Adolescents aged 12-17 years who were presenting to the child and adolescent psychiatry outpatient clinic for the first time were included in the study.

Exclusion criteria: Adolescents with a known psychiatric diagnosis, intellectual disability, neurological or metabolic disorder, or other medical condition that could interfere with the study assessment were excluded.

Psychiatric Diagnostic Assessment

Psychiatric diagnostic assessments were conducted by the second researcher, who was a psychiatrist. No structured or semi-structured diagnostic interview was used. Following a clinical psychiatric examination, diagnoses were established according to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Both adolescents and their parents were interviewed as part of the clinical assessment. Primary and comorbid diagnoses were determined based on the clinical evaluation and recorded accordingly. No diagnostic disagreements or uncertain cases occurred during the assessment process.

Data Collection Tools

Data were collected using the Descriptive Information Form and the YIAT-SF.

Descriptive Information Form: The Descriptive Information Form consisted of 24 questions developed by the researchers based on a review of the literature (Cerniglia et al., 2017; Hekim et al., 2019). The form assessed adolescents' sociodemographic characteristics (e.g., age, gender, education level, economic status, and place of residence), medical and psychiatric history, and internet-use characteristics. Internet-use characteristics included the duration of internet-related complaints, the person reporting excessive internet use (the adolescent, parents, both parents and the adolescent, or no complaints), whether excessive internet use was a presenting complaint (yes/no), and whether the adolescent reported difficulty controlling internet use (yes/no).

Regarding addictive behaviours, adolescents were asked, "Which of the following addictive behaviours do you engage in?" The response options included smoking, alcohol use, technology/internet/online gaming, other substance/behavioural use, and none. Participants could select more than one response. These responses were based on self-report and did not represent clinically established addiction diagnoses.

For variables with denominators lower than the total sample, the corresponding denominators reflect the applicability

of the question or the availability of a valid response. The reported symptoms item was applicable only to adolescents who reported symptoms at presentation (n=117). The leisure activity item was answered by 152 participants, as four adolescents declined to answer this question. No imputation was performed for the four missing responses.

The Young's Internet Addiction Test-Short Form (YIAT-SF): The YIAT-SF was originally developed by Young (1998) and shortened to a 12-item version by Pawlikowski et al. (2013). The Turkish validity and reliability study was conducted by Kutlu et al. (2016) in both university students and adolescents, including adolescents aged 14-17 years. The Turkish version consists of 12 items rated on a five-point Likert scale (1=never, 5=very often), with total scores ranging from 12 to 60. Higher scores indicate higher levels of problematic internet use as measured by the YIAT-SF. The Turkish validation study supported a one-factor structure and demonstrated acceptable validity and reliability among adolescents. In the present study, the questionnaire was administered in Turkish as a self-report measure, using the original response options and scoring procedure. The Cronbach's alpha coefficient was 0.86 in the Turkish adolescent validation study and 0.86 in the present study.

Statistical Analysis

Study data were analyzed using SPSS (Statistical Package for the Social Sciences) version 21.0(IBM Corp., Armonk, NY, USA). Descriptive characteristics were presented using number (n), percentage (%), mean±standard deviation, median, and 25th and 75th percentile values [M (25th-75th)]. The normality of the data was evaluated using the Kolmogorov-Smirnov test. The YIAT-SF total score was analysed as a continuous variable, and no categorical cut-off points were applied. Continuous variables were compared using the Mann-Whitney U test for two-group comparisons and the Kruskal-Wallis test for comparisons involving more than two groups. Significant Kruskal-Wallis results were further evaluated using the Bonferroni post hoc test.

Missing data were handled using available-case analysis; no imputation was performed. Variables with missing responses were analysed using the available observations, and the corresponding denominators were reported in the tables. Symptom-related data were based on the 117 adolescents who reported symptoms at presentation, whereas leisure activity data were available for 152 adolescents because four participants did not provide a response.

Reporting Guideline

This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (von Elm et al., 2007).

RESULTS

The mean age of the adolescents was 15.1±1.5 years, and 59.0% were female. Most participants (69.2%) were high school students. At least one psychiatric disorder was identified in all adolescents, while 26.9% had more than one psychiatric disorder. The most common diagnoses were major depressive disorder (MDD) (28.8%), attention-deficit/hyperactivity disorder (ADHD) (23.1%), and generalized anxiety disorder (16.0%) (Table 1).

Table 1. Descriptive characteristics of the adolescents (n=156)

Mean age		
Mean±SD	15.1±1.5	
Characteristics	**n**	**%**
Gender		
Female	92	59.0
Male	64	41.0
Education level		
Middle school	48	30.8
High school	108	69.2
Economic status		
Income<expenses	30	19.2
Income>expenses	104	66.7
Income=expenses	22	14.1
Place of residence		
Province	111	71.2
District	28	17.9
Village	17	10.9
Parents		
Alive	145	92.9
Divorced or not alive	11	7.1
Birth order		
First or only child	66	42.3
Second	48	30.8
Third	19	12.2
≥Fourth	23	14.7
Reported symptoms among adolescents reporting symptoms*/ (n=117)**		
Lack of attention/inability to focus	25	21.4
Aggressive/anger management problem	24	20.5
Depression, anhedonia, unhappiness	23	19.7
Stress/distress	10	8.5
Fear, anxiety, breathlessness, panic attack	17	14.5
Sleep disorders	7	6.0
Other (suicide, obsession, being asocial, lack of self-confidence, etc.)	17	14.5
Diagnosis		
MDD	45	28.8
ADHD	36	23.1
GAD	25	16.0
SAD	5	3.2
Other (panic disorder, PTSD, OCD)	3	1.9
Multiple	42	26.9
Self-reported addictive behaviours*		
Smoking	34	21.8
Alcohol	6	3.8
Technology, the internet, online games	53	34.0
Other substance/behavioural use	18	11.5
None	75	48.1
Activity (n:152)		
Yes	74	48.7
No	78	51.3

*Multiple responses were permitted; therefore, percentages do not sum to 100%. **This item was applicable only to participants who reported symptoms at presentation. SD: Standard deviation, MDD: Major depressive disorder, ADHD: Attention-deficit/hyperactivity disorder, GAD: Generalized anxiety disorder, SAD: Social anxiety disorder, PTSD: Post-traumatic stress disorder, OCD: Obsessive-compulsive disorder

Among the 117 adolescents who reported symptoms, the most frequently reported symptoms were lack of attention/inability to focus (21.4%), aggressive or anger-management problems (20.5%), and depression, anhedonia, or unhappiness (19.7%) (Table 1).

The mean YIAT-SF score was 29.6±9.9 (median=28.0, IQR=22.0–37.0; range=12–56). Excessive internet use was the presenting complaint in 3.8% of adolescents; however, 62.2% (97/156) reported having difficulty controlling their internet use. The mean duration of internet-related complaints was 631.4±714.8 days. Further internet-use characteristics are presented in Table 2.

Table 2. Distribution of adolescents according to selected characteristics related to problematic internet use (n=156)

Characteristics		
YIAT-SF score		
Mean±SD	29.6±9.9	
Median (IQR)	28.0 (22.0–37.0)	
Min–max	12–56	
Duration of internet-related complaints (days)		
Mean±SD	631.4±714.8	
	n	**%**
Person reporting excessive internet use		
The adolescent	17	10.9
Parents	50	32.1
Parents and the adolescent	47	30.1
No complaints	42	26.9
Presenting complaint of excessive internet use		
Yes	6	3.8
No	150	96.2
	n	**%**
Difficulty controlling internet use		
Yes	97	62.2
No	59	37.8

YIAT-SF: Young's Internet Addiction Test-Short Form, SD: Standard deviation, IQR: Interquartile range, Min: Minimum, Max: Maximum

Self-reported addictive behaviours were assessed using a multiple-response question; therefore, the percentages do not sum to 100%. Technology/internet/online gaming was reported by 34.0% of adolescents, smoking by 21.8%, alcohol use by 3.8%, and other substance/behavioural use by 11.5%, while 48.1% reported none of these behaviours (Table 1).

YIAT-SF scores did not differ significantly according to gender, education level, economic status, place of residence, psychiatric diagnosis, person deciding to seek professional help, or engagement in leisure activities (all p>0.05) (Table 3).

Table 3. Comparison of YIAT-SF scores according to selected sociodemographic and clinical characteristics (n=156)

Characteristics	Mean±SD; median (IQR)	Statistical analysis	p
Gender			
Female	29.0±9.40 28.0(22.0-36.25)	Z=-0.314	0.754
Male	30.0±10.53 28.5 (21.75-37.25)	Z=-0.314	0.754
Education level			
Middle school	29.8±9.97 28.00 (21.00-38.00)	Z=-0.010	0.992
High school	29.6±9.70 28.00 (22.00-37.00)	Z=-0.010	0.992
Economic status			
Income<expenses	29.4±9.45 28.00 (23.00-35.00)	H=1.216	0.544
Income>expenses	29.07±9.74 28.00 (21.00-37.00)	H=1.216	0.544
Income=expenses	32.0±11.20 34.00 (21.00-40.50)	H=1.216	0.544
Place of residence			
Province	30.09±9.86 29.00 (22.00-37.00)	H=4.239	0.120
District	25.96±9.67 26.00 (17.00-34.75)	H=4.239	0.120
Village	31.17±9.34 30.00 (24.00-38.50)	H=4.239	0.120
Diagnosis			
MDD	30.27±10.76 30.00 (20.25-37.00)	H=5.579	0.233
ADHD	28.26±8.32 27.00 (23.50-33.25)	H=5.579	0.233
GAD	27.84±9.92 27.00 (20.50-32.50)	H=5.579	0.233
SAD	24.14±5.75 24.00 (20.00-27.00)	H=5.579	0.233
Comorbid/other	31.63±10.58 31.00 (23.00-39.00)	H=5.579	0.233
Person deciding to see a professional			
The adolescent (31)	28.67±9.44 29.00 (21.00-36.00)	H=3.197	0.525
Mother (58)	30.56±10.6 27.5 (23.00-38.25)	H=3.197	0.525
Father (7)	24.28±9.14 17.00 (12.00-24.00)	H=3.197	0.525
Mother and father (19)	27.7±9.01 27.00 (19.00-35.00)	H=3.197	0.525
Other (41)	30.1±9.46 29.00 (23.50-37.50)	H=3.197	0.525
Activity			
Yes	28.90±9.75 27.00 (21.00-36.25)	Z=-0.778	0.436
No	29.92±10.20 29.00 (22.75-37.25)	Z=-0.778	0.436

(table continues)

YIAT-SF: Young's Internet Addiction Test-Short Form, SD: Standard deviation, IQR: Interquartile range, Z: Mann–Whitney U test statistic, H: Kruskal–Wallis's test statistic, MDD: Major depressive disorder, ADHD: Attention-deficit/hyperactivity disorder, GAD: Generalized anxiety disorder, SAD: Social anxiety disorder

DISCUSSION

In this study, which examined problematic internet use and related clinical characteristics among adolescents presenting to a child and adolescent psychiatry outpatient clinic, the mean YIAT-SF score was 29.6±9.9. Although excessive internet use was the presenting complaint in only 3.8% of adolescents, 62.2% reported difficulty controlling their internet use during the clinical assessment. These findings suggest that difficulties related to internet use may be present even when internet use is not the primary reason for seeking psychiatric care, highlighting the potential value of routinely assessing internet-use patterns during clinical evaluation.

Compared with the relatively small proportion of adolescents who presented directly because of excessive internet use, a considerably larger proportion reported difficulty controlling their internet use. In addition, internet-related complaints had persisted for a mean of approximately 21 months (631.4±714.8 days). Previous studies conducted in clinical adolescent samples in Turkiye have similarly indicated that problematic internet use may occur among adolescents presenting with different psychiatric complaints (Hekim et al., 2019; Karaer & Akdemir, 2019). However, direct comparisons of prevalence or severity across studies should be made cautiously because of differences in measurement instruments, operational definitions, and clinical populations.

The discrepancy between the primary presenting complaint and the internet-use difficulties identified during assessment is clinically noteworthy. Among adolescents who reported symptoms at presentation, commonly reported symptoms included attention and concentration difficulties, anger-management problems, depressive symptoms, anxiety, and sleep problems. This observation is consistent with previous clinical research from Turkiye showing that technology-related problems may occur alongside a range of psychiatric symptoms among adolescents presenting to psychiatric services (Fırat et al., 2018). These findings suggest that problematic internet use may sometimes represent an additional clinical concern rather than the primary presenting problem.

The presence of self-reported smoking, alcohol use, and other substance/behavioral use in a proportion of participants is also clinically noteworthy. Previous research has reported associations between problematic internet use and substance-related or other potentially addictive behaviors among adolescents and young people (Evren et al., 2014; Liu et al., 2019; Di Nicola et al., 2015; Lanthier-Labonté et al., 2020). In the present study, however, these behaviors were assessed using a researcher-developed self-report question and were not evaluated using validated instruments or diagnostic criteria. Therefore, the observed patterns should not be interpreted as evidence of comorbid addiction diagnoses.

The YIAT-SF scores did not differ significantly according to gender, education level, economic status, place of residence, psychiatric diagnosis, person deciding to seek professional help, or engagement in leisure activities. These findings suggest that, within this clinical sample, YIAT-SF scores were not significantly associated with the examined sociodemographic or clinical characteristics. Nevertheless, these analyses were based on unadjusted bivariate comparisons, and potential confounding factors were not controlled for. Therefore, the findings should be interpreted as exploratory associations rather than evidence of independent relationships.

Previous studies and meta-analyses have reported associations between problematic internet use and conditions such as ADHD and MDD (Wang et al., 2017; Ye et al., 2023). Longitudinal clinical research has also examined the relationship between problematic internet use and the course of depressive symptoms, although the directionality of this relationship remains complex (Zhou et al., 2023). In the present study, all adolescents had at least one psychiatric diagnosis, and 26.9% had multiple diagnoses. Although the differences in YIAT-SF scores across diagnostic groups were not statistically significant, adolescents with MDD and ADHD had relatively higher mean scores than some other diagnostic groups. These descriptive differences should be interpreted cautiously because the overall diagnostic-group comparison was not statistically significant and the analyses were not adjusted for potential confounders. Furthermore, given the cross-sectional design, the direction or temporal relationship between problematic internet use and psychopathology cannot be determined.

From a clinical perspective, the findings support the consideration of internet-use patterns as part of the broader psychiatric assessment of adolescents. Rather than assuming that problematic internet use is the primary clinical problem, clinicians may consider assessing the frequency and context of internet use, perceived loss of control, functional consequences, and its relationship with the adolescent's presenting symptoms. Such an approach may be particularly relevant for adolescents who do not spontaneously identify internet use as a concern. Previous research has similarly emphasized the complex relationship between problematic internet use and psychopathology and the importance of comprehensive clinical assessment (So et al., 2019; Ye et al., 2023; Kuss & Lopez-Fernandez, 2016).

Overall, the findings suggest that problematic internet use may be clinically relevant even when it is not the primary reason for presentation to child and adolescent psychiatry services. The relatively low proportion of adolescents reporting excessive internet use as a presenting complaint, compared with the substantially higher proportion reporting difficulty controlling their internet use, suggests that internet-related difficulties may not always emerge as the primary presenting concern during help-seeking. This finding underscores the potential usefulness of brief, standardized assessment of internet-use patterns as part of routine psychiatric evaluation, while recognizing that YIAT-SF scores alone do not establish a clinical diagnosis of internet addiction.

Limitations

This study has several limitations. First, its cross-sectional design precludes conclusions regarding temporal or causal relationships between problematic internet use and psychiatric characteristics. Second, the study was conducted in a single child and adolescent psychiatry outpatient clinic using purposive sampling, which limits the generalizability of the findings to other clinical and community populations. Third, internet-use characteristics and other addictive behaviors were assessed partly through self-report and may therefore have been subject to recall and social-desirability

bias. In addition, other addictive behaviors were assessed using researcher-developed self-report questions rather than validated instruments or clinical diagnostic criteria.

Fourth, the statistical analyses were primarily based on unadjusted bivariate comparisons. Therefore, potential confounding by age, gender, socioeconomic characteristics, psychiatric diagnosis, and other relevant factors could not be controlled for. The observed associations should consequently be interpreted as exploratory rather than as evidence of independent relationships. In addition, the final sample size (n=156) was slightly below the calculated minimum requirement (n=168), which may have reduced statistical precision and the ability to detect small associations. Fifth, although the YIAT-SF was used to assess problematic internet use, no categorical cut-off points were applied in the present study. Accordingly, the findings should not be interpreted as estimates of the prevalence of clinically diagnosed internet addiction.

Finally, the data were collected in 2018/2019. Given the rapid evolution of adolescents' internet use, social media practices, online gaming, and other digital behaviors, the findings may not fully represent current patterns of problematic internet use. Nevertheless, the study provides clinically relevant information from a child and adolescent psychiatry outpatient setting and highlights the potential value of considering internet-use difficulties during routine psychiatric assessment.

CONCLUSION

In this study, adolescents presenting to a child and adolescent psychiatry outpatient clinic had a mean YIAT-SF score of 29.6±9.9, reflecting the distribution of problematic internet-use scores within this clinical sample. Although excessive internet use was the presenting complaint in only a small proportion of adolescents, difficulty controlling internet use was reported by a substantially larger proportion during clinical assessment. YIAT-SF scores did not differ significantly according to the examined sociodemographic or clinical characteristics, including psychiatric diagnosis.

These findings suggest that problematic internet use may be present among adolescents presenting with a range of psychiatric concerns and may not always emerge as the primary presenting problem. Routine consideration of internet-use patterns, particularly perceived difficulty controlling use, may therefore be useful as part of a comprehensive psychiatric assessment. Standardized assessment tools may complement clinical questioning and facilitate the identification of internet-related difficulties that are not reported as the primary presenting concern.

Future research should include larger, multicenter, and contemporary samples to better reflect current patterns of adolescent internet use. Longitudinal studies are also needed to clarify the temporal relationships between problematic internet use and psychiatric symptoms and to identify factors that may contribute to the persistence or progression of problematic internet use.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was conducted with the approval of the Ethics Committee of Nevşehir Hacı Bektaş Veli University (Date: 27.09.2018, Decision No: 11).

Informed Consent

Informed consent was obtained from a parent or legal guardian. Where appropriate, age-adjusted assent was also obtained from the child. The inclusion of vulnerable populations in this study adhered to national and international ethical guidelines. Extra care was taken to ensure voluntary participation, understanding, and protection of participant dignity and autonomy.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

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Author Contributions

Concept: ŞŞK, DA, ND; Design: ŞŞK, DA, ND; Control: ŞŞK, DA, ND; Resources: ŞŞK, DA; Materials: ŞŞK, DA, ND; Data Collection and/or Processing: ŞŞK, DA; Analysis and/or Interpretation: ŞŞK, DA, ND; Literature Review: ŞŞK, DA, ND; Article Writing: ŞŞK, DA, ND; Critical Review: All Authors.

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The salutogenic model in psychiatric disorders: a systematic review of applications and outcomes

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ABSTRACT

This systematic review aimed to examine how the salutogenic model has been applied in psychiatric disorders and to synthesize evidence regarding its clinical relevance. A systematic search was conducted in Web of Science, Scopus, and PubMed, yielding 525 records. Following the removal of duplicates and screening according to predefined eligibility criteria, 31 studies were included in the final review. The studies encompassed a wide range of psychiatric populations, including individuals with schizophrenia, mood disorders, substance use disorders, and trauma-related conditions.

The findings demonstrated that the salutogenic model has been applied primarily as an explanatory framework for understanding mental health beyond symptom reduction, as a predictor of recovery-related outcomes, and as a foundation for intervention development. Across studies, higher levels of sense of coherence (SOC) and related psychosocial resources were consistently associated with lower symptom severity, better functioning, enhanced quality of life, and reduced engagement in risk behaviors. Longitudinal evidence suggested that salutogenic processes are dynamic and may strengthen over time, particularly during recovery. Intervention studies indicated that resource-oriented and salutogenic approaches can improve psychological resources, although their effects on SOC were not consistently significant. Social and contextual factors, particularly social support and stigma, also played an important role in shaping salutogenic processes and mental health outcomes. Overall, the evidence supports the clinical relevance of the salutogenic model in psychiatric settings and highlights the importance of incorporating resource-oriented and recovery-focused approaches into mental health care.

Keywords: Sense of coherence, mental disorders, mental health

INTRODUCTION

For decades, the dominant paradigm in health sciences has been the pathogenic model, which primarily focuses on identifying the causes of disease and pathological processes. Although this approach has significantly contributed to understanding the mechanisms underlying illness, it remains limited in explaining how individuals maintain health and well-being despite exposure to adversity and stressors. In response to this limitation, Aaron Antonovsky introduced the salutogenic model in the late 1970s, shifting the focus from disease to the origins of health and emphasizing the processes that support individuals in moving along the health–illness continuum (Antonovsky, 1987; Klepp et al., 2007). Within this framework, health is conceptualized not as a dichotomous state but as a dynamic continuum influenced by the individual's ability to utilize available resources to cope with life stressors.

At the core of the salutogenic model lies the concept of sense of coherence (SOC), defined as a global orientation reflecting the extent to which individuals perceive life as comprehensible, manageable, and meaningful (Antonovsky, 1987). These three interrelated components-comprehensibility, manageability, and meaningfulness-operate synergistically to facilitate adaptive coping and resilience in the face of stress (Klepp et al., 2007). SOC is not a specific coping strategy but rather a generalized capacity that enables individuals to mobilize internal and external resources effectively, thereby enhancing their ability to deal with both everyday challenges and major life adversities. Empirical evidence suggests that SOC reflects a broader adaptive capacity shaped by general resistance resources, including cognitive, emotional, social, and material factors (Griffiths et al., 2011).

A growing body of research has demonstrated the relevance of SOC in mental health contexts. Individuals with higher SOC tend to report lower levels of psychological distress, including depression, anxiety, and other psychiatric symptoms, and exhibit better overall psychological well-being (Klepp et al., 2007; Fiscone et al., 2024). Conversely, lower SOC has been associated with increased vulnerability to mental health problems and reduced coping capacity. In clinical populations, particularly among individuals with severe mental illnesses such as schizophrenia, higher SOC has been linked to lower symptom severity, improved

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recovery trajectories, and better quality of life (Witkowska-Łuć, 2018). These findings support the role of SOC as a protective and health-promoting factor within psychiatric populations.

Furthermore, psychosocial factors such as stigma, social rejection, and reduced empowerment have been shown to negatively influence SOC levels among individuals with mental illness. Experiences of stigma and discrimination are associated with lower SOC, self-esteem, and empowerment, indicating that social context plays a critical role in shaping individuals' coping resources and psychological resilience (Lundberg et al., 2009). At the same time, evidence from vulnerable populations, such as refugees and forcibly displaced individuals, highlights the importance of SOC and related constructs in mitigating the negative effects of trauma and chronic stress on mental health (Fiscone et al., 2024) .

In summary, the salutogenic model and its central construct, SOC, offer a comprehensive framework for understanding mental health beyond the traditional pathogenic perspective. By focusing on strengths, resources, and adaptive processes, the salutogenic approach provides valuable insights into how individuals maintain psychological well-being and recover from mental illness. Therefore, integrating the salutogenic model into psychiatric research and practice represents a promising direction for enhancing recovery-oriented and resource-based mental health care.

Despite the growing body of research on SOC and related psychosocial resources, the application of the salutogenic model in psychiatric populations has not yet been comprehensively synthesized. Existing studies are often fragmented across diagnostic groups, methodologies, and conceptual approaches, limiting a coherent understanding of how salutogenic principles contribute to mental health and recovery processes. Therefore, the aim of this systematic review is to examine how the salutogenic model has been utilized in the context of psychiatric disorders and to synthesize the available evidence regarding its explanatory, predictive, and intervention-based roles. Specifically, this review seeks to (i) explore the use of the salutogenic framework in understanding mental health beyond symptomatology, (ii) evaluate the role of SOC and related resources in predicting clinical and recovery outcomes, and (iii) assess the extent to which salutogenic principles have been integrated into intervention studies within psychiatric settings.

METHODS

Study Design

This study is a systematic review conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The primary aim was to comprehensively examine the literature on the application of the salutogenic model in mental health disorders.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of Studies

This review included quantitative, qualitative, and mixed-methods studies that examined the application of the salutogenic model in psychiatric contexts. Given the exploratory nature of the review topic, a broad range of study designs-including cross-sectional, longitudinal, randomized controlled trials, quasi-experimental, and qualitative studies-were considered in order to capture the full scope of existing evidence.

Types of Participants

The review focused on individuals diagnosed with psychiatric disorders, including but not limited to schizophrenia, bipolar disorder, major depressive disorder, substance use disorders, and trauma-related conditions. Studies conducted in both inpatient and outpatient psychiatric settings, as well as community-based samples with clinically relevant mental health conditions, were included.

Types of Interventions/Phenomena of Interest

This review examined studies that applied the salutogenic model either directly or indirectly. Direct applications included interventions explicitly based on salutogenic principles (e.g., salutogenic therapy, resource-oriented programs), while indirect applications included studies examining core components of the model, such as sense of coherence, generalized resistance resources, and related psychosocial constructs (e.g., social support, self-efficacy, resilience). Additionally, studies conducted in general population samples were considered eligible when they explicitly examined sense of coherence (SOC) as a central study variable or intervention outcome, providing relevant evidence on the application of salutogenic principles to mental health promotion and psychological well-being.

Types of Outcome Measures

The primary outcomes of interest included:

- Psychiatric symptom severity (e.g., depression, anxiety, psychosis)
- Quality of life and well-being
- Psychosocial functioning
- Recovery-related outcomes (e.g., remission, relapse, coping, resilience)
- Secondary outcomes included:
- Sense of coherence
- Social support and psychosocial resources
- Self-efficacy and adaptive coping mechanisms

Search Strategy

A systematic search was conducted using three major electronic databases: Web of Science, Scopus, and PubMed. The search strategy followed a staged approach, as recommended by JBI guidelines. In the initial stage, a limited search was conducted to identify relevant keywords and index terms related to the salutogenic model and psychiatric disorders. Based on this preliminary search, a comprehensive search strategy was developed using combinations of keywords such as "salutogenesis," "sense of coherence," "mental health," and "psychiatric disorders." The Boolean search strategy was as follows: ("salutogenesis" OR "salutogenic" OR "sense of coherence" OR "generalized resistance resources") AND ("mental health" OR "mental disorders" OR "psychiatric disorders" OR "schizophrenia" OR "bipolar disorder" OR

"depression" OR "substance use disorders" OR "trauma-related disorders" OR "psychological well-being"). The initial systematic literature search was conducted in March 2025. To ensure the inclusion of the most recent evidence, the database search was updated in May 2026 using the same search strategy and eligibility criteria. Following this initial search, additional databases were incorporated to enhance the comprehensiveness of the review, and the search was subsequently expanded. The full search was then performed across all selected databases without restricting study design. Reference lists of all included studies were manually screened to identify additional relevant publications. Only studies published in English were included. All studies identified through the search process were screened based on titles, abstracts, and keywords. Full texts of potentially relevant studies were retrieved and assessed against the inclusion criteria.

Assessment of Methodological Quality

The methodological quality of the included studies was assessed using standardized critical appraisal tools appropriate to each study design, in accordance with JBI recommendations. Each study was evaluated based on criteria such as study design, sampling methods, measurement validity, and risk of bias. The appraisal process was conducted independently by the review team, and discrepancies were resolved through discussion. Although variations in methodological quality were identified across studies, no studies were excluded based on quality assessment. Instead, all eligible studies were retained to provide a comprehensive overview of the application of the salutogenic model in psychiatric contexts, and methodological limitations were taken into account during the interpretation of findings.

Data Extraction

Data were extracted using a structured data extraction form developed by the researchers in line with JBI guidance.

Extracted data included:

- Author(s), year, and country
- Study design
- Sample characteristics
- Objectives
- Measurement tools
- Key findings related to the salutogenic model (Table).

The data extraction form was refined iteratively during the review process to ensure consistency and comprehensiveness.

Data Synthesis

Given the heterogeneity of study designs, populations, and outcome measures, a meta-analysis was not considered appropriate. Instead, a narrative synthesis approach was employed.

The findings were synthesized thematically based on the role of the salutogenic model in psychiatric contexts, including:

- Explanatory role of the model
- Predictive role in mental health outcomes
- Application in intervention studies

This approach enabled the integration of findings across diverse methodologies and provided a comprehensive understanding of how the salutogenic model has been utilized in psychiatric research and practice.

RESULTS

Study Characteristics

A total of 31 studies were included in this review (Figure), encompassing a wide range of study designs, psychiatric populations, and methodological approaches. The included studies demonstrated considerable heterogeneity, reflecting the broad application of the salutogenic model across mental health research.

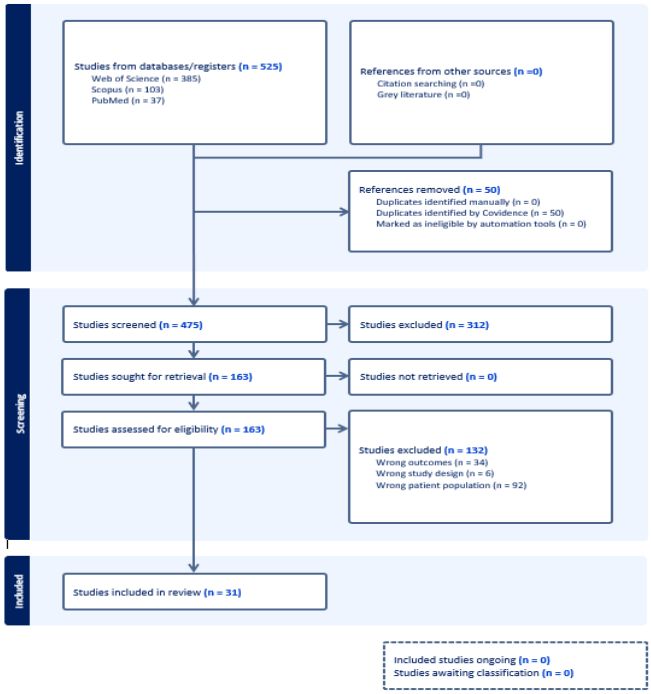

Figure 1. Flow diagram of the systematic review and article selection process according to PRISMA

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

In terms of study design, the majority of studies employed quantitative approaches, including cross-sectional designs (Tagay et al., 2005; Bergstein et al., 2008; Lundberg et al., 2009; Henje Blom et al., 2010; Glück et al., 2016; Witkowska-Łuć, 2018; Badura-Brzoza et al., 2019; Başkaya, 2026; Malinowska & Rodzeń, 2026), longitudinal or prospective studies (Hansson et al., 2004; Skärsäter et al., 2005; 2009; Langeland et al., 2007; Sjöström et al., 2012; Stein-Parbury et al., 2012; Schäfer et al., 2020; Vagedes et al., 2021; Pålsson & Landén, 2025), and randomized controlled trials (Forsberg et al., 2010; Schrank et al., 2016; Aci & Kutlu, 2022; Westerberg et al., 2023; Khedr et al., 2024; Nomura et al., 2026) or quasi-experimental interventions (Johansson et al., 2018; Komóczi & Kósa, 2025; Kuroda et al., 2026). In addition, one study focused on intervention development or implementation of salutogenic frameworks in clinical settings (Langeland et al., 2007). This diversity highlights that the salutogenic model has been explored both as an explanatory framework and as a basis for intervention design.

The sample sizes varied considerably, ranging from small pilot samples (e.g., n=20) (Kuroda et al., 2026) to large clinical

Table. Characteristics of the included studies

Author/year and country	Research type	Sample size	Objective	Measurement tools	Findings
Bergstein et al. 2008 Israel	Cross-sectional	The study included 48 patients diagnosed with delusional disorder.	This study aimed to examine the role of sense of coherence (SOC) in predicting remission and risk of relapse among patients with delusional disorder.	Sense of Coherence (SOC) Scale Positive and Negative Syndrome Scale (PANSS)	Patients with higher SOC scores demonstrated faster remission and a lower risk of relapse compared to those with lower SOC scores. A negative correlation was found between SOC scores and PANSS scores; that is, a stronger sense of coherence was associated with less severe symptoms.
Bengtsson-Tops & Hansson 2001 Sweden	Longitudinal study (18-month follow-up)	120 patients with schizophrenia or schizoaffective disorder	To examine the construct and predictive validity of sense of coherence in individuals with schizophrenia and its relationship with psychological, social, and health-related outcomes	Sense of Coherence (SOC) Scale Pearlin's Mastery Scale Rosenberg Self-Esteem ScaleInterview Schedule for Social Interactions (ISSI) Brief Psychiatric Rating Scale (BPRS) Lancashire Quality of Life Profile (LQOLP) Global Assessment of Functioning (GAF)	Sense of coherence was positively associated with mastery, self-esteem, social support, quality of life, well-being, and psychosocial functioning, and negatively associated with psychiatric symptoms. Changes in SOC over time were significantly correlated with improvements in quality of life, general health, and overall well-being, supporting both the construct and predictive validity of SOC in individuals with schizophrenia
Henje Blom et al. 2010 Sweden	Cross-sectional comparative study	139 adolescent females (73 clinical, 66 non-clinical)	To examine whether sense of coherence represents a distinct salutogenic construct or reflects symptoms of anxiety and depression	Sense of Coherence (SOC) Scale Beck Depression Inventory (BDI) Beck Anxiety Inventory (BAI) Strengths and Difficulties Questionnaire – Emotional Symptoms Subscale (SDQ-em)	Sense of coherence showed strong inverse correlations with depression and anxiety measures, and these variables explained a large proportion of SOC variance. Multivariate analyses failed to support SOC as a distinct construct, suggesting that SOC may function as an inverse indicator of persistent depressive and anxiety symptoms rather than a separate salutogenic factor.
Grevenstein et al. 2016 Germany	Prospective and longitudinal	A total of 318 adolescents, aged 14–15 years at baseline, participated in the study.	To examine the incremental validity of sense of coherence compared to neuroticism, extraversion, and self-efficacy in predicting substance use and mental health	SOC-13 Neuroticism & Extraversion (FPI-R) General Self-Efficacy Scale SCL-90-R (mental health) Substance use frequency measure	Sense of coherence demonstrated significant long-term predictive power for both substance use and mental health outcomes. It showed incremental validity beyond neuroticism, extraversion, and self-efficacy, and was the only variable predicting long-term mental health, supporting its role as a distinct and robust salutogenic construct.
Witkowska-Łuć (2018), Poland	Cross-sectional (with pre–post clinical assessment during hospitalization)	n=134 patients with schizophrenia or schizoaffective disorder	To examine the relationship between sense of coherence and symptomatic improvement during hospitalization in patients with schizophrenia spectrum disorders	Sense of Coherence Scale (SOC-29) Positive and Negative Syndrome Scale (PANSS)	Higher sense of coherence was associated with lower severity of negative and general psychopathological symptoms at admission Sense of comprehensibility showed the strongest associations with symptom severity Higher SOC was linked to less symptom escalation during hospitalization However, greater symptom improvement (reduction) was paradoxically associated with lower SOC levels, possibly reflecting increased illness insight during recovery
Lundberg et al., 2009, Sweden	Quantitative (cross-sectional study)	200 individuals with current or previous contact with mental health services	To examine the relationship between stigma-related rejection experiences and self-related variables, including sense of coherence, self-esteem, and empowerment among individuals with mental illness	Sense of Coherence Scale (SOC-13) Rejection Experience Scale Rosenberg Self-Esteem Scale Empowerment Scale	Higher levels of rejection experiences were significantly associated with lower sense of coherence, lower self-esteem, and lower empowerment. A moderate negative correlation was found between stigma experiences and SOC, suggesting that SOC may play a role in how individuals with mental illness cope with stigma.
Schäfer et al., 2020, Germany	Quantitative (longitudinal, two-wave study)	294 patients receiving inpatient psychosomatic rehabilitation	To investigate whether pre-treatment sense of coherence predicts changes in psychopathological symptoms following rehabilitation	Sense of Coherence Scale (SOC-13) Health-49 (general mental health problems) Beck Depression Inventory-II (BDI-II) Beck Anxiety Inventory (BAI)	Sense of coherence significantly increased following treatment, while depression, anxiety, and general mental health problems significantly decreased. Pre-treatment SOC was a significant negative predictor of post-treatment symptom severity across all outcomes, even after controlling for baseline symptoms. Higher SOC levels were associated with greater symptom improvement, indicating that SOC plays a predictive role in mental health recovery.

(table continues)

Table. Characteristics of the included studies (table continues)

Vagedes et al., 2021, Germany	Quantitative (long-term follow-up, correlational study)	68 former patients with anorexia nervosa (initial N=149)	To examine the relationship between sense of coherence and long-term eating disorder symptoms in individuals previously hospitalized for anorexia nervosa	Sense of Coherence Scale (SOC-13) Eating Disorder Inventory (EDI-2)	Sense of coherence was significantly lower than normative values among individuals with a history of anorexia nervosa. SOC scores were negatively correlated with all eating disorder symptom subscales, indicating that lower SOC was associated with more severe ongoing symptoms. Individuals with lower SOC demonstrated significantly higher levels of eating disorder pathology at long-term follow-up.
Başkaya, 2026, Turkiye	Quantitative (cross-sectional, correlational study)	104 patients diagnosed with schizophrenia	To examine the relationship between sense of coherence, cognitive flexibility, and well-being in individuals with schizophrenia	Sense of Coherence Scale (SOC) Cognitive Flexibility Inventory (CFI) Flourishing Scale (FS)	Sense of coherence was positively and significantly associated with both cognitive flexibility and well-being. Higher levels of cognitive flexibility and well-being were linked to higher SOC scores. Additionally, cognitive flexibility and well-being together explained a substantial proportion of variance in SOC, indicating that these factors are important correlates of SOC in individuals with schizophrenia.
Skärsäter et al., 2005, Sweden	Quantitative (prospective longitudinal study)	24 patients with first-episode major depression	To explore the relationship between sense of coherence, social support, and recovery in patients treated for a first episode of major depression over a one-year follow-up period	Sense of Coherence Scale (SOC-29) Montgomery Åsberg Depression Rating Scale (MADRS) Support-Q (social support and social network)	Patients exhibited low sense of coherence at baseline, which significantly increased among those who recovered at the one-year follow-up. Approximately 71% of patients achieved recovery, and this group demonstrated significant improvements in both SOC and perceived social support. Changes in SOC were significantly associated with changes in depressive symptoms, indicating that SOC is dynamically related to recovery processes in major depression.
Sjöström et al., 2012, Sweden	Quantitative (prospective clinical study)	155 patients admitted after a suicide attempt	To examine whether low sense of coherence predicts suicidality and repeat suicide attempts in individuals hospitalized after a suicide attempt	Sense of Coherence Scale (SOC-29) Structured Clinical Interview for DSM-IV (SCID) Suicide Assessment Scale (SUAS) Comprehensive Psychopathological Rating Scale (CPRS-S-A)	Low sense of coherence was significantly associated with higher suicidality both at baseline and at 2-month follow-up. Low SOC predicted increased risk of suicidality independently of major depression and symptom severity. Although low SOC was associated with repeat suicide attempts over a 3-year period in univariate analysis, this association did not remain significant after controlling for depression and symptom burden. Overall, SOC was identified as an important marker of suicide risk in clinical populations.
Skärsäter et al. (2009), Sweden	Longitudinal study (4-year follow-up)	n=33 (baseline), n=22 (completed follow-up)	To examine changes in sense of coherence over time and its relationship with depressive symptoms, aggression, and functional status in individuals with first-episode major depression	Sense of Coherence Scale (SOC-29) Montgomery–Åsberg Depression Rating Scale (MADRS) Aggression Questionnaire (AQ) Global Assessment of Functioning (GAF) SF-36 (Quality of Life)	Sense of coherence significantly increased over time ($p<.0001$) SOC was not related to depression at baseline but became significantly associated at 4-year follow-up ($r=-.60$) Higher SOC was associated with: better functioning (GAF) ($r=.64$) better quality of life (SF-36) ($r=.72–.74$) lower aggression and hostility Results suggest that SOC improves alongside recovery and may be strengthened through treatment
Hansson et al., 2004, Sweden	Quantitative (long-term follow-up study)	186 adolescents diagnosed with conduct disorder	To investigate long-term outcomes and the role of sense of coherence and other psychosocial factors in adolescents diagnosed with conduct disorder who received inpatient psychiatric treatment	Sense of Coherence Scale (SOC) Self-reported psychiatric symptom measures Family climate assessment Interview-based health ratings	A substantial proportion of participants demonstrated improvement in life functioning over time, including domains such as relationships, work, and overall life adjustment. Sense of coherence was included as a key psychosocial resource associated with better long-term outcomes, suggesting that higher SOC may contribute to more adaptive life trajectories in individuals with conduct disorder.
Tagay et al., 2005, Germany	Quantitative (cross-sectional clinical study)	583 psychiatric outpatients	To examine the prevalence of PTSD and compare psychopathology, sense of coherence, and service utilization between patients with and without PTSD	Sense of Coherence Scale (SOC) Trauma-specific questionnaires DSM-IV/ICD-10 diagnostic criteria Measures of depression and anxiety	Patients with PTSD exhibited significantly lower levels of sense of coherence compared to those without PTSD. PTSD was also associated with higher levels of depression and anxiety, as well as increased use of mental health services, including psychotherapy and medication. These findings suggest that lower SOC is linked to greater psychological distress and clinical burden in PTSD.

(table continues)

Table. Characteristics of the included studies (table continues)

Glück et al., 2016, Austria	Cross-sectional (mediation/path analysis study)	N=97	To examine the influence of sense of coherence and mindfulness on PTSD symptoms and posttraumatic cognitions in elderly individuals with a history of trauma.	Sense of Coherence Scale (SOC-13) Essen Trauma Inventory (ETI) Posttraumatic Cognitions Inventory (PTCI) Five Facet Mindfulness Questionnaire (FFMQ) Brief Symptom Inventory (BSI-18)	Sense of coherence was a strong predictor of lower PTSD symptoms and posttraumatic cognitions. Mindfulness partially mediated the relationship between SOC and posttraumatic cognitions, and indirectly influenced PTSD symptoms through posttraumatic cognitions. SOC and mindfulness together explained a substantial proportion of variance in PTSD symptoms.
Badura-Brzoza et al., 2019, Poland	Quantitative (cross-sectional study)	147 patients with various psychiatric disorders	To evaluate sense of coherence in different psychiatric disorders and examine its relationship with depression, anxiety, and quality of life	Sense of Coherence Scale (SOC-29) Beck Depression Inventory (BDI) State-Trait Anxiety Inventory (STAI) SF-36 Quality of Life Scale	Sense of coherence was significantly lower in patients with major depression and eating disorders compared to other diagnostic groups. SOC showed a significant negative correlation with depression and anxiety symptoms across all patients, and a positive correlation with quality of life. These findings indicate that higher SOC is associated with better psychological well-being and functioning in psychiatric populations.
Stein-Parbury et al., 2012, Australia	Quantitative (prospective descriptive study/secondary analysis)	84 older adults with schizophrenia	To identify factors associated with illness self-management in older adults with schizophrenia and examine the role of sense of coherence	Sense of Coherence Scale (SOC-29) Partners in Health Scale (self-management) Self-rated health scale	A higher sense of coherence was significantly associated with better illness self-management, particularly in understanding symptoms and responding appropriately to health-related changes. SOC emerged as an important predictor of self-management abilities in individuals with schizophrenia, highlighting its role in functional adaptation and illness management.
Pajewska et al., 2025, Poland	Quantitative (cross-sectional with regression and mediation analysis)	100 patients with alcohol use disorder	To examine the role of sense of coherence in predicting perceived stress, health behaviors, acceptance of illness, and life satisfaction among individuals with alcohol use disorder, and to test potential mediation effects	Sense of Coherence Scale (SOC-29) Perceived Stress Scale (PSS-10) Satisfaction with Life Scale (SWLS) Acceptance of Illness Scale (AIS) Health Behavior Inventory (HBI)	Sense of coherence was a significant predictor of lower perceived stress and higher life satisfaction among individuals with alcohol use disorder. Mediation analysis showed that perceived stress partially mediated the relationship between SOC and life satisfaction, indicating that higher SOC reduces stress, which in turn enhances well-being. SOC was also positively associated with health behaviors and acceptance of illness.
Pålsson & Landén, 2025, Sweden	Quantitative (longitudinal cohort study with case–control comparison)	248 patients with bipolar disorder and 113 healthy controls	To examine sense of coherence in individuals with bipolar disorder, its association with clinical characteristics, and its predictive value for psychiatric outcomes over time	Sense of Coherence Scale (SOC-29) Montgomery–Åsberg Depression Rating Scale (MADRS) Sheehan Disability Scale Global Assessment of Functioning (GAF)	Individuals with bipolar disorder had significantly lower SOC compared to healthy controls. Lower SOC was associated with greater depressive symptoms, functional impairment, and comorbid anxiety disorders. Longitudinal analyses showed that SOC remained relatively stable over a 14-year period. Importantly, lower baseline SOC predicted self-harm during follow-up, although it was not associated with relapse or suicide attempts.
Malinowska & Rodzeń, 2026, Poland	Quantitative (cross-sectional with mediation analysis)	180 adults with ADHD	To examine the relationships between procrastination, self-efficacy, and sense of coherence, and to test the mediating role of self-efficacy in adults with ADHD	Sense of Coherence Scale General Self-Efficacy Scale Procrastination Scale	Sense of coherence was negatively associated with procrastination and positively associated with self-efficacy. Mediation analysis indicated that self-efficacy partially mediated the relationship between procrastination and SOC, suggesting that higher self-efficacy may buffer the negative impact of procrastination on psychological coherence and functioning.
Langeland & Wahl (2009), Norway	Prospective longitudinal panel study	n=107 (baseline), n=92 (1-year follow-up)	To examine whether social support predicts changes in sense of coherence (SOC) over one year among individuals with mental health problems	Sense of Coherence Scale (SOC-29) Social Provision Scale (SPS) Symptom Checklist-90-R (SCL-90-R)	Social support significantly predicted positive changes in SOC (β=0.32, p=.016) Mental symptom severity did not predict SOC change (p=.621) The most important predictor was opportunity for nurturance (β=0.24) Social integration showed a weaker and non-significant effect after adjustment Results indicate that social relational factors, rather than symptom severity, drive SOC development

(table continues)

Table. Characteristics of the included studies (table continues)

Kuroda et al., 2026, Japan	Quantitative (non-randomized pre–post pilot intervention study)	20 individuals with schizophrenia	To examine the effects of the Japanese version of metacognitive training (MCT-J) on self-efficacy, sense of coherence, and cognitive functioning in community-dwelling individuals with schizophrenia	A 10-session group-based metacognitive training program delivered weekly, targeting cognitive biases (e.g., jumping to conclusions, attributional style, and self-reflection) through structured exercises, psychoeducation, and group discussions. Sense of Coherence Scale (SOC-13) Self-Efficacy for Community Life Scale (SECL) Beck Cognitive Insight Scale (BCIS) Trail Making Test (TMT-J) PANSS (symptoms)	The intervention led to improvements in self-efficacy and attentional performance; however, changes in sense of coherence were limited and not consistently significant across analyses. Exploratory findings suggested minor improvements in the comprehensibility subdimension, but overall SOC remained relatively stable.
Johansson et al. 2018 Sweden	Implementation study (quasi-experimental, pre-post +comparative)	Evaluation: n=41 Comparative: n=829	To develop, implement, and evaluate a salutogenic treatment model based on generalized resistance resources in a child and adolescent psychiatric emergency setting	A salutogenic treatment model based on eight generalized resistance resources (GRRs), including clear communication, patient involvement in decision-making, continuous staff availability, daily information, maintenance of social connections, self-help guidance, and improvement of the care environment, implemented in a child and adolescent psychiatric emergency setting. Generalized Resistance Resources (GRR) were identified and applied within the unit. Patient and parent satisfaction questionnaires. Mental health assessments conducted at admission and discharge. Data on length of treatment and rates of readmission.	Implementation of a salutogenic treatment model based on eight generalized resistance resources was associated with improved mental health outcomes, increased patient and parent satisfaction, reduced treatment duration, and lower readmission rates, suggesting the model as a promising approach in psychiatric emergency care.
Nomura et al., 2026, Japan	Randomized Controlled Trial (RCT)	175 postpartum women	To evaluate the effectiveness of a remote group-based physical activity intervention on physical activity and psychosocial outcomes, including sense of coherence	Sense of Coherence Scale (SOC-13) SF-12 (QoL) Accelerometer (MVPA) Exercise self-efficacy scale	The intervention significantly increased sense of coherence compared to the control group. Improvements in SOC were accompanied by increased physical activity and self-efficacy. The findings suggest that structured, group-based physical activity interventions can strengthen psychological resources such as SOC by enhancing social support, perceived competence, and coping capacity.
Forsberg et al., 2010, Sweden	Quantitative (cluster randomized controlled trial)	41 individuals with psychiatric disabilities (DSM-IV diagnoses)	To investigate the effects of a 12-month lifestyle intervention on psychiatric symptoms, quality of life, functioning, and sense of coherence among individuals with psychiatric disabilities	A 12-month group-based lifestyle intervention including dietary education, physical activity, and psychoeducation on health, stress, and motivation. Sessions were held twice weekly (one educational and one physical activity session), each lasting approximately two hours, and were delivered in a socially interactive group setting. Sense of Coherence Scale (SOC-13) Symptom Checklist-90-R (SCL-90-R) Global Assessment of Functioning (GAF) SF-36 (quality of life) MANSA (quality of life)	The intervention resulted in a significant increase in sense of coherence compared to the control group. Improvements in psychosocial functioning were observed, while no significant changes were found in psychiatric symptoms or quality of life. Higher attendance was associated with greater improvements in SOC, suggesting that structured, socially engaging lifestyle interventions can enhance SOC in individuals with psychiatric disabilities.

(table continues)

Table. Characteristics of the included studies (table continues)

Aci & Kutlu 2022 Turkiye	Randomized Controlled Experimental Study	Initial sample: 60 participants (30 experimental, 30 control) Completed: 49 participants (22 experimental, 27 control)	To determine the effects of salutogenesis-based interventions on sense of coherence (SOC) and psychological resilience in individuals diagnosed with schizophrenia.	Intervention/Measurement Tools Group counseling sessions based on the salutogenic approach Conducted over 8 weeks, twice a week, for a total of 16 sessions Each session lasted 45–90 minutes Sessions were facilitated by a trained nurse Measurement Tools Sense of Coherence Scale-13 (SOC-13) Brief Resilience Scale (BRS)	In the experimental group, significant increases were observed in SOC and BRS scores at post-test and 1-month follow-up ($p < 0.001$). SOC sub-dimensions (meaningfulness, manageability, comprehensibility) also showed significant improvements. No significant changes were found in the control group. These findings indicate that the intervention program enhanced both sense of coherence and psychological resilience.
Khedr et al., 2024, (Egypt)	Quantitative (randomized controlled trial; pre–post design with follow-up)	50 patients with bipolar disorder (25 intervention, 25 control)	To examine the effect of a physical exercise program on sense of coherence, social functioning, and alexithymia among patients with bipolar disorder	A structured physical exercise program delivered to patients with bipolar disorder, including regular supervised exercise sessions over a defined intervention period, compared with a waiting-list control group. Sense of Coherence Scale Social Functioning Scale Toronto Alexithymia Scale	The intervention group showed a significant increase in sense of coherence and social functioning scores, along with a significant decrease in alexithymia levels compared to the control group. These improvements were maintained at the three-month follow-up, indicating the sustained benefits of physical exercise as an adjunctive treatment in bipolar disorder.
Schrank et al., 2016, UK	Randomized Controlled Trial (pilot RCT)	94 individuals with psychosis	To evaluate the feasibility and effectiveness of a positive psychotherapy group intervention (WELLFOCUS PPT) on well-being and psychological outcomes in people with psychosis	Measurement Tools: Sense of Coherence Scale Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) Brief Psychiatric Rating Scale (BPRS) Depression scale Quality of Life measures	The intervention group showed improvements in several psychological outcomes, including symptoms, depression, hope, and self-esteem. Sense of coherence also increased in the intervention group at a descriptive level. However, SOC was not a primary outcome, and overall effects on well-being were mixed depending on the measurement approach.
Westerberg et al., 2023, Sweden	Randomized Controlled Trial	84 adults with Autism Spectrum Disorder	To evaluate the feasibility and effectiveness of an internet-based intervention on quality of life, sense of coherence, and psychiatric symptoms	A therapist-guided, internet-based group intervention designed for adults with autism spectrum disorder, combining structured online modules and regular group sessions. The program focused on enhancing coping skills, daily functioning, and quality of life through psychoeducation, cognitive-behavioral strategies, and peer interaction. Sense of Coherence Scale (SOC-13) General Self-Efficacy Scale (GSE-10) General Health Questionnaire (GHQ-12) Life Satisfaction (single-item scale)	No significant differences were found between intervention and control groups for sense of coherence, quality of life, or psychiatric symptoms. Although the intervention was feasible and well accepted, it did not produce significant improvements in SOC or mental health outcomes.
Komóczi & Kósa, 2025, Hungary	Quasi-experimental study (pretest–posttest design)	27 participants (matched pre–post analysis: n=11) with mental disorders in a community-based psychiatric rehabilitation setting	To evaluate the feasibility and effects of a storytelling-based intervention on sense of coherence, self-efficacy, psychological distress, and life satisfaction among individuals with mental disorders in community psychiatric rehabilitation	A community-based storytelling intervention consisting of eight group sessions over four months, in which participants listened to and discussed narratives depicting challenging life situations, followed by open reflection and meaning-making processes.	The storytelling intervention significantly improved life satisfaction. Although sense of coherence, self-efficacy, and psychological distress showed a tendency toward improvement, these changes were not statistically significant. Additionally, sense of coherence was positively correlated with self-efficacy and negatively associated with psychological distress.
Langeland et al., 2007, Norway	Intervention framework/ program development study (theory-based)	Not applicable (program description for individuals with mental health problems)	To operationalize the salutogenic model into therapy principles and develop a structured group-based intervention aimed at enhancing sense of coherence, coping, and mental health among individuals with mental health problems	Not directly applied in this paper (the program is based on the Sense of Coherence framework and has been evaluated in a separate randomized controlled trial study)	The study presents a structured salutogenic intervention consisting of 16 group sessions based on five core therapy principles (health continuum, personal narrative, health-promoting factors, tension as a resource, and active adaptation). The program aims to enhance sense of coherence and coping by increasing awareness of personal and environmental resources. The authors suggest that such interventions can support mental health promotion and recovery-oriented care.

FPI-R: Freiburg Personality Inventory-Revised; SCL-90-R: Symptom Checklist-90-Revised; CPRS-S-A: Comprehensive Psychopathological Rating Scale-Self-rating Scale for Affective Syndromes; SF-36: 36-Item Short Form Health Survey; PTSD: Post-Traumatic Stress Disorder; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; ICD-10: International Classification of Diseases, 10th Revision; ADHD: Attention-Deficit/Hyperactivity Disorder; SF-12: 12-Item Short Form Health Survey; QoL: Quality of Life; MVPA: Moderate-to-Vigorous Physical Activity; MANSA: Manchester Short Assessment of Quality of Life; WELLFOCUS PPT: WELLFOCUS Positive Psychotherapy

cohorts exceeding 583 participants (Tagay et al., 2005). The populations included individuals with a wide spectrum of psychiatric conditions, most commonly schizophrenia and related psychotic disorders, followed by mood disorders such as major depression and bipolar disorder. Other populations included individuals with substance use disorders, post-traumatic stress disorder, autism spectrum disorder, eating disorders, and those with a history of suicide attempts.

Geographically, the studies were conducted across multiple regions, with a strong concentration in European countries, particularly Sweden (Bengtsson-Tops & Hansson, 2001; Hansson et al., 2004; Skärsäter et al., 2005; 2009; Tagay et al., 2005; Drageset et al., 2009; Langeland et al., 2007; Lundberg et al., 2009; Forsberg et al., 2010; Henje Blom et al., 2010; Sjöström et al., 2012; Grevenstein et al., 2016; Johansson et al., 2018; Witkowska-Łuć, 2018; Badura-Brzoza et al., 2019; Schäfer et al., 2020; Vagedes et al., 2021; Westerberg et al., 2023; Pajewska et al., 2025; Pålsson & Landén, 2025; Malinowska & Rodzeń, 2026). Notably, Scandinavian countries contributed a substantial proportion of the longitudinal and intervention-based studies, highlighting their leading role in salutogenesis research.

Across all studies, the Sense of Coherence (SOC) Scale was the most frequently used instrument, applied in both its 13-item (SOC-13) and 29-item (SOC-29) versions. In addition to SOC, a wide range of validated measurement tools were used to assess psychiatric symptoms, functioning, and well-being. These included instruments such as the Positive and Negative Syndrome Scale (PANSS), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Global Assessment of Functioning (GAF), and quality of life measures such as SF-36. Several studies also incorporated measures of psychosocial resources, including self-efficacy, social support, empowerment, and cognitive flexibility, reflecting the multidimensional nature of the salutogenic model.

A subset of the included studies applied the salutogenic model within intervention contexts (Langeland et al., 2007; Forsberg et al., 2010; Schrank et al., 2016; Johansson et al., 2018; Aci & Kutlu, 2022; Westerberg et al., 2023; Khedr et al., 2024; Komóczi & Kósa, 2025; Kuroda et al., 2026; Nomura et al., 2026). These interventions varied in structure, duration, and theoretical emphasis but generally aimed to enhance psychosocial resources and coping capacities. Intervention types included group-based salutogenic counseling programs, lifestyle and physical activity interventions, metacognitive training, positive psychotherapy, storytelling-based interventions, and internet-based programs. While some interventions were explicitly grounded in salutogenic theory, others indirectly targeted core salutogenic components such as social support, coping, and self-efficacy. Intervention durations ranged from short-term programs (e.g., 8 weeks) Aci & Kutlu (2022) to long-term interventions (e.g., 12 months) Forsberg et al. (2010), with varying levels of effectiveness in improving SOC and related outcomes

Study Findings

This review synthesized 31 studies examining the use of the salutogenic model in psychiatric populations. Across the included studies, the salutogenic model was operationalized primarily through the concept of SOC and related psychosocial resources, and was applied in three main ways: (1) as an explanatory framework for mental health and illness, (2) as a predictor of clinical and recovery-related outcomes, and (3) as a basis for intervention development and implementation.

Salutogenic model as an explanatory framework: A substantial proportion of studies used the salutogenic model to explain variations in psychiatric symptoms, functioning, and well-being. Within this framework, SOC functioned as a central construct reflecting individuals' capacity to perceive life as comprehensible, manageable, and meaningful. Across diagnostic groups-including schizophrenia, depression, bipolar disorder, PTSD, and eating disorders-higher SOC was consistently associated with lower symptom severity and better psychosocial outcomes (Bengtsson-Tops & Hansson, 2001; Tagay et al., 2006; Bergstein et al., 2008; Badura-Brzoza et al., 2019; Vagedes et al., 2021).

These findings suggest that the salutogenic model provides a useful lens for understanding not only the presence of psychopathology but also the distribution of psychological resources that contribute to mental health. In this context, SOC appears to capture an individual's overall orientation toward coping with stressors, rather than representing a disorder-specific factor.

Salutogenic model as a predictor of clinical and recovery outcomes: Several longitudinal and prospective studies demonstrated that the salutogenic model, operationalized through SOC, has predictive value for psychiatric outcomes. Higher SOC was associated with faster remission and lower relapse risk in psychotic disorders (Bergstein et al., 2008) as well as improved quality of life, functioning, and well-being over time (Bengtsson-Tops & Hansson, 2001).

In mood disorders, SOC increased during recovery and became more strongly associated with depressive symptoms and functioning over time, suggesting that salutogenic processes may evolve throughout the course of illness (Skärsäter et al., 2005; 2009). Similarly, low SOC predicted higher suicidality and psychological distress in clinical populations (Sjöström et al., 2012).

Importantly, longitudinal evidence indicated that salutogenic resources may operate independently of symptom severity. For example, social support predicted changes in SOC, whereas baseline symptom levels did not (Langeland et al., 2007) . This finding highlights a core assumption of the salutogenic model: that health is not merely the absence of illness but is shaped by access to and utilization of generalized resistance resources.

Role of social and psychological resources in the salutogenic model: Across studies, the salutogenic model emphasized the importance of psychosocial resources such as social support, self-efficacy, cognitive flexibility, and empowerment. These resources were consistently associated with higher SOC and better mental health outcomes (Lundberg et al., 2009; Pajewska et al., 2025; Başkaya, 2026; Malinowska & Rodzeń, 2026).

In particular, relational factors played a critical role. Social support-especially opportunities for meaningful interpersonal engagement-was a key predictor of SOC development (Langeland et al., 2007). Conversely, negative social experiences such as stigma and rejection were

associated with lower SOC, suggesting that social context is central to the functioning of the salutogenic model (Lundberg et al., 2009).

These findings reinforce the view that salutogenesis is inherently relational and contextual, extending beyond individual coping to include social and environmental determinants of mental health.

Salutogenic model in intervention studies: A growing number of studies applied the salutogenic model in intervention design, although findings were mixed. Interventions explicitly based on salutogenic principles-such as group counseling programs, lifestyle interventions, and structured psychosocial programs-generally demonstrated improvements in SOC and related outcomes (Forsberg et al., 2010; Johansson et al., 2018; Aci & Kutlu, 2022).

Additionally, interventions not explicitly labeled as "salutogenic" but targeting core salutogenic mechanisms-such as physical activity, self-efficacy, and social engagement-also resulted in significant increases in SOC (Khedr et al., 2024; Nomura et al., 2026). These findings suggest that the salutogenic model can be applied both directly and indirectly in clinical practice.

However, not all interventions led to significant changes in SOC. Internet-based interventions and narrative-based rehabilitation programs showed limited or non-significant effects on SOC, despite improvements in other outcomes (Westerberg et al., 2023; Komóczi & Kósa, 2025). This variability indicates that SOC may be more responsive to interventions that include sustained engagement, social interaction, and active participation.

Conceptual considerations in the application of the salutogenic model: Some studies raised important conceptual questions regarding the distinctiveness of SOC within the salutogenic model. While several findings supported SOC as an independent and predictive construct (Grevenstein et al., 2016), others suggested that SOC may overlap substantially with depression and anxiety, functioning partly as an inverse indicator of psychopathology (Henje Blom et al., 2010).

These contrasting findings highlight an ongoing debate in the literature and suggest that the application of the salutogenic model in psychiatric contexts requires careful conceptual consideration. Nevertheless, even in studies where SOC overlapped with symptom measures, it remained strongly associated with clinically relevant outcomes, supporting its practical relevance.

DISCUSSION

The findings of this systematic review demonstrate that the salutogenic model and its central construct, SOC, function both as protective and predictive factors in the field of mental health. Overall, the studies indicated that higher SOC levels help individuals buffer against the negative effects of depression, anxiety, psychotic disorders, and traumatic life events, whereas lower SOC levels were closely associated with adverse mental health outcomes. Furthermore, general resistance resources (GRRs)-such as social support, self-efficacy, self-esteem, and mindfulness-were found to exert strong protective effects on mental health when combined with high SOC.

These results are consistent with Antonovsky's (1996) conceptualization of the salutogenic model. Antonovsky emphasized that SOC reflects individuals' capacity to perceive life stressors as comprehensible, manageable, and meaningful, thereby serving as a fundamental resource that shifts individuals toward the healthier end of the health–disease continuum. Eriksson and Lindström's (2006) comprehensive review also highlighted SOC as one of the strongest predictors of both physical and mental health outcomes. The present review supports these perspectives and underscores the importance of considering SOC as a central variable, particularly in the context of mental disorders.

Studies conducted with clinical populations clearly demonstrate the role of SOC in treatment processes. For instance, higher SOC levels were associated with faster remission and lower relapse risk among individuals with delusional disorder (Bergstein et al., 2008), suggesting that SOC is a critical prognostic indicator. Similarly, among patients with schizophrenia and schizoaffective disorder, SOC was strongly associated with social support and self-esteem (Bengtsson-Tops & Hansson, 2001), indicating that targeting SOC in rehabilitation and psychosocial interventions may enhance treatment outcomes. Evidence from non-clinical populations further supports these findings. For example, low SOC among adolescent girls was strongly linked with depressive and anxiety symptoms (Henje Blom et al., 2010), highlighting the importance of strengthening SOC within preventive mental health programs for youth.

Research focusing on trauma and special conditions further illustrates SOC's role in coping with adversity. A qualitative study of war-affected adolescents revealed that high SOC was related to more effective coping strategies, whereas low SOC was associated with difficulties in adjustment (Ebina & Yamazaki, 2008). Likewise, siblings of children with autism spectrum disorder who demonstrated higher SOC reported greater social support, better adjustment, and stronger coping skills (Smith et al., 2015), indicating that SOC is an important resource not only at the individual level but also within family mental health.

Community-based studies provided additional support for SOC's protective role in larger samples. Among university students, self-efficacy, mindfulness, and social support were positively associated with SOC, collectively enhancing mental health outcomes (Guzman Villegas-Frei et al., 2024). In a longitudinal study with adolescents, SOC was identified as the strongest predictor of long-term mental health and a protective factor against substance use (Grevenstein et al., 2016). In older adults, lower SOC was significantly linked with alcohol problems (Midanik et al., 1992), while a longitudinal study in Sweden demonstrated that childhood self-esteem and secure parental relationships predicted higher SOC and positive mental health in adulthood (Cederblad et al., 1994).

The findings of this review contribute to the literature in three significant ways. First, SOC was shown to strengthen mental health not only at the individual level but also at the family and community levels. Second, SOC was found to be associated not only with current mental health symptoms but also with long-term prognosis, underscoring its predictive value. Third, the integration of SOC with psychosocial factors such as social support, self-efficacy, and mindfulness

offers new perspectives for preventive and health-promoting interventions.

CONCLUSION

Nevertheless, some limitations must be acknowledged. The majority of included studies were cross-sectional, which limits the ability to establish causal relationships. In addition, the relatively small number of intervention studies restricts conclusions about the effectiveness of programs that directly target SOC. From a cultural perspective, most studies were conducted in Europe and North America, with limited representation from low- and middle-income countries.

Future research should focus on developing and evaluating psychoeducational and psychosocial interventions designed to strengthen SOC, particularly through experimental designs. Moreover, longitudinal studies are needed to further examine the long-term effects of SOC on mental health, thereby providing a stronger foundation for the application of the salutogenic model in both clinical and community-based contexts.

ETHICAL DECLARATIONS

Peer Review Process

This review was externally peer-reviewed.

Conflict of Interest

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Evaluation of nursing care using Gordon's functional health patterns model in a patient undergoing percutaneous transluminal coronary angioplasty: a case report

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ABSTRACT

Coronary artery disease remains a leading global cause of mortality, where timely percutaneous transluminal coronary angioplasty (PTCA) is critical for restoring myocardial perfusion. This case report presents the individualized nursing care of a 58-year-old male with a history of coronary disease and hypertension who presented with acute inferior STEMI and underwent primary PTCA with RCA stenting. Nursing care was systematically structured using Gordon's Functional Health Patterns Model and NANDA-I taxonomy. Key identified diagnoses included acute pain, risk for bleeding, risk for infection, anxiety, disturbed sleep pattern, and ineffective health maintenance. Tailored nursing interventions spanned emergency admission, intensive care surveillance, and discharge planning, focusing on continuous hemodynamic monitoring, procedural safety, psychological reassurance, and lifestyle education. Consequently, the patient achieved significant pain relief, avoided procedural complications, gained emotional stability, and successfully completed comprehensive discharge education. This case underscores the value of structured nursing frameworks in optimizing recovery in interventional cardiology.

Keywords: Angioplasty; balloon; coronary, coronary artery disease, nursing assessment, nursing process, case reports

INTRODUCTION

According to the World Health Organization (WHO), cardiovascular diseases are among the leading causes of death globally, accounting for approximately 32% of all mortalities, with 85% of these deaths resulting from myocardial infarction (World Health Organization, 2025). Annually, ST-elevation myocardial infarction (STEMI) develops in more than 3 million individuals worldwide, while STEMI findings are detected in over 4 million people (Salari et al., 2023). According to data from the Turkish Statistical Institute (TURKSTAT), diseases of the circulatory system accounted for 35.4% of mortalities in Turkiye in 2024, with ischemic heart diseases comprising 42.9% of these cases (Turkish Statistical Institute, 2025).

Acute coronary syndromes (ACS) are classified into three subgroups: unstable angina pectoris (UAP), ST-elevation myocardial infarction (STEMI), and non-ST-elevation myocardial infarction (NSTEMI) (NICE, 2020). Coronary artery diseases are characterized by narrowing and occlusion in the vascular lumen resulting from atherosclerotic plaque accumulation, where plaque rupture remains a primary trigger for myocardial infarction (Bhatt et al., 2022). In recent years, percutaneous transluminal coronary angioplasty (PTCA) with stent deployment has become a primary revascularization strategy, achieving high initial procedural success rates in STEMI management (Abubakar et al., 2023).

Nursing care plays a critical role in preventing complications, maintaining hemodynamic stability, and supporting overall recovery following PTCA (Roffi et al., 2024; Zhang & Qi, 2021). In this context, Gordon's Functional Health Patterns (FHP) Model provides a structured framework to systematically assess an individual's physical, psychological, and social needs across 11 functional health domains (Hakyemez & Koç, 2021).

This case report is presented to demonstrate that nursing care requirements for a patient undergoing PTCA following STEMI extend beyond acute cardiac surveillance. Rather, it highlights the educational value of systematically evaluating multidimensional nursing care areas-including lifestyle modifications, adherence to cardiac rehabilitation, anxiety management, pain control, early mobilization, and discharge education-through the application of Gordon's FHP model. In this context, the nursing diagnoses of the patient were determined according to the North American Nursing Diagnosis Association (NANDA) taxonomy, and the care plan was comprehensively evaluated using Gordon's framework.

Nursing Care in Percutaneous Coronary and Valvular Interventions

Nursing care provided to patients undergoing invasive medical procedures is delivered in alignment with the nursing process.

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Patient care needs are analyzed, and nursing diagnoses are established based on the patient's medical history, physical examination, hemodynamic monitoring, and medical diagnoses. Interventions must be implemented and evaluated according to these nursing diagnoses. In patients undergoing PCI, nursing care encompasses the peri-procedural period as well as post-procedural follow-up, risk-factor management, patient education, and secondary prevention (Wennberg et al., 2025). Within this scope, the responsibilities of the nurse include:

Prevention of Potential Complications

The prevention of potential complications and the early identification of risk factors represent one of the most critical factors influencing patient prognosis in interventional procedures. In particular, vigilant assessment of the vascular access site is essential for the early identification of complications such as bleeding, hematoma, and pseudoaneurysm following cardiac catheterization (Clark & Hyrkas, 2024). In addition to preventing complications, individualized, patient-specific nursing care throughout the pre-, intra-, and post-procedural periods is essential for ensuring patient safety and optimizing clinical outcomes.

Patient and Family Education

Patient and family education regarding the disease, the procedure, and discharge planning begins at the time of admission. Disease risk factors, post-procedural care, and home care processes are planned on an individual basis. Lifestyle modifications, post-procedural follow-up appointments, exercise, and dietary management must be coordinated with the patient and family, utilizing the educational role of the nurse. Following PCI, patient education should address lifestyle modification, risk-factor management, physical activity, dietary habits, medication adherence, and recognition of symptoms that require medical attention (Wennberg et al., 2025)

Rehabilitation

The rehabilitation process involves the concurrent management of physical, psychological, and social dimensions. The individual must recognize risk factors associated with their disease, know when to seek medical attention, effectively manage stress, organize diet and exercise plans, and comprehend the risks related to tobacco and alcohol consumption. Cardiac rehabilitation and secondary prevention following PCI should incorporate lifestyle modification, regular physical activity, healthy dietary practices, risk-factor management, and appropriate psychological support (Wennberg et al., 2025). Furthermore, patients undergoing PCI may experience psychological changes such as anxiety and depression in addition to physiological symptoms, emphasizing the importance of comprehensive assessment and psychosocial support during the rehabilitation process (Calegari et al., 2025).

In individualized and structured nursing care-particularly during the post-procedural period and the home care process-it is of paramount importance that nurses follow the latest developments and literature from their undergraduate years onward, and actively participate in scientific nursing activities to ensure accurate and effective patient and family education.

Within this framework, Gordon's FHP model, which is one of the conceptual frameworks utilized in nursing care, addresses the needs of individuals across 11 functional areas, thereby ensuring the delivery of comprehensive care (Butcher & Jones, 2021). This case report aims to present the care plan categorized according to Gordon's FHP model and the diagnoses determined via the NANDA taxonomy for a patient monitored and treated in the coronary intensive care unit (CICU) following a PTCA procedure. The nursing care of the case was additionally planned using data obtained from a relevant literature review. In **Table 1**, the case assessment according to Gordon's FHP Model and the nursing diagnoses identified through the NANDA taxonomy are presented in tabular form.

CASE REPORT

The patient received the interventions outlined below in October 2023. Following the emergency department presentation and completion of all necessary procedures, the patient completed a 72-hour monitoring period in the intensive care unit and was subsequently discharged with the knowledge and approval of the attending physician.

Sociodemographic Characteristics

A.H. is a 58-year-old male patient who is a high school graduate, retired, married, and has two children. There is no family history of coronary artery disease.

Past Medical History

The patient has been receiving treatment for coronary artery disease (CAD) for 23 years and Hypertension (HT) for 10 years. He underwent a coronary artery bypass graft (CABG) operation in 2001. He has no known food or medication allergies, but has a documented allergy to silk medical tape. The patient stated that prior to his diagnosis, he smoked one and a half packs of cigarettes per day and consumed alcohol at least 2-3 days a week (minimum of three glasses per occasion); however, after being diagnosed, he attempted to quit and managed to reduce his consumption instead. He noted that for the past ten years, he has smoked half a pack of cigarettes (10 cigarettes) per day and consumed alcohol once a week (3-4 drinks), a pattern he currently maintains.

Medical History

The patient, who is monitored with diagnoses of CAD and HT, presented to the emergency department with complaints of severe chest pain, cold sweating, and numbness in the left arm. Following the initial evaluation, he was admitted to the CICU. The patient's vital signs were recorded as follows: blood pressure 155/98 mmHg, heart rate 120 beats/min, oxygen saturation 93%, body temperature 36,5 °C, and a pain score of 9/10.

Emergency department medications administered included 300 mg aspirin peroral (PO), 0.6 ml Enox (enoxaparin) subcutaneous (SC), and 600 mg clopidogrel (PO). A 12-lead electrocardiogram (ECG) and an echocardiogram (ECHO) were requested. Intravenous access was established to evaluate cardiac enzymes, and blood samples were drawn for laboratory testing. The relevant and significant laboratory values of the patient are presented in **Table 2**.

Table 1. Evaluation and nursing care of the case according to gordon's functional health patterns model

1) Health perception and health management			
During the clinical interview, the patient reported a history of smoking 1.5 packs of cigarettes per day and alcohol consumption of 2-3 days per week (at least 3 drinks per session) prior to diagnosis. Following the diagnosis, he reported attempting to quit these habits but was unable to achieve complete cessation, maintaining a reduced intake of half a pack per day. Furthermore, the patient expressed difficulty adhering to recommended lifestyle modifications and the cardiac rehabilitation program.			
NANDA domain 1: health promotion, class 2: health management			
Nursing diagnosis 1: Ineffective Health Maintenance related to difficulty adhering to the cardiac rehabilitation program and insufficient knowledge, as evidenced by verbalization of non-adherence and continued tobacco and alcohol use.	Expected outcomes: The patient will demonstrate willingness to participate in health-maintaining behaviors. The patient will initiate adherence to the cardiac rehabilitation program and commit to long-term lifestyle modifications, including smoking and alcohol cessation follow-up.	Interventions: The patient's educational needs regarding the disease process and treatment plan were assessed. Information regarding the importance of the cardiac rehabilitation program was provided, and family members were integrated into the education process to enhance support. Facilitators and barriers to program adherence were identified. Referral to the smoking cessation clinic and outpatient cardiac rehabilitation unit for post-discharge follow-up was initiated.	Evaluation: The patient demonstrated increased health awareness through active engagement and compliance with the treatment plan, accepting the established lifestyle goals. Furthermore, the patient expressed strong adherence to the prescribed therapeutic regimen and a willingness to maintain recommended follow-up visits post-discharge.
2) Nutritional-metabolic pattern			
The patient's oral intake is monitored in accordance with their clinical status. Following the PTCA procedure, controlled intravenous fluid hydration was administered to facilitate the renal elimination of the radiopaque contrast agent and to protect renal function. The patient's fluid intake and output are strictly monitored, and a risk for fluid volume imbalance exists secondary to contrast agent administration and hemodynamic monitoring.			
NANDA domain 2: nutrition, class 5: hydration			
Nursing Diagnosis 2: Risk for imbalanced fluid volume related to radiopaque contrast agent administration and intravenous hydration therapy.	Expected outcomes: To ensure that the patient's fluid intake and output remain balanced and fluid volume stability is maintained, to keep blood pressure and electrolyte levels within normal limits, to facilitate the safe elimination of the radiopaque contrast medium from the body, and to detect and prevent potential complications early.	Interventions: The patient's hourly intake and output were monitored, with fluid supplementation tracked. To facilitate radiopaque contrast medium elimination, fluid intake was supported orally and intravenously (at least 2500 cc within 24 hours). The patient's consciousness, vital signs, and laboratory values were closely monitored. The patient was monitored for signs and symptoms of fluid and electrolyte imbalance (such as altered skin turgor, nausea, thirst, weakness, jugular venous distension, edema, and a weak, rapid pulse).	Evaluation: The patient's hourly intake and output were monitored post-PTCA. Oral fluid intake was encouraged, and intravenous therapy was maintained. Vital signs and laboratory values remained within normal limits. No contrast agent complications or fluid-electrolyte imbalances were observed.
3) Elimination pattern			
Urinary elimination is provided via an indwelling urinary catheter. Additionally, the patient has a peripheral venous catheter and a PTCA procedure site, both of which constitute risk factors for the development of infection.			
NANDA domain 11: safety/protection, class 1: infection			
Nursing diagnosis 3: Risk for infection related to hospitalization, urinary catheterization, invasive procedure (PTCA), and presence of peripheral venous catheters.	Expected outcomes: To recognize early signs and symptoms of infection in the patient, and to detect and prevent potential infections and complications.	Interventions: The patient was assessed for infection risk factors, including hospitalization, urinary catheterization, the PTCA insertion site, and peripheral venous catheter sites. Clinical signs of infection were closely monitored. Strict aseptic technique was maintained during all invasive procedures. Daily care and site maintenance of the urinary and vascular catheters were performed. Education on adherence to hygiene practices was provided to the patient and their family.	Evaluation: The patient was monitored for potential infections and complications associated with hospitalization and invasive devices. No infection developed during the intensive care unit stay. The patient and their family adhered to hygiene rules in line with the education provided, and discharge instructions regarding the continuation of home hygiene practices were delivered.
4) Activity-exercise pattern			
During ECG monitoring in the CVICU, ST-segment elevation and arrhythmia were observed, accompanied by clinical manifestations of tachycardia and dyspnea. Following the PTCA procedure, the patient was admitted for close hemodynamic monitoring. Furthermore, following the administration of the antiplatelet agent "Brilinta" (ticagrelor) included in the post-procedure treatment regimen, dyspnea and a transient ineffective breathing pattern were observed, attributed to potential adverse effects of the medication. Approximately half an hour post-administration, an anxious/restless facial expression associated with respiratory discomfort was identified.			
NANDA domain 4: activity/rest, class 4: cardiovascular/pulmonary responses			
Nursing diagnosis 4: Ineffective Breathing Pattern related to potential adverse effects of antiplatelet therapy (Brilinta/ticagrelor), as evidenced by verbalization of dyspnea, respiratory distress, and a restless facial expression	Expected outcomes: To alleviate the patient's complaint of dyspnea and maintain an effective breathing pattern within normal parameters.	Interventions: Vital signs and oxygen saturation (SpO_2) were monitored hourly. Respiratory rate, depth, and breath sounds were closely tracked. The patient was placed in a semi-Fowler's position to reduce respiratory effort. Following the onset of dyspnea half an hour post-medication administration, supplemental oxygen therapy was initiated via nasal cannula at 2 L/min.	Evaluation: The patient stated that his breathing was significantly more comfortable compared to the initial administration of the medication. His facial expression was observed to be relaxed, and his breathing pattern returned to baseline.
NANDA domain 4: activity/rest | class 4: cardiovascular/pulmonary responses			
Nursing diagnosis 5: Decreased Cardiac Output related to myocardial ischemia and cardiac arrhythmia, as evidenced by tachycardia, ST-segment elevation on ECG, and dyspnea.	Expected outcomes: The patient will maintain heart rate and rhythm within safe physiological limits. Hemodynamic stability will be preserved, and potential post-PTCA complications will be prevented or detected early.	Interventions: The patient was continuously monitored post-PTCA. Vital signs (heart rate, blood pressure, SpO_2 body temperature) were tracked hourly. Serial 12-lead ECGs were obtained and monitored for persistent or new arrhythmias. Peripheral tissue perfusion was evaluated via skin color, temperature, and capillary refill time (<3 seconds). Cardiac enzymes, arterial blood gases, and laboratory parameters were closely monitored. The PTCA access site and peripheral lines were assessed for signs of bleeding, hematoma, or vascular complications. Hourly fluid intake and urinary output were recorded to monitor fluid balance.	Evaluation: The patient's heart rate returned to normal baseline limits (averaging 70-80 beats/min). Prescribed pharmacological therapy was administered for the ongoing cardiac rhythm irregularities observed on ECG. Arterial blood gas values remained within physiological ranges. No bleeding or procedural complications developed at the access site.
NANDA Domain 4: activity/rest, class 4: cardiovascular/pulmonary responses			

(table continues)

Table 1. Evaluation and nursing care of the case according to gordon's functional health patterns model (table continues)

Nursing Diagnosis 6: Activity Intolerance related to imbalance between oxygen supply and demand secondary to myocardial ischemia and post-procedure immobility, as evidenced by verbalization of activity-induced discomfort and fatigue.	Expected outcomes: To enable the patient to maintain desired activities of daily living and to support the achievement of these goals by planning activity targets for cardiac rehabilitation.	Interventions: Initial mobilization following the procedure was performed under the supervision of the primary nurse with fall prevention precautions. The patient was monitored for dizziness, mobility level, and balance coordination during mobilization. The importance of physical movement was explained, an appropriate schedule was established for activities of daily living, and vital signs were thoroughly assessed before and after mobilization.	Evaluation: Initial mobilization was performed under nurse supervision without complications. The patient reported mild activity-induced pain that did not significantly restrict activities of daily living.
NANDA domain 12: comfort, class 1: physical comfort			
Nursing diagnosis 7: Acute Pain related to biological injury agents (myocardial ischemia) and physical injury agents (post-PTCA vascular access site), as evidenced by a VAS score of 6/10, verbalization of chest pain, and restlessness.	Expected outcomes: To ensure that the patient verbalizes and non-verbally demonstrates a reduction or relief of pain after appropriate interventions.	Interventions: The frequency, severity, and radiation of chest and procedure site pain were assessed using the VAS (rated 6/10). Past pain coping mechanisms were explored, deep breathing exercises were encouraged, hourly vital signs were tracked, and prescribed analgesics were administered.	Evaluation: Following interventions, the patient reported a decrease in pain (VAS: 3/10) and pain-induced restlessness subsided. The patient noted occasional mild activity-induced pain.
NANDA domain 11: safety/protection, class 2: physical injury			
Nursing Diagnosis 8: Risk for Bleeding related to pharmacological agents (anticoagulant and antiplatelet therapy) and invasive vascular access site (post-PTCA).	Expected outcomes: To identify early signs and symptoms of bleeding and to prevent potential bleeding events and related complications.	Interventions: The patient was monitored for signs of bleeding (hematoma, ecchymosis, petechiae, hematuria, hematemesis, hypotension) and the procedure site was closely inspected. Coagulation profiles and complete blood counts (platelets, Hct, PT, aPTT) were tracked. Unnecessary invasive procedures were avoided, and prolonged manual pressure was applied to necessary intervention sites.	Evaluation: No bleeding or associated complications developed. Comprehensive discharge education regarding post-discharge anticoagulant therapy and bleeding risk was provided.
5) Sleep-rest			
The patient stated that they had no prior history of sleep disturbances; however, following hospitalization, they experienced insomnia, difficulty falling asleep, and frequent nighttime awakenings. They noted that due to poor sleep quality at night, they felt fatigued during the day, and they had not implemented any interventions to resolve this issue.			
NANDA domain 4: activity/rest, class 1: sleep/rest			
Nursing diagnosis 9: Disturbed Sleep Pattern related to environmental sensory alterations (ICU noise and lighting) and physical discomfort, as evidenced by verbalization of frequent nighttime awakenings.	Expected Outcomes: To identify and eliminate the factors disrupting the patient's sleep quality, and to ensure an improvement in their overall sleep quality.	Interventions: The physiological and psychological factors disrupting the patient's sleep pattern were explored. Factors such as pain, intensive care unit conditions (noise, light, etc.), and the treatment process were identified. The administration times of analgesics used for pain management were rearranged according to the patient's sleep schedule. The patient was encouraged to perform breathing exercises before sleeping. The intensive care unit conditions were explained to the patient, and they were psychologically supported by reassuring them that this situation is temporary.	Evaluation: The factors related to the patient's pain were eliminated. The patient stated that their pain subsided before falling asleep and that they slept more comfortably. They noted that nighttime awakenings related to hospitalization continued, but the frequency of these awakenings had decreased. It was observed that the patient practiced the breathing exercises that had been taught to them.
6) Cognitive-perceptual pattern			
The patient is conscious and oriented to time, place, and person. No pathological findings were detected during the neurological examination.			
7) Self-perception- self-concept pattern			
The patient is able to express themselves verbally and perceives no negative changes regarding their self-esteem or body image. They possess a realistic awareness of their current health condition. No nursing diagnosis was identified within the scope of this pattern.			
8) Role-relationship pattern			
During the interview, the patient stated that they live with their spouse and children, and that their family communication is good. They noted that since being diagnosed with CAD (coronary artery disease), their spouse and children have been supportive throughout the treatment process. When the patient was transferred from the intensive care unit to the inpatient ward, their spouse and children took turns accompanying them as caregivers and supported their adherence to the cardiac rehabilitation process.			
9) Sexuality-reproductive pattern			
The patient stated that they do not experience any problems in their sexual life.			
10) Coping-stress tolerance pattern			
The patient expressed anxiety regarding the experienced myocardial infarction and the interventional procedure; however, they stated that they avoided discussing this situation with their family because they believed it stemmed from their own unhealthy habits. They noted that being monitored in the intensive care unit caused them apprehension. Throughout their stay in the intensive care unit, an anxious and restless facial expression was observed.			
NANDA Domain 9: coping/stress tolerance, class 2: coping responses			
Nursing Diagnosis 10: Anxiety related to threat to current health status and intensive care environment, as evidenced by an anxious and restless facial expression.	Expected outcomes: To reduce the patient's fears and anxieties, to physically observe that the patient is relaxed, and to enable them to express this state of relaxation verbally.	Interventions: An interview was conducted with the patient to identify the circumstances causing fear and anxiety. Information regarding the disease and treatment process was provided in collaboration with the physician, and the patient was encouraged to ask questions. The patient was supported in communicating with their family. Coping mechanisms for dealing with the disease were explored, and the patient was assisted in selecting an appropriate coping strategy for themselves.	Evaluation: The circumstances causing fear and anxiety in the patient were identified. Information regarding the implemented treatment plan and the rehabilitation process was provided. The patient's questions and uncertainties were resolved. The patient determined that praying was an effective coping mechanism for them. They communicated with their family about their illness. They stated that as they began to adhere to the treatment, their sense of guilt toward their family decreased and they felt happy, which consequently brought them peace of mind.

(table continues)

Table 1. Evaluation and nursing care of the case according to gordon's functional health patterns model (table continues)

11) Value-belief pattern
The patient stated that they have no cultural and/or religious beliefs that hinder the implementation of their treatment. They expressed that during their hospitalization, they pray whenever they feel unwell, and that believing their illness comes from Allah comforts them. They also noted that the healthcare professionals involved in their care respect their values and beliefs.

NANDA: North American Nursing Diagnosis Association, PTCA: Percutaneous transluminal coronary angioplasty, ECG: Electrocardiogram, CVICU: Cardiovascular intensive care unit, VAS: Visual analog scale, Hct: Hematocrit, PT: Prothrombin time, aPTT: Activated partial thromboplastin time, ICU: Intensive care unit, SpO_2: Peripheral oxygen saturation, CAD: Coronary artery disease

Table 2. Patient's laboratory results

Parameters	Results	Reference range
CK-MB	31.4 ng/ml ↑	0-4.9 ng/ml
Hs troponin T (emergency)	784.2 pg/ml ↑	0-19 pg/ml
HGB	15.7 g/dl ↑	11.9-15.4 g/dl
LDL	147 mg/dl ↑	60-130 mg/dl
Triglyceride	283 mg/dl ↑	50-150 mg/dl
LDH	635 U/L ↑	313-618 U/L
NE %	82.4% ↑	40.3-74.8%
LYM %	10.9% ↓	12.2-47.1%
LYM#	0.81 x10^3 cells/µL ↓	0.85-3 cells/µL

Urea, creatinine, potassium (K), sodium (Na), calcium (Ca), C-reactive protein (CRP), free thyroxine (T4), thyroid-stimulating hormone (TSH), and hepatitis panel markers were found to be within normal reference ranges. CK-MB: Creatine kinase-MB isoenzyme, hs-Troponin T: High-sensitivity cardiac troponin T, HGB: Hemoglobin, LDL: Low-density lipoprotein, LDH: Lactate dehydrogenase, NE%: Neutrophil percentage, LYM%: Lymphocyte percentage, LYM#: Absolute lymphocyte count

The patient was transferred from the emergency department to the coronary intensive care unit, where clinical monitoring was initiated. Due to the presence of ST elevations on the ECG, informed consent was obtained, and preparations for angiography were initiated. Subsequently, the patient was diagnosed with an "Inferior STEMI." In the angiography laboratory, the patient underwent a PTCA procedure and stent placement in the right coronary artery. After completing 72 hours of observation in the coronary intensive care unit, the patient was discharged in a stable clinical condition following the provision of individualized cardiac rehabilitation education to both the patient and their family members. The patient's clinical course and follow-up are summarized in Table 3.

Medical treatment in the CICU: Coversyl Plus 10/2.5 mg 1x1 PO, Brilinta 90 mg 2x1 PO, Saneloc 50 mg 2x1 PO, Urikoliz 300 mg 1x1 PO, and Enox 6000 Anti-Xa IU/0.6 ml 2x1 SC.

Pre-Procedural Nursing Assessment Notes

The patient was received from the emergency department team and admitted to the CICU by physician decision due to his clinical presentation. Upon detecting ST elevations on the ECG, informed consent was obtained, and preparations for angiography were initiated. The patient was placed in bed and immediately monitored. Intravenous access was established, and blood samples were drawn for requested laboratory tests, including CK-MB, cardiac enzymes, D-dimer, PT and PTT, serum electrolytes, BUN, urea, creatinine, and complete blood count. The patient's chronic conditions and allergies were reviewed; history of CAD and HT was noted, and while no food or medication allergies were present, an allergy to silk medical tape was documented. The patient was informed that the angiography procedure would be performed via the femoral approach and received relevant instructions regarding the required shaving of the femoral region. The patient was assisted into a surgical gown, and upon completion of the pre-procedural angiography preparations, he was transferred to the angiography unit.

Intra-Procedural Nursing Assessment Notes

The patient was admitted to the angiography unit, the procedures to be performed were explained, and both verbal and written informed consent were obtained. The right femoral artery was selected as the access site, and local anesthesia was administered to the region. During the angiographic intervention, a PTCA procedure and stent placement in the right coronary artery were performed. Throughout the procedure, the patient remained fully conscious and in good general condition, with continuous cardiac and hemodynamic monitoring showing stable vital signs. Following the procedure, the patient was transferred back to the CICU.

Table 3. Timeline of the patient's clinical course and nursing care

Timeframe	Clinical events & medical interventions	Nursing care & follow-up
Day 1: emergency department admission	Patient presented with severe retrosternal chest pain, diaphoresis, and left arm numbness. 12-lead ECG revealed ST-segment elevation with arrhythmia and tachycardia. Patient was diagnosed with acute inferior STEMI.	Emergency nursing care initiated: continuous cardiac monitoring, peripheral intravenous access, oxygen therapy, and preparation for emergency cardiac catheterization.
Day 1: angiography & primary PTCA	Immediate transfer to the catheterization laboratory. Primary PTCA was performed, and a drug-eluting stent was successfully deployed in the RCA.	Pre- and post-procedural nursing care: access site compression, pulse monitoring, and hemodynamic stabilization during interhospital/unit transfer.
Day 1-3: intensive care unit (CVICU)	Transferred to the cardiovascular intensive care unit for close monitoring. Pharmacotherapy (including dual antiplatelet therapy with ticagrelor/Brilinta and anticoagulants) was administered and monitored.	Individualized nursing care based on Gordon's Functional Health Patterns and NANDA-I diagnoses: hourly vital signs and telemetry tracking, access site monitoring for bleeding/hematoma, pain management, dyspnea monitoring, and early progressive mobilization.
Day 4: discharge & follow-up	Patient achieved clinical stability with no active chest pain or procedural complications. Discharge cleared by the cardiology team.	Comprehensive post-discharge education provided to the patient and family regarding cardiac rehabilitation, pharmacological adherence, lifestyle modifications (smoking/alcohol cessation), and emergency warning signs.

ECG: Electrocardiogram, STEMI: ST-segment elevation myocardial infarction, PTCA: Percutaneous transluminal coronary angioplasty, RCA: Right coronary artery, CVICU: Cardiovascular intensive care unit, NANDA-I: North American Nursing Diagnosis Association International

Post-Procedural Nursing Assessment Notes

Following the PTCA procedure, the patient was received from the angiography unit into the CICU. The patient underwent PTCA and stent placement in the right coronary artery, and his clinical status is stable. Upon arrival at the CICU post-procedure, his vital signs were recorded as follows: blood pressure 121/88 mmHg, heart rate 105 beats/min, oxygen saturation 93%, body temperature 36 °C, and a pain score of 6/10. Following the PTCA procedure, manual pressure was applied to the catheter insertion site at the right femoral artery using gauze sponges for 20 minutes, followed by the application of a sandbag for 6 hours of monitored follow-up. No complications or bleeding were observed during this period.

The patient was evaluated in the intensive care unit post-procedure; his general condition was good, and he was observed to be conscious and oriented. In the cardiovascular assessment, heart sounds were normal with no murmurs detected. The patient's ECG showed sinus rhythm with intermittent tachycardia. The heart rate was recorded as 105 beats/min. In the respiratory system, no adventitious breath sounds were auscultated. Tachypnea and dyspnea were observed. In the gastrointestinal system, bowel sounds were normal, the abdomen was soft, and no rebound tenderness or sensitivity was present. The patient's urine output was normal, and he was monitored via a urinary catheter until mobilization. Other systemic examinations were evaluated as normal. Furthermore, concerns contributing to the patient's anxiety regarding cardiac rehabilitation were addressed, knowledge deficits were eliminated through patient education, adherence to healthy lifestyle behaviors was emphasized, and comprehensive discharge instruction was provided.

The assessments of the aforementioned case conducted in line with Gordon's FHP Model and the nursing care plans prepared according to the NANDA taxonomy are detailed in **Table 1.**

Nursing Interventions and Femoral Sheath Management Post-PTCA

Following PTCA, post-procedural monitoring of the femoral sheath placed in the groin region requires meticulous attention to prevent life-threatening vascular and hemodynamic complications. In this phase, critical nursing responsibilities include preparing the necessary equipment and environment for sheath removal, maintaining the patient in a strict supine position with the affected extremity extended, and strictly prohibiting bed-rest restriction violations such as unassisted ambulation or using a bedpan. To ensure accurate fluid balance and prevent urinary retention or strain during bed rest, urine output is continuously monitored via a urinary catheter, along with strict fluid intake-output tracking (AÇT). Furthermore, post-PTCA nursing care encompasses frequent monitoring of peripheral pulses (dorsalis pedis and posterior tibial), assessment of the puncture site for hematoma formation, ecchymosis, or active bleeding, continuous vital sign monitoring, and prompt evaluation of post-procedural groin or back pain.

DISCUSSION

Narrowing or occlusion within coronary vessels can be resolved through percutaneous coronary interventions (PCI), such as balloon angioplasty or stent placement. In a PTCA procedure, a balloon located on a catheter is inflated with pressurized fluid within the stenotic segment, thereby restoring vessel patency (Fernando et al., 2024; Mutlu et al., 2022).

In our case, the patient presented to the emergency department with complaints of severe chest pain, cold sweating, and numbness in the left arm and was admitted to the CICU following the initial evaluation. Diagnostic workup revealed ST-segment elevations on the ECG, accompanied by arrhythmia, dyspnea, and tachycardia. Blood parameters were also evaluated. Consequently, the patient was diagnosed with an inferior STEMI. Following diagnosis, the patient was transferred to the angiography laboratory, where a PTCA procedure was performed and a stent was successfully placed in the right coronary artery. Monitoring was conducted for potential complications associated with the intervention, and a patient-specific nursing care plan was developed and implemented. At the end of the procedure, the patient's general status was stable, and laboratory values and systemic physical examination findings were within normal limits.

Bleeding is a recognized complication following percutaneous coronary intervention (PCI), and reperfusion arrhythmias may also occur during the procedure (Galli et al., 2022; Taha & Shaker, 2021). In this case, arrhythmia was observed, whereas bleeding did not occur. Cardiovascular monitoring and early identification of postoperative complications are key components of nursing care after PTCA. Nurses play a critical role in monitoring cardiac rhythm, assessing hemodynamic status and respiratory function, and identifying changes in the patient's overall condition, thus enabling monitoring and early intervention for complications (Zhang & Qi, 2021). Furthermore, cardiac diseases, especially acute illness and the intensive care process, can increase anxiety and psychological stress in patients (Hakyemez & Koç, 2021). In this case, which is parallel to the literature, anxiety symptoms were observed during the patient's stay in the intensive care unit. Therefore, nursing care for patients undergoing PCI should not be limited to physiological monitoring; the patient's psychological responses, coping mechanisms, sleep, activity tolerance, and responses to the disease and treatment should be systematically evaluated.

When examining studies on coronary interventions and associated cardiac rehabilitation, individualized cardiac rehabilitation programs designed to maintain health and manage disease have been reported to contribute to recovery and long-term cardiovascular health (İğrek & Yurdalan, 2022; Suematsu et al., 2026; Wang et al., 2021). In this context, it was determined that although our patient was diagnosed with coronary artery disease, they showed insufficient adherence to cardiac rehabilitation and lifestyle recommendations. It should be remembered that a successful PCI (percutaneous coronary intervention) in this patient marks the beginning of a continuous education and lifestyle program that includes lifestyle changes, secondary measures, patient education, risk factor management, and rehabilitation. Nurses play a crucial role in assessing patients' knowledge level, health behaviors,

readiness for change, and barriers to adherence, and in reinforcing individualized care and education throughout hospitalization and discharge planning (Zhang & Qi, 2021; İğrek & Yurdalan, 2022).

This case highlights the importance of identifying individual patient needs from an early stage and integrating this into clinical supervision throughout the entire peri-procedural process. In acute STEMI patients undergoing PTCA, nurses should integrate physiological assessment with psychosocial assessment, patient education, complication prevention, and self-management preparation. In this context, the use of a structured nursing assessment model can facilitate the identification of needs that may be overlooked in the acute phase of care. In this case, nursing diagnoses were determined according to Gordon's FHP Model, and care plans were structured based on the NANDA classification system. The application of Gordon's FHP Model contributed systematically to the nursing care process by providing a structured and comprehensive framework for collecting and organizing patient data across multiple dimensions of health. The model helps nurses consider various functional domains instead of focusing solely on medical diagnosis or acute physiological findings (Butcher & Jones, 2021).

In the present case, this framework facilitated the comprehensive assessment of health perception and health management, nutritional-metabolic status, activity and exercise, sleep and rest patterns, cognitive-perceptual status, coping and stress tolerance, and family support systems. Rather than focusing solely on immediate physiological parameters, Gordon's model was particularly instrumental in unveiling non-physiological nursing needs-such as the patient's difficulty in adhering to lifestyle modifications, hospitalization-related anxiety, sleep disturbances, and the critical role of family dynamics. Thus, Gordon's model successfully linked the patient's clinical findings with his behavioral, psychological, and self-management needs.

The integration of Gordon's model with NANDA-based nursing diagnoses also strengthened the connection between assessment findings, diagnostic reasoning, planning, implementation, and evaluation. Evidence from a randomized controlled trial in patients with symptomatic heart failure demonstrated that nursing care planned according to Gordon's FHP Model was associated with improved quality of life and lower 30-day hospital readmission compared with standard nursing care (Türen & Enç, 2020). Although these findings were obtained in patients with heart failure and cannot be directly generalized to patients with STEMI undergoing PTCA, they support the potential value of a structured, individualized assessment framework in cardiovascular nursing care. Accordingly, the use of Gordon's FHP Model in this case should not be viewed merely as a method for categorizing patient data. Rather, it provided a systematic basis for translating comprehensive assessment findings into individualized nursing diagnoses and care interventions. This approach enabled the nursing process to extend beyond the immediate management of STEMI and PTCA-related complications and to incorporate psychological well-being, health behaviors, rehabilitation needs, and preparation for self-management.

Patient's Perspective

During the initial period of hospitalization, the patient expressed significant anxiety regarding his acute illness and the intensive care unit environment, alongside feelings of guilt toward his family regarding his past health behaviors and lifestyle choices. To cope with this acute psychological distress, the patient utilized prayer and spiritual reflection as primary coping mechanisms. Following individualized informational sessions and comprehensive discharge education provided by the nursing team, the patient reported feeling noticeably more secure, reassured, and empowered. Consequently, his willingness and motivation to actively participate in the prescribed treatment plan, lifestyle modifications, and cardiac rehabilitation program increased significantly.

One of the key strengths of this case report is the comprehensive tracking of the entire clinical trajectory-encompassing the emergency department presentation, intensive care, and the pre-, intra-, and post-procedural phases of PTCA through to recovery. Ultimately, this systematic nursing assessment illustrates how continuous observation supports care continuity across different stages of recovery, while allowing the patient's response to treatment, clinical course, and intervention efficacy to be analyzed from a truly holistic perspective.

Conversely, a limitation of this case is the lack of accessible data regarding the post-discharge period. Although the cardiac rehabilitation process was initiated in the hospital setting, data concerning the continuity of this process and the extent of the patient's adherence to lifestyle modifications could not be obtained. Therefore, the long-term efficacy and sustainability of the rehabilitation program could not be evaluated. This limitation also demonstrates the importance of continuity of nursing care beyond hospitalization, particularly for patients requiring long-term lifestyle modification and cardiac rehabilitation. Future follow-up should include assessment of adherence to medication and lifestyle recommendations, participation in cardiac rehabilitation, symptom management, and the patient's ability to maintain self-care behaviors after discharge.

Overall, this case demonstrates that nursing care in patients undergoing PTCA extends beyond the prevention and management of immediate procedural complications. The case highlights the value of continuous assessment, individualized patient education, psychological support, rehabilitation planning, and preparation for self-management. More importantly, the integration of Gordon's FHP Model with the NANDA nursing diagnosis framework provided a systematic and holistic approach to identifying patient needs and translating assessment findings into individualized nursing interventions. Supported by evidence demonstrating the clinical value of Gordon-based nursing care and its role in comprehensive nursing assessment (Türen & Enç, 2020; Butcher & Jones, 2021), this approach may contribute to more comprehensive nursing care for patients undergoing PCI by linking acute clinical management with long-term cardiovascular health and self-management.

CONCLUSION

This case report highlights the importance of standardized and individualized pre-, intra-, and postprocedural nursing care

in patients undergoing PTCA. Gordon's Functional Health Patterns (FHP) Model and NANDA-I nursing diagnoses provided a systematic framework for identifying the patient's physical, psychological, and self-management needs and planning appropriate nursing interventions. Comprehensive nursing care, including continuous hemodynamic monitoring, procedural safety measures, psychological support, and individualized patient education, plays a critical role in preventing potential complications, maintaining patient safety, and supporting recovery. Furthermore, holistic and evidence-based nursing interventions promote continuity of care from acute clinical management to discharge and support long-term self-management. Consequently, the patient achieved significant pain relief, avoided procedural complications, gained emotional stability, and successfully completed comprehensive discharge education. This case underscores the value of structured nursing frameworks in optimizing recovery in interventional cardiology.

ETHICAL DECLARATIONS

Informed Consent

Written informed consent was obtained from the patient included in this report. Signed consent forms are retained by the authors and are available upon request.

Peer Review Process

This report underwent external peer review.

Conflict of Interest

The authors declare no conflicts of interest.

Financial Disclosure

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Author Contributions

Concept: CE, ÖK; Design: CE, ÖK; Control: CE, ÖK; Data Collection and/or Processing: CE, ÖK; Analysis and/or Interpretation: CE, ÖK; Literature Review: CE, ÖK; Article Writing: CE, ÖK; Critical Review: CE, ÖK.

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