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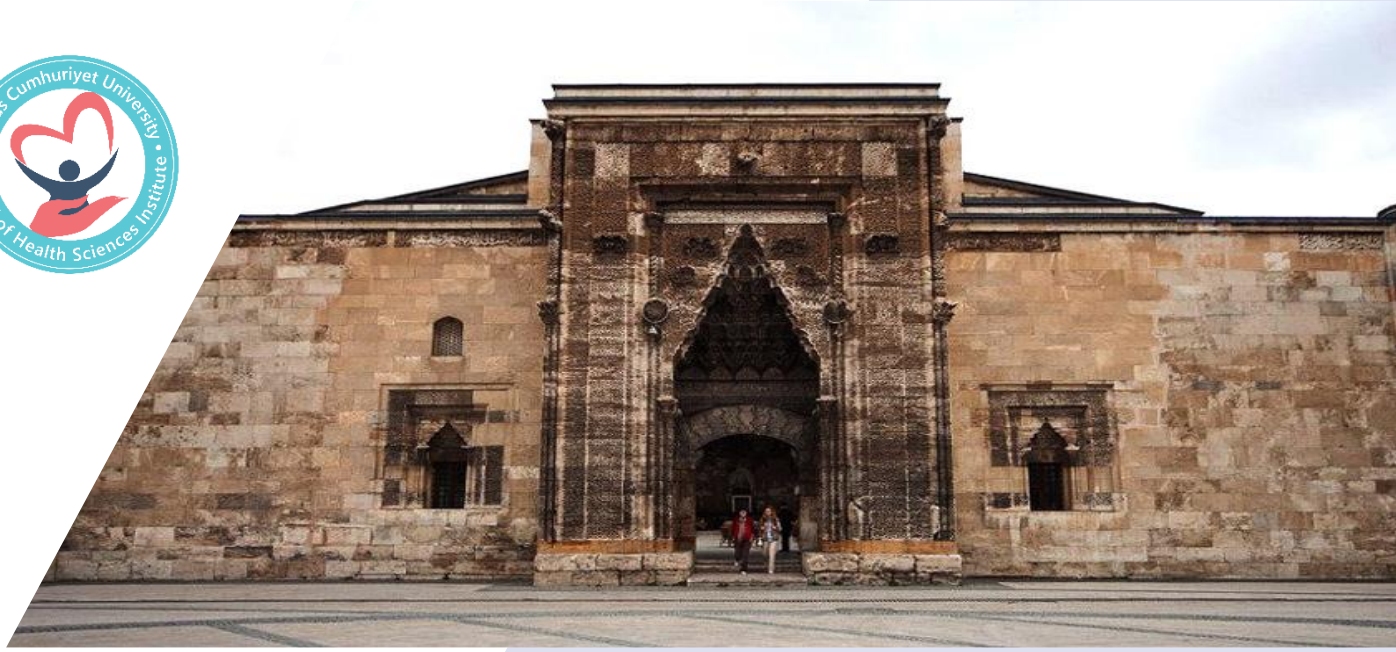

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ORIGINAL RESEARCH

Determination of Metaphorical Perceptions of Nursing Students Regarding Pediatric Nursing

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ABSTRACT

This study aims to explore the perceptions of nursing students in the 3rd and 4th grades regarding pediatric nursing through metaphors. Employing a phenomenological approach, this research was conducted with 152 students enrolled in the nursing department in the spring semester of 2022-2023 who were taking the Pediatric Health and Diseases Nursing course. A data form containing fill-in-the-blank questions querying students' demographic characteristics and their perceptions of pediatric nursing ("Pediatric nursing is like..., because..." metaphorical sentence) was utilized. The data were analyzed using content analysis technique. The analysis was performed using SPSS 25.0 statistical package program. Of the participants, 53.9% were female, with 57.2% aged 22 and above. These students generated 40 distinct metaphors. The positive metaphorical association with pediatric nursing was significantly negatively impacted by a reluctance to work in pediatric services by a factor of 7.1 and by being a third-year student by a factor of 3.8 ($p<0.05$). The students used the metaphors of mother (28.9%), angel (9.9%), and family (7.9%) for pediatric nursing. Additionally, the caregiving role emerged as the predominant metaphorical perception associated with pediatric nurses, accounting for 63.2% of responses. Conversely, negative associations included the metaphors caregiver (f=7), chaos (f=3), and rocky road (f=3). A majority of students (85.5%) utilized positive metaphorical constructs to depict "pediatric nursing." It is recommended to identify expectations regarding pediatric nursing, enhance motivation towards the profession, and improve working conditions.

Introduction

Pediatric nurses are defined as nurses responsible for the physical, cognitive, emotional and social care and improvement of children between the ages of 0-18 within the family and society in terms of intellectual and social aspects, in line with universal children's rights and professional nursing roles (Çetinkaya et al., 2017).

The primary purpose of pediatric nurses are to ensure the physical, emotional and social development/maturation of the child and adolescent within the family and society in terms of intellectual and social aspects (Keklik and Çetinkaya, 2019). They play an important role in providing child and family-centered health services. In various areas such as protecting, promoting and improving health, monitoring growth and development, addressing health-threatening conditions, preventing and managing acute and chronic diseases, and restoring health in the event of illness, children, they facilitate collaboration between families and healthcare teams (Conk et al., 2013; Karakul et al., 2022; Turan, 2022).

To provide appropriate health services in pediatric nursing, a comprehensive assessment of the child, including physical, mental and emotional aspects, is essential. This approach, known as holistic nursing care, emphasises efforts to promote the child's rehabilitation, accelerate recovery and improve the quality of life within a holistic framework. Pediatric nurses are responsible for ensuring continuity and coordination in holistic health services (Takase and Teraoka,

2011; Sözeri et al., 2016; Aydin and Hiçdurmaz, 2019; Çınar, 2022).

A metaphor involves describing one's feelings and thoughts about a concept in the most immediate manner that comes to mind (Zembat et al., 2015; Demir and Yıldırım, 2019). In other words, metaphors are an effective method in determining individuals' perceptions, solving problems and creating a mental model (Keskin et al., 2019). Metaphors are employed to make the concepts more comprehensible and concrete (Karadağ and Kaya, 2020). Various concepts are utilized to comprehend the duties, knowledge, skills, and attitudes in pediatric nursing within the context of holistic healthcare (Karadağ and Kaya, 2020). Each individual may have a different perception and understanding of these concepts (Erişti et al., 2013). "Metaphors can be an effective tool used to determine how students understand concepts and to facilitate the teaching of concepts." Despite the intricate nature of concepts in pediatric nursing, the use of metaphors enhances comprehension. Each nursing student should be seen as a future healthcare professional, and their perceptions about the profession should be evaluated in detail. Having positive perceptions about the profession among pediatric nurses can influence their adaptability to the profession, their ability to provide quality healthcare services, and their professional performance. Therefore, efforts must prioritize fostering positive perceptions and mitigating negative ones from early in students' education (Dimitriadou et al., 2015; Özmen and Çetinkaya, 2016; Yang et al., 2021).

While studies have explored nurses' and nursing students' perceptions through metaphors (Karakul et al., 2022; Turan, 2022), there is limited research on pediatric nursing, particularly concerning its care for vulnerable populations. This study aims to examine nursing students' perceptions of pediatric nursing through metaphors, examining the factors shaping these metaphors' content, with a focus on students enrolled in the Pediatric Health and Diseases Nursing course.

Research Questions

How did 3rd and 4th-year nursing students describe their perceptions of 'pediatric nursing' using which metaphors?

What are the variables influencing the generated metaphors?

Material and Methods

Research Type

This study employed a qualitative research approach, specifically utilizing the “phenomenological” type of metaphor technique. This method facilitates the concretization of reality by describing individuals’ thoughts and perspectives (Şimşek and Yıldırım, 2011). Through the metaphor technique, genuine perceptions of nursing students enrolled in the Children’s Health and Diseases Nursing course regarding pediatric nursing were accessed.

Place and Timing of the Research

The research was conducted with 3rd and 4th-year students studying in the nursing department of the University’s Health Sciences Faculty. Data were collected online via Google Form between May and June 2022.

Research Universe/Sample

The research population comprised third and fourth-year students enrolled in the nursing department of the Health Sciences Faculty during the spring semester of the 2022-2023 academic year. Given the phenomenological nature of the study, research was conducted with individuals and groups present at the time, without resorting to sample selection (Kocabıyık, 2016). The aim was to reach all third and fourth-year students (164 students); however, due to reasons such as unwillingness to participate or failure to contact the students, 160 individuals participated in the research. Eight forms were excluded due to reasons such as incomprehensible expressions, lack of similarity with the reasons for the generated metaphors, or failure to explain the relevant concept. The research was completed with data from 152 individuals. In the information form, transitioning to the next question without answering the previous one was not allowed. Thus, the forms were completed without any missing data, and there was no sample loss.

Inclusion criteria

- Voluntary participation in the research
- Ability to read and write in Turkish
- Absence of any physical or communication barriers
- Enrollment in the third or fourth year of the nursing program
- Taking the ‘Children’s Health and Diseases Nursing’ course

Exclusion Criteria

- Not taking or failing the ‘Children’s Health and Diseases Nursing’ course
- Unwillingness to participate in the research
- Participant’s desire to withdraw from the study at any stage
- Use of inappropriate metaphors in responses, similar to the rationale for exclusion

Variables of the Research

Independent variables include age, gender, marital status, number of siblings, parental status, satisfaction with the nursing department, interest in paediatric nursing, willingness to work in pediatric services, grade. The dependent variable is the use of positive metaphors to describe pediatric nursing.

Data Collection Tools

Data were obtained using a structured information form aligned with existing literature (Eşer et al., 2008; Limon and Durnalı, 2018; Karakul et al., 2022). The form consisted of two sections, one addressing students’ descriptive characteristics (age, gender, marital status, number of siblings, parental status, satisfaction with the

nursing department, interest in pediatric nursing, willingness to work in pediatric services, grade) with nine questions. The second section contained blank-filled metaphorical sentences (A pediatric nurse is like..., because...) aimed at revealing participants' perceptions of pediatric nursing (Sönmez and Alacapınar, 2017; Temel et al., 2018; Demir and Yıldırım, 2019).

Data Collection Procedure

Research data were amassed online. Participants were briefed on the research's intent via a Google Form, and their consent was obtained for engagement. Responding to inquiries typically took 3-4 minutes. The information form was structured to enforce completion of each question before progression to the subsequent one.

Data Assessment

Content analysis was used to assess metaphors related to 'pediatric nursing' (Kale and Çiçek, 2015; Küçük et al., 2020). Content analysis is the summarization of content categories by creating them through coding (Küçük et al., 2020). The obtained data were analyzed using the methods of examining the data, deriving meaning from the data, shaping the meaning in the data and categorizing. In line with the reasons, the data were divided into separate categories by the researchers.

Naming: Data were identified, similar concepts and themes were delineated and subsequently categorized. The formulated metaphors were coded accordingly (Şimşek and Yıldırım, 2011).

Classification: The metaphors were independently assessed by two researchers. Concepts deemed inappropriate for evaluation as metaphors or with inadequate justifications were excluded from the analysis.

Category Development: The metaphors crafted by students underwent independent evaluation by two researchers. Concepts deemed unsuitable for metaphorical assessment or lacking appropriate justification were excluded from the analysis.

Category Formation: Metaphors were independently categorized by both researchers and subsequently compared. This comparison led to the reorganization of categories and metaphors. Metaphors were aggregated into two categories: positive and negative (Eraslan, 2011). Participants were denoted by the letter P and numbered from 1 to 152 (e.g., the first participant as P1, the second participant as P2). Among the explanatory texts, 40 metaphors created by students were considered for evaluation. The relevance of the generated metaphors to the research topic was taken into account during the analysis. Each metaphor describing a pediatric nurse was linked to the roles of a pediatric nurse. Following the analysis, the metaphors were categorized into nine distinct categories: caregiver, healer, educator, communicator, advocate, counselor, comforter, manager, and mixed roles.

Statistical Analysis

Descriptive statistics (number, frequency, percentage) were employed for the descriptive characteristics of nursing students. Factors influencing the categorical status of metaphors were evaluated using Fisher/Pearson Chi-square tests. Multiple Logistic Regression analysis was conducted with significant factors identified through univariate statistics. The quantitative data obtained from the research were analyzed using the SPSS 25.0 statistical software package.

Results

57.2% of students were aged 22 and above, 53.9% were female, 5.3% were married, 2.6% were parents, and 48.7% had five or more siblings. Majority of the participants (86.8%) expressed contentment with their department, while 71.1% expressed interest in pediatric nursing. Additionally, 73.7% indicated willingness to work in pediatric services, and 57.2% were fourth-year students (Table 1).

All metaphors associated with pediatric nursing were categorized into two groups: positive (135) and negative (17). The prevalence of positive metaphors was noted at 85.5%, contrasting with the 14.5% prevalence of negative metaphors.

The socio-demographic variables (age, gender, marital status, number of siblings, parental status) exhibited no significant impact on the usage of positive metaphors ($p > 0.05$). The level of positive metaphorical usage was found to be higher in those satisfied with studying in the Nursing department (88.6%) compared to those not satisfied (65.0%), in those interested in pediatric nursing (93.5%) compared to those not interested (65.9%), in those willing to work in the pediatric service (94.6%) compared to those willing (60.0%), and in those in the 4th grade (95.4%) compared to those in the 3rd grade (72.3%) ($p < 0.05$; Table 1).

Logistic regression analysis evaluated the variables collectively affecting the status of metaphors. The analysis revealed that the status of positive metaphors generated for pediatric nursing was negatively influenced by the reluctance to work in pediatric services by a factor of 7.1 and being a third-year student by a factor of 3.8 (Table 2).

The 152 participants in the study produced a total of 40 different metaphorical sentences. Notably, students most frequently utilized the metaphors of mother (28.9%), angel (9.9%), and family (7.9%) to describe pediatric nursing. The distribution of metaphors crafted by nursing students pertaining to pediatric nursing is delineated under each category heading in Table 3.

The created metaphors (positive, negative), justifications are given in Table 4 and sample expressions are determined as follows:

Participant's Expressions and Justifications for Positive Perceptions

Metaphors in the positive category often liken pediatric nursing to nurturing roles such as being a mother, angel, or family.

Being a pediatric nurse is like a beginning, because you learn something new with every child (P35).

Like a mother, because they are always protective, safe, and striving for the best for every moment (P106).

Being a pediatric nurse is like hope, because it gives hope for the recovery of children (P86).

Being a pediatric nurse is like breathing, because it gives life to children (P23).

Participant's Expressions and Justifications for Negative Perceptions

Upon examining the justifications for metaphors in the negative category, it's observed that the reasons are related to the challenging and exhausting working conditions, the risks involved, the excessive workload in dealing with children, and additional job burdens.

Like walking on a rocky road, because dealing with children is very difficult (P93).

Like a caregiver, because you constantly need to meet their needs (P100).

Like flying, because it's both fun and risky (P21)

Being a pediatric nurse is like taking exams all the time, because it is very tiring, it is necessary to improve (P28).

Participants described the roles associated with 'pediatric nursing' as 63.2% caregiving, 14.5% therapeutic, and 5.3% educational (Table 5).

Table 1. Distribution of variables pertaining to students according to the status of metaphors describing pediatric nursing

			Positive		Negative			
Variables	**n**	**%**	**n**	**%**	**n**	**%**	**χ^2**	**p**
Age								
Below 22 years	65	42.8	53	81.5	12	18.5	0.95	0.3
22 years and above	87	57.2	77	88.5	10	11.5		
Gender								
Female	82	53.9	72	87.8	10	12.2	0.40	0.5
Male	70	46.1	58	82.9	12	17.1		
Marital Status								
Single	144	94.7	123	85.4	21	14.6		1.0
Married	8	5.3	7	87.5	1	12.5		
Number of Siblings								
Less than 5	78	51.3	66	84.6	12	15.4	0.009	0.9
5 or more	74	48.7	64	86.5	10	13.5		
Parental Status								
No	146	96.1	125	85.6	21	14.4		1.0
Yes	6	2.6	5	83.3	1	16.7		
Satisfaction with Nursing Department								
Yes	132	86.8	117	88.6	15	11.4		0.01
No	20	13.2	13	65.0	7	35.0		
Interest in Pediatric Nursing								
Yes	108	71.1	101	93.5	7	6.5	17.08	<0.01
No	44	28.9	29	65.9	15	34.1		
Willingness to Work in Pediatric Services								
Yes	112	73.7	106	94.6	6	5.4	25.84	<0.01
No	40	26.3	24	60.0	16	40.0		
Grade								
3	65	42.8	47	72.3	18	27.7	14.21	<0.01
4	87	57.2	83	95.4	4	4.6		

Table 2. Logistic regression model of factors affecting the status of metaphors generated for pediatric nursing (Final model, step 3)

Variables	B	Standard deviation	p	OR	95% Confidence interval
Reluctance to work in pediatric services	1.97	0.56	<0.01	7.1	2.37-21.73
Being a third-year student	1.35	0.63	0.03	3.8	1.11-13.36

Table 3. Metaphors formulated by nursing students for pediatric nursing

Metaphor definition	n	%
Positive Metaphors		
Mother	44	28.9
Angel	15	9.9
Family	12	7.9
Mother and father	7	4.6
Hero	5	3.3
Sister/brother	5	3.3
Child	5	3.3
Teacher	4	2.6
Growing flowers	3	2.0
Rooted tree	3	2.0
Manager	3	2.0
Superman	2	1.3
Friendship	2	1.3
World	2	1.3
Hope	2	1.3
Lawyer	2	1.3
Assistant mother	2	1.3
Doctor	2	1.3
Relative	2	1.3
Life energy	1	0.7
Breath	1	0.7
Traffic light	1	0.7
Beginning	1	0.7
Life	1	0.7
Leaf	1	0.7
Beauty	1	0.7
Water	1	0.7
Gardening	1	0.7
Book	1	0.7
Tree branches	1	0.7
Pomegranate	1	0.7
Negative Metaphors		
Caregiver	7	4.6
Chaos	3	2.0
Architect	2	1.3
Exam	1	0.7
Tightrope walking	1	0.7
Flying	1	0.7
Rocky road	1	0.7
Engineer	1	0.7
Clown	1	0.7

** The n number indicates the frequency of each metaphor being reported*

Table 4. Metaphors formulated by nursing students for pediatric nursing

Categories	Metaphors	Frequency
Positive Metaphors	Mother, Angel, Family, Mother and father, Hero, Sister/brother, Child, Teacher, Growing flowers, Rooted tree, Manager, Superman, Friendship, World, Hope, Lawyer, Assistant mother, Doctor, Relative, Life energy, Breath, Traffic light, Beginning, Life, Leaf, Beauty, Water, Gardening, Book, Tree branches, Pomegranate	135
Negative Metaphors	Caregiver, Chaos, Architect, Exam, Tightrope walking, Flying, Rocky road, Engineer, Clown	17
Total	40 metaphors	152

Table 5. Defining pediatric nursing roles through metaphor

Nursing Role	n	%
Caregiving (e.g., mother, family, beauty, gardening, sister/brother, nurturing flowers, caregiver, aunt, relative)	96	63.2
Therapeutic (doctor, world, angel, hero, hope, water, life, Superman, vitality, breath)	22	14.5
Educational (teacher, book, fruit-bearing tree, beginning, exam)	8	5.3
Communication (pomegranate, family, being a child, friend)	7	4.6
Advocacy (leaf, angel, lawyer)	6	3.9
Counseling (traffic light)	1	0.7
Mix (architect, acrobat, flying, engineer, chaos)	8	5.3
Soothing (clown)	1	0.7
Management (manager)	3	2.0
Total	152	100.0

Discussion

This research described the perceptions of nursing students regarding 'pediatric nursing' through metaphors. The metaphors primarily highlighted the nurturing aspect of pediatric nursing. The grounding of metaphors on the concept of parenthood reflects the nurturing aspect inherent in pediatric nursing (Karakul et al., 2022). Pediatric nurses are portrayed as professionals who provide compassionate care akin to familial bonds (Çınar, 2022). In this study, students preferred the metaphor of mother the most for the caregiving role of pediatric nurses (Özveren et al., 2018; Karakul et al., 2022; Karatana, 2023). Pediatric

nursing has been likened to motherhood due to its incorporation of values such as patience, dedication, compassion, and sacrifice (Fagin and Donna, 2000). The love-based relationship between mother and child facilitates the formation of positive bonds and enhances the child's sense of empowerment. The relationship between the pediatric nurse and the child resembles this situation. The positive relationship established between the child and the nurse, who desires to heal them, accelerates the child's adaptation to the hospital environment (Turan, 2022). Additionally, the study employed alternative allegorical frameworks to delineate the duties of pediatric nurses, who bear responsibility for a child's well-being. These included likening them to nurturing parents, devoted gardeners nurturing a seedling, and committed artists honing their craft over years (Özmen and Çetinkaya, 2016; Turan, 2022; Rolfe, 2019; Yılmaz and Özbek Güven, 2021). The familial metaphor recurrently features in the portrayal of nurses' caregiving roles. Despite evolving structural dynamics within Turkish culture, the concept of family endures as a foundational entity where affection and reverence are manifested through actions. Pediatric nurses evoke the familial warmth by providing compassionate care to children from treatment initiation to discharge (Tomas, 2009; Canatan and Yıldırım, 2011; Kale and Çiçek, 2015; Karakul et al., 2022).

The second most frequently used metaphors were those describing the therapeutic role of pediatric nurses. Pediatric nurses were compared to doctors, heroes, and even superheroes due to their ability to heal and save the lives of fragile children. The concept of vitality was chosen to illustrate their improvement of children's quality of life. Nurses were metaphorically depicted as angels for their creation of a tranquil and secure environment conducive to healing for their patients. The research suggests that pediatric nurses positively impact the lives of children and families, making their lives easier (Mullan and Higgins, 2014). Both Florence Nightingale, the founder of modern nursing, and Safiye Hüseyin Elbi, a nursing pioneer in Turkey, viewed their profession as a divine calling (Yılmaz Gören and Yalım, 2016) Metaphors generated by students endowed pediatric nurses with exceptional abilities, reflecting the sacredness attributed to nursing (Kale and Çiçek, 2015; Özmen and Çetinkaya, 2016).

The third category of focused on the educational aspect of nurses. Pediatric nurses were likened to teachers, fruitful trees, and books for their roles in providing counseling to families and children, guiding them, and offering supportive care (Komprood, 2013; Sözeri et al., 2016). Teacher and book metaphors have been commonly employed in the literature to describe the educational role (Sözeri et al., 2016; Yılmaz and Özbek Güven, 2021). Research has demonstrated that the educational role of pediatric nurses is effective in managing symptoms and improving patient outcomes (Musavi et al., 2021; Peixoto et al., 2021; Çınar 2022).

Metaphors offer insights into the perceived image of nursing (Yılmaz and Özbek Güven, 2021). The study revealed the usage of both positive and negative metaphors for pediatric nursing, yet an overall positive perception was evident. In another investigation, although pediatric nurses were likened to superheroes rescuing families and children in dire situations, the challenges of the profession were distinctly underscored (Turan, 2022).

A favorable perception of pediatric nursing among nursing students serves as a motivating factor for fulfilling professional responsibilities proficiently (Komprood, 2013). This study identified the simultaneous use of positive and negative metaphors for pediatric nursing, indicating an overall positive perception. While Özmen and Çetinkaya (2016) observed the coexistence of positive and negative metaphors in nursing descriptions, Yılmaz and Özbek Güven (2021) noted that students primarily employed positive metaphors to depict the profession and nursing (Gökdere-Çınar, 2019).

This study found that students with an interest in working in pediatric services tended to use more positive metaphors compared to their peers. Those who employed positive metaphors for pediatric nursing showed enthusiasm for working in pediatric services and a fondness for the pediatric department. The ability of pediatric nurses to interact lovingly with children and their interest in the pediatric field contribute to a favorable perception of the profession (Yılmaz and Özbek Güven, 2021; Turan, 2022). On the other hand, pediatrics necessitates knowledge and experience. It was noted that fourth-year students, who underwent practical training in pediatric services and observed pediatric nurses, leaned towards more positive metaphors. During the research process, while fourth-year students engaged in hospital placements as part of their semester training, third-year students continued their Pediatric Nursing course remotely due to an earthquake. Hospital placements were deemed essential for students to gain insights into the profession and acquire practical nursing experience (Yılmaz and Özbek Güven, 2021).

In the study, a small group of students used negative metaphors such as caregiver, chaos, exam, etc. Factors contributing to the formation of a negative perception among students include the challenging and risky nature of the patient population, the heightened need for attention and affection among children compared to other age groups, the requirement for proficient communication skills in the profession, demanding working conditions, and the continuous need for self-improvement. In the literature, negative metaphors such as robot, modern slavery, remote-controlled toy are encountered in reference to pediatric nurses. Stressful working conditions, high workload, and uncertainties in the nursing job description are cited as reasons for this perception (Yılmaz et al., 2014; Kale and Çiçek, 2015; Buckley et al., 2020). Nursing is often perceived as a less professional occupation and described as physician assistants in society (Kocabaş and Erdem, 2019). Surprisingly, none of the students used the physician assistant metaphor in the study. This outcome clearly indicates that students in the educational process

recognize the value of nursing and have a positive perception of the profession (Sapountzi-Krepia et al., 2007; Safadi et al., 2011; Özveren et al., 2018; Yılmaz and Özbek Güven, 2021).

The constraints of the study include its online conduct solely with nursing students from a single university, and the evaluation of metaphors by a limited number of researchers. Moreover, the seismic period's hindrance for third-year nursing students to partake in clinical practice and the online delivery of the pediatric nursing course may have influenced the constrained utilization of metaphors.

Conclusion

The study reveals that a significant portion of nursing students (73.7%) express interest in pursuing pediatric nursing. Students highlight pediatric nursing as a challenging and sensitive field with substantial responsibilities. Most of the students produced metaphors containing positive perceptions about their profession. It is imperative to identify the underlying reasons for perceived negative perceptions, alter students' viewpoints, and implement measures to counteract negative perceptions.

Identifying the metaphors employed by student nurses who have taken the Pediatric Health and Diseases Nursing course regarding pediatric nursing will aid in fostering professional awareness and sensitivity, as well as in addressing potential challenges. To address common challenges encountered by pediatric nurses in clinical settings, it is recommended to undertake project studies, ascertain students' professional expectations, and enhance working conditions.

Declarations

Acknowledgments

Not applicable.

Conflict of Interest

Authors disclose no potential conflicts of interest.

Ethics Statement

Ethical standards were complied with in the study. Ethical approval was obtained from the university's non-interventional clinical research ethics committee (12.10.2022/41) and the institution where the research was conducted.

Informed Consent

Verbal informed consent was obtained from all participants.

Author Contributions

Conceptualization: EB; methodology: EB, SG; software: EB, SG; validation: EB, SG; formal analysis: EB, SG; investigation: EB; data curation: EB, SG; writing-original draft: EB, SG; writing-review&editing: EB, SG; visualition: EB, SG; supervision: SG; project administration: EB, SG; funding acquisition: EB.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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ORIGINAL RESEARCH

Self Perceptions of Midwives Working in the Delivery Unit on Work Motivation: A Qualitative Study

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ABSTRACT

Midwives working in delivery units frequently encounter stressful events and face mental challenges. Work motivation is crucial for delivering high-quality healthcare services. This study aims to explore the perspectives of midwives working in delivery units regarding their work motivation. The research was conducted as a case study based on a qualitative research design, and data were collected using a semi-structured interview technique. The study group consisted of 12 midwives working in a district state hospital. The data were analyzed using content analysis. The perspectives of midwives on work motivation were examined under three main themes: "Choosing the Midwifery Profession," "Sources of Work Motivation for Midwives," and "Determinants of Midwives' Work Motivation." The findings indicate that most midwives chose their profession without full awareness but developed a passion over time. Their motivation was primarily driven by financial compensation for their work and the ability to witness and contribute to maternal and neonatal health. Factors that enhanced work motivation included organizing social activities, protecting maternal and neonatal health, experiencing understanding, harmony, and satisfaction from pregnant and postpartum women and their families, and receiving psychological and social support. Conversely, factors that decreased work motivation included low salaries, difficulties in communication with patients and their relatives, negative attitudes from patients and their families, stress, fear, anxiety, traumatic birth experiences, and conflicts with hospital staff. Based on the findings, several recommendations can be made to improve work motivation among midwives in delivery units, including financial improvements, organizing social activities, enhancing communication channels, establishing a work schedule that ensures work-life balance, providing emotional support from hospital management, and equipping delivery units with more functional equipment.

Introduction

Motivation can be defined as the process through which human resources in organizations direct their physical, mental, and psychological energy toward organizational goals with high willingness and energy (Tarakçıoğlu et al., 2010; Can et al., 2015). Motivation, which influences employees' productivity, efficiency, performance, and effectiveness, can vary positively or negatively (Tunçer, 2013; Cumbler et al., 2016). Motivation is affected by various factors, including economic aspects such as rewards and wages, psychosocial factors such as achievement and status, and organizational elements such as communication and teamwork (Örücü & Kanbur, 2008).

Employee motivation has been reported as a critical component of health system performance, with motivating factors having a significant impact on healthcare workers' performance (Franco et al., 2002). Healthcare professionals frequently encounter intense physical labor, adverse conditions, and emotional stress. Inadequate physical conditions, shift work, staff shortages, and unfair reward systems can contribute to stress among healthcare workers (Karaca-Sivrikaya & Erişen, 2019). It is well known that low motivation among healthcare professionals negatively affects service quality, and unless issues related to motivation are comprehensively addressed, high-quality

care cannot be ensured (Willis-Shattuck et al., 2008; Ünaldı-Türkkan et al., 2014).

Midwives working in delivery units are frequently exposed to stressful events and psychological challenges (Ünver et al., 2020). Understanding what motivates midwives to remain in their profession is crucial for ensuring the delivery of high-quality care before, during, and after childbirth (Filby et al., 2016; WHO, 2016). For midwives, motivation is essential not only for ensuring quality service delivery but also for strengthening teamwork and enhancing their job performance and personal satisfaction. Therefore, investigating the factors that enable midwives working in delivery units to provide high-quality care is of vital importance. This study aims to explore the perspectives of midwives working in a delivery unit regarding their work motivation.

Material and Methods

Research Design

This study is a case study based on a qualitative research approach. Case studies are research methods that associate a specific phenomenon with various factors, providing a holistic perspective on the collected data (Aytaçlı, 2012; Merriam, 2013; Yıldırım & Şimşek, 2021). In this study, the case under investigation is the perspectives of midwives working in a delivery unit regarding their work motivation. The study aimed to answer the following questions:

1. What are the midwives' thoughts on the midwifery profession?
2. How do midwives define motivation in their professional lives?
3. What are the midwives' perspectives on the factors affecting their work motivation?

Study Setting

The study was conducted in the delivery unit of a district hospital in the Aegean region, which operates as a mother- and baby-friendly hospital. The delivery unit consists of six LDR (Labor, Delivery, and Recovery) rooms, with five specialist doctors and 19 midwives working in the unit.

Participants

The study population consisted of all midwives working in the delivery unit of the district hospital. A criterion-based purposive sampling method, one of the purposive sampling techniques, was used (Hatch, 2002). Midwives who had been working in the delivery unit for at least five months and consented to audio recording during in-depth interviews were included in the study. Midwives who were on leave or medical report leave during data collection were excluded. Additionally, four newly recruited midwives, two midwives on leave, and one midwife who was also a researcher were excluded from the study, resulting in a total of 12 midwives participating in the research. In qualitative research, the sample size is typically determined based on data saturation, with a recommended range of five to 25 participants (Aksayan & Emiroğlu, 2002; Başkale, 2016). In this study, saturation was reached with the 10th participant.

Data Collection Tools

Data were collected using a "Demographic Information Form" and A "Semi-Structured Interview Form". The demographic form included ten questions about the midwives' socio-demographic and professional characteristics, while the semi-structured interview form was developed based on the literature (Öztürk & Doğuç, 2020; Acar & Bulut, 2021; Yeşilaydın et al., 2022).

Data Collection

The research data were collected between April 15 and May 15, 2023, using an in-depth interview technique in a quiet and comfortable area within the delivery unit. To ensure adherence to the inclusion criteria, initial conversations were held with the midwives, and the research aim was explained. The interviews lasted an average of 28 minutes (min: 14, max: 57 minutes).

Data Analysis and Interpretation

The data were analyzed using the inductive content analysis technique. Audio recordings from the interviews were transcribed into Microsoft Word, resulting in a total of 78 pages of raw data. The data were manually coded by the researcher. A line-by-line reading technique was used to generate initial codes, which were then categorized and grouped into themes. The initial codes were created by the first researcher and verified by the second researcher. The agreement rate for coding consistency (reliability = number of agreements / total number of agreements + disagreements) was found to be 85% (Miles & Huberman, 2014). Subsequently, the data were interpreted within the context of themes and categories and compared with similar studies in the literature where applicable. The study results were reported in the discussion and conclusion sections.

Results

Personal Data of Participants

All participating midwives were female. The midwives reported having attended in-service training or certification programs related to their profession. The average age of the midwives was 38.41±7.35 years, with an average professional experience of 17.25±8.00 years, and an average of 6.18±3.54 years of experience in the delivery unit. The detailed characteristics of the midwives in the study group are presented in Table 1.

The data obtained from the interviews were categorized into three main themes:

- Theme 1: "Choosing the Midwifery Profession"
- Theme 2: "Sources of Work Motivation for Midwives"
- Theme 3: "Determinants of Midwives' Work Motivation"

Perspectives on Choosing the Midwifery Profession

The categories and codes derived from the interviews regarding the reasons for choosing the midwifery profession are presented in Table 2.

Regarding the theme of choosing midwifery, one participant stated: *"Bringing a new life into the world, hearing their first cry, seeing them breathe because of you—I think that's something beautiful. Nothing compares to that."* (P10). Another participant shared a similar view: *"Bringing the mother and baby together, enabling that skin-to-skin contact, helping with breastfeeding—these are beautiful things."* (P3)

Conversely, some midwives expressed different motivations or initial reluctance toward the profession: *"I chose it for a quick entry into the workforce."* (P2)

"When I saw my first birth and the first episiotomy, I called my mother and said, 'I don't want to do this job.'. But my younger siblings who would come after me, my father's financial situation… I had to study, I had to finish it." (P6)

"Actually, I didn't choose this profession willingly. My mother and my teacher decided on it for me. But once I started studying and practicing midwifery, I realized it was the right choice." (P8).

Perspectives on Sources of Work Motivation for Midwives

The categories and codes obtained from interviews regarding midwives' work motivation sources are presented in Table 3.

Upon analyzing the responses, the participants' motivation sources were classified into social (positive professional experience and work environment; recognition), individual (passion for the profession), and economic (salary).

One participant emphasized economic factors: *"When we talk about motivation, I think of working conditions, salary, and leave rights."* (P3)

Another participant highlighted the importance of passion for the profession: *"I think motivation, above all, is loving your profession. If you love your job, you will already be motivated."* (P11)

Teamwork and the work environment were also identified as crucial factors: *"The work environment, colleagues, the team you work night shifts with—from doctors to fellow midwives and staff—these matter."* (P1)

Additionally, receiving appreciation from patients and their families was found to be motivating: *"After delivery, if at least the patient thanks you, or if the patient's relative says, 'Thank you, midwife, bless your hands,' it motivates us."* (P10).

Perspectives on Determinants of Midwives' Work Motivation

The data obtained regarding the determinants of midwives' work motivation were categorized into motivational enhancers and motivational reducers. The categories, subcategories, and codes for these determinants are presented in Table 4.

Table 1. Characteristics of the midwives constituting the study group

Participant	Age	Education Level	Marital Status	Family Type	Years of Work Experience	Working Time in This Unit
P1	39	Bachelor's	Single	Nuclear	18	11 months
P2	35	Associate's	Married	Nuclear	17	10 years
P3	36	Bachelor's	Married	Nuclear	11	11 years
P4	37	Bachelor's	Married	Nuclear	15	5 years
P5	28	Bachelor's	Married	Nuclear	6	4 months
P6	37	Bachelor's	Married	Nuclear	15	5 years
P7	44	Associate's	Single	Divorced	25	8 years
P8	27	Bachelor's	Married	Childless	4	9 months
P9	50	Associate's	Married	Nuclear	26	3 years
P10	48	Bachelor's	Single	Divorced	27	6 years
P11	46	Master's	Married	Nuclear	28	10 years

Table 2. Categories and codes related to the theme of choosing the midwifery profession

Category	Codes	*f*
Emotional-psychological reasons	Beautiful, enjoyable, wonderful feeling (11) Desire to care for mother and baby (4)	15
Socio-economic reasons	Lack of awareness (6) Job opportunity (5) Obligation (4)	15

Since participants expressed more than one opinion, the obtained frequencies exceeded the number of participants. Frequencies were obtained by summing up the code repeated by the participants.

Table 3. Categories and codes related to the sources of work motivation for midwives

Category	Codes	*f*
Midwives' work motivation sources	Positive professional experience and environment (9) Income (5) Recognition (5) Passion for the profession (2)	21

Since participants expressed more than one opinion, the obtained frequencies exceeded the number of participants. Frequencies were obtained by summing up the code repeated by the participants.

Table 4. Categories, subcategories, and codes related to the theme of determinants of work motivation for midwives

Categories	Subcategories	Codes	*f*
Motivational enhancers	Social dimension	Social activity (10) Understanding, harmony, and satisfaction of pregnant/postpartum women and relatives (10) Psychological and social support (9) Positive birth experience (9) Recognition (6)	44
	Individual dimension	Protection of maternal and infant health (11) Rest and leave usage (5) Positive thinking (5) Opportunity to organize work schedule (5)	26
	Economic dimension	Financial improvement (6)	6
	Work environment/working conditions	Team communication and organization (9) Access to relevant persons within the hospital (8) Qualified hospital equipment (7) Administration's problem-solving ability (5)	32
Motivational reducers	Social dimension	Difficulty in communication with patients and relatives (11) Negative attitudes of patients and relatives (10) Traumatic birth experience (10) Lack of interest from administration (5)	36
	Individual dimension	Stress, fear, and anxiety (10) Exhausting profession (8) Work-life imbalance (4)	22
	Economic dimension	Low salary (12) Unfair compensation (9)	21
	Work environment/working conditions	Low-performance hospital equipment (10) Internal hospital communication issues (10) Negative attitudes of team/hospital staff (9) Overtime (6) Lack of healthy communication within the team (5) Lack of a neonatal team (5)	45

Since participants expressed more than one opinion, the obtained frequencies exceeded the number of participants. Frequencies were obtained by summing up the code repeated by the participants.

Motivational Enhancers

One participant expressed how witnessing positive outcomes contributed to their motivation: *"Seeing healthy babies and healthy mothers, seeing their happiness—it makes me even happier."* (P7)

Another participant mentioned the importance of flexible work arrangements: *"Our supervisor usually adjusts schedules based on circumstances. Since they create a work plan according to our preferences and requests, it positively affects our motivation."* (P11)

The role of incentives was also highlighted: *"A small performance bonus would be nice. Like 'Employee of the Month.' Private hospitals do this, and their staff are more motivated."* (P6)

Social interactions outside of work were also seen as a motivation booster: *"Spending time with colleagues outside of work—going on trips or gatherings—also enhances our motivation."* (P4)

Other participants shared similar views: *"If the patient is communicative and positive, and if you accompany them throughout labor and delivery, you also feel positive. I always think about this: I want the mother to remember her birth experience in a good way."* (P8)

"Receiving recognition matters—not just financially but emotionally. Being acknowledged for a successful audit, a well-organized event, or a well-executed practice increases our motivation." (P6)

Motivational Reducers

Among the factors that reduced motivation, communication barriers with certain patient groups were mentioned: *"Working with Syrian patients and providing healthcare for them is really challenging. Not being able to communicate properly is a major issue."* (P4)

Experiencing traumatic events during work also had a significant impact: *"I once had a case of umbilical cord prolapse, and the baby didn't survive. That deeply affected me. At that moment, I wished I could work in another department. Because we are responsible for two lives. Our job can be extremely difficult at times."* (P2)

Economic challenges and work conditions were also demotivating: *"In normal circumstances if we didn't have financial concerns, working 24-hour shifts wouldn't be ethical. It's truly exhausting and affects my motivation."* (P10)

"Balancing both home and work responsibilities is difficult. It negatively affects us." (P4)

Another participant expressed dissatisfaction with compensation: *"We work shifts, we work in a stressful and high-risk environment, and yet, we are paid the lowest government salary. I don't think that's fair."* (P3)

Interdepartmental conflicts and poor communication with medical staff were also cited as demotivating factors: *"We often have problems with the neonatal unit and the operating room. Poor communication lowers our motivation. Sometimes the delivery unit gets involved as well, which further decreases motivation."* (P2)

"Every doctor has a different attitude. When we encounter a negative attitude, it affects us negatively." (P9)

Other participants shared structural and organizational concerns: *"Because our hospital follows a mother-friendly policy, we have LDR (Labor, Delivery, and Recovery) rooms. Patients are expected to labor, give birth, and stay postpartum in the same room. But those beds are so uncomfortable. I once lay on one to test it, and my back hurt so much. Sure, a patient can tolerate it for one- or two hours during birth but spending the entire labor and postpartum period there is not suitable. These beds are not designed for extended use."* (P10)

"The doctors we work with are very important. Even though we are supposed to function as a team, they are our superiors. We don't have autonomy. In Turkey, we can't even suture an episiotomy independently—it's considered a doctor's task. Yet, we still do it, and doctors receive performance-based compensation for it. There is a clear issue with role definitions and task distribution in Türkiye." (P11)

In this study, the perspectives of midwives working in the delivery unit on work motivation were examined. The findings of our research were discussed under themes by reviewing the relevant literature.

Choosing the Midwifery Profession

Research examining the reasons for choosing the midwifery profession among students in Turkey has found that ease of employment and family influence are significant factors, which is consistent with the findings of this study (Çakaloz & Çoban, 2019; Güner et al., 2019). Additionally, it has been observed that midwifery is often chosen randomly without a clear understanding of its definition and responsibilities, suggesting that economic concerns play a crucial role in the decision-making process.

Similarly, studies conducted in Australia and Portugal (Cullen et al., 2016; Sim-Sim et al., 2022) have identified reasons for choosing midwifery that align with our findings, such as a childhood desire to pursue the profession, an interest in maternal and infant health, witnessing midwifery firsthand, a love for babies, and a preference for midwifery over nursing. Other qualitative studies (Bloxsome et al., 2020; Adcock et al., 2022) have reported similar motivations, emphasizing the role of midwives in supporting women through the transition to parenthood, advocating for women, providing care, and experiencing feelings of pride, passion, and fulfilment.

Sources of Midwives' Work Motivation

Consistent with our findings, the literature suggests that healthcare workers' motivation is influenced by both material and non-material factors, such as salary, positive recognition, appreciation from others, and passion for their work (Çakar, 2013; Kılıç Aksoy, 2020; Keleş & Altınkaya, 2022). Similarly, positive professional experiences in the delivery unit and a supportive team culture have been reported as influential factors in midwives' behaviors (Sheehy et al., 2021; Peterwerth et al., 2022).

Determinants of Midwives' Work Motivation

Similar to our study findings, a survey conducted by the International Confederation of Midwives (ICM), the World Health Organization (WHO), and the White Ribbon Alliance found that only 58% of midwives across 93 countries felt respected in their profession (WHO, 2016). Furthermore, midwives have reported experiencing bullying from senior midwives, managers, and physicians (Cull et al., 2020). Studies have shown that midwives enhance their motivation by distancing themselves from work-related issues while at home, receiving social support from colleagues and their surroundings, and achieving a work-life balance (Hunter & Warren, 2014).

Positive professional interactions and support are known to be primary sources of work motivation and satisfaction (Morgeson & Humphrey, 2006). Supporting our findings, previous studies have shown that having colleague support and feeling like part of a team is crucial for midwives in coping with challenges (Adcock et al., 2022; Kool et al., 2023). Qualitative research has indicated that midwives struggle to provide holistic care without peer support and that a lack of support leads to burnout (Bloxsome et al., 2020; Catling et al., 2022). Teamwork and social relationships have been found to have a strong impact on work motivation (Çakar, 2013). Midwives have reported that recognition and trust from the women they care for and from society increase their motivation

(Bogren et al., 2020), whereas concerns about potential legal actions negatively affect their job satisfaction (Hunter & Warren, 2014; Robertson & Thomson, 2016).

Discussion

The WHELM Report on midwives' work, health, and emotional well-being in the UK found that 67% of midwives reported work-related stress, burnout, anxiety, and depression. Related factors included being under 40 years old, having less than 30 years of work experience, working in hospitals or integrated hospital/community settings, perceiving low managerial support, and experiencing limited professional recognition and opportunities (Hunter et al., 2018). These findings align with our study results. Occupational stress among midwives is globally acknowledged to have negative effects on their professional, physical, and psychological health (Wright et al., 2018). Midwives' compassion and burnout levels have been associated with professional factors such as patient load, shift work, exposure to traumatic births, work-related stress, and long working hours (Ergin et al., 2020; Coll et al., 2021). Our study also highlights these factors as significant determinants of work motivation.

Long working hours have been linked to disruptions in family life, increased stress, anxiety, and somatic symptoms, as supported by qualitative data (Versevel, 2011). However, some studies have shown that midwives with fewer working hours may still experience burnout due to other workplace stressors, while others choose to work longer hours to maintain job satisfaction (Gilkison et al., 2015; Dixon et al., 2017). Another study emphasized that taking midwives' preferences into account regarding work schedules and implementing more personalized shift planning can enhance motivation (Cull et al., 2020). A survey conducted among midwives revealed that 68% believed their workplaces were understaffed, leading to excessive workloads (WHO, 2016). Similar to our findings, another study reported that midwives felt unable to provide the desired level of care due to staff shortages, high workloads, and excessive documentation requirements (Catling et al., 2022).

The midwives in our study expressed that financial compensation significantly influenced their motivation. Their views align with findings in the literature that highlight economic factors as the most influential on work motivation (WHO, 2016; Yeşilaydın et al., 2022). Additionally, a qualitative study conducted in the Democratic Republic of the Congo found that some midwives felt their salaries were too low and complained about the lack of a fair wage system (Bogren et al., 2020).

Our findings also reflect concerns about the delegation of medical tasks to midwives and the role ambiguity within healthcare teams. One participant noted that midwives often take on physicians' responsibilities due to systemic and interpersonal factors, yet the financial rewards and official records of these procedures are attributed to physicians. This situation negatively impacts midwives' professional motivation and job satisfaction, as also reported in previous studies (Öztürk et al., 2018). Similarly, another study (Catling et al., 2022) found that midwives perceived childbirth services as overly medicalized, which disrupted midwife-led care and undermined the woman-centered approach and autonomy central to midwifery philosophy.

Several studies support our findings, emphasizing that midwives' motivation is influenced by physical working conditions, the adequacy of medical equipment, and regular updates of workplace tools to align with technological advancements and proper lighting systems. Conversely, lacking the necessary tools to perform their job and deliver quality care has been shown to decrease motivation (Çakar, 2013; Bogren et al., 2020).

Managerial support also plays a crucial role in motivation. Factors such as managers addressing employees' problems, valuing their opinions, acknowledging their efforts on special occasions, rewarding high-performing employees, giving gifts during holidays, and organizing social activities have been found to enhance motivation, supporting our study findings (Aksoy, 2020). Similarly, studies have indicated that non-material rewards are significant motivators for midwives and that personal challenges in their private lives have a substantial impact on work motivation (Çakar, 2013).

Consistent with our results, qualitative studies have reported that midwives describe their profession as challenging (Keleş & Altınkaya, 2022). In multiple qualitative studies, midwives have expressed feelings of guilt due to traumatic births and complications, as well as concerns about the quality of care they provide, leading to self-doubt about their professional competency (Rice & Warland, 2013; Bogren et al., 2020). Other studies have reported that one-third of midwives who had witnessed at least one traumatic event in the workplace exhibited symptoms equivalent to post-traumatic stress disorder (Beck et al., 2015; Schrøder et al., 2016).

Despite the barriers they face, midwives continue to provide care due to their strong intrinsic motivation and deep commitment to their profession. A qualitative study aligned with our findings showed that midwives remain dedicated to their work because of their passion for saving the lives of women and newborns (Ismaila et al., 2021). Even in the face of challenges, midwives identified their strongest motivation as their unwavering dedication to maternal and neonatal health and their love for the profession.

Conclusion

This study examined the perspectives of midwives working in a delivery unit regarding their work motivation, identifying sources of motivation as well as factors that enhance or diminish motivation. The findings indicate that midwives consider their work environment as a significant factor in their work motivation. Additionally, earning an income from their profession, receiving recognition, and having a passion for midwifery were also reported as influential elements.

The most frequently mentioned motivational enhancers included participation in social activities, harmony with pregnant and postpartum women and their families, psychological and social support, protecting maternal and neonatal health, financial improvements, and effective communication within the team and hospital. Conversely, the most frequently cited motivational reducers included negative attitudes and lack of communication with patients' relatives, traumatic birth experiences, stress and anxiety, low salaries, unfair compensation, inadequate hospital equipment, poor communication within the hospital, and negative attitudes from team members or hospital staff.

Based on these findings, several recommendations can be made to improve the work motivation of midwives working in delivery units:

- Policymakers can implement financial improvements, increase incentive payments, and ensure job security for midwives.
- The employment of midwives can be increased, and working conditions can be improved, particularly in terms of working hours, rest and leave periods, and the safety and functionality of the work environment.
- Psychological support should be provided for midwives who witness traumatic births, and hospital staff should receive training on effective communication both within the institution and with patients and their families.
- Social activities can be organized to strengthen collaboration among midwives and other healthcare professionals in the hospital.
- Continuous and efficient communication channels within the hospital can be developed, and a dedicated neonatal team can be established to ensure proper care for newborns immediately after birth.
- Hospital administrations can provide greater support for midwives and conduct new research aimed at enhancing their work motivation.

Declarations

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Conflict of Interest

No conflicts of interest were reported.

Ethics Statement

The ethical suitability of this study was approved by the Non-Interventional Clinical Research Ethics Committee of the Faculty of Health Sciences at a state university on March 31, 2023, under protocol number 2023/008. Institutional permission was obtained from the relevant institution to conduct the research.

Informed Consent

At the beginning of the study, the participants were informed about the research purpose, and their verbal and written consent was obtained after informing them that the semi-structured interviews would be recorded using a mobile phone with audio recording capability.

Author Contributions

G.F.K. conceptualized the study, developed the methodology, curated the data, performed the statistical analysis, developed the software, managed the project administration, contributed to the original draft, conducted the literature review, and contributed to the validation of the results. A.Ç. contributed to the conceptualization and methodology, co-wrote the original draft, supervised the research, contributed to the validation of the results, and critically reviewed and edited the manuscript for intellectual content and clarity.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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ORIGINAL RESEARCH

The Effect of University Students' Body Image and Eating Behaviors on Food Choices

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ABSTRACT

Body image perception and eating behavior disorders are influenced by genetic and environmental factors. Social pressures and abnormal body image trigger negative food choices. It is known that these problems are especially prevalent in adolescents and young adults. The aim of this study was to determine the presence of eating behavior disorders and body image perceptions among university students aged 18-24 years. In the study, the factors that university students with eating behavior disorders and abnormal body image perception pay attention to in their food choices were examined. Within the scope of the study, 7 hypotheses were established and Food Choice Questionnaire (FCQ), Body Image Questionnaire (BSQ) and Eating Attitude Test (EAT-26) scales were used to evaluate the hypotheses. After excluding participants who did not meet the age criteria and who gave incomplete or inconsistent answers to the survey questions, the questionnaires of 134 individuals were evaluated. Partial Least Squares Structural Equation Model (PLS) and Smart PLS 3 package program were used for reliability and validity analyses of the questionnaires and tests of the hypotheses. Significant results were obtained for 4 of the hypotheses ($p<0.05$). It was determined that the gender of university students had the highest effect on body image perception. It was also determined that body image perception and gender had an effect on eating behavior. Eating behaviors were also found to have an effect on food choice. Early detection of eating behaviors and body image disorders of university students is important for taking necessary precautions against future disorders and for health and academic success.

Introduction

Nutrition is defined by the World Health Organization (WHO) as “the intake of nutrients for the body's needs”. A balanced and healthy diet varies according to sociocultural and personal characteristics (gender, age, degree of physical activity, etc.), accessible foods and diets (WHO, 2015). The increase in processed foods with industrialized social life and the change in lifestyles have led to difficulties in dietary patterns. Individuals living in developed countries generally have easy access to the foods they want anytime and anywhere. It is estimated that adults make food choices approximately 220 times daily (Wansink, 2006). Food choice is a dynamic, situation-dependent, multifactorial and complex set of decisions (Cabral et al., 2017).

The food selection process is not a simple process but involves many sensory and non-sensory factors that interact with each other. The price, accessibility, sensory character and healthfulness of food are the main factors that influence food choice. There is a complex relationship between the sensory nature of food and consumers' food choices, which may vary according to the person making the choice (Honkanen and Frewer, 2009). Food odor,

appearance and texture are sensory factors, while environmental, individual, sociological, psychological, economic and sociodemographic characteristics are non-sensory factors. Examples of non-sensory factors are the knowledge level, specific preferences, health status and cultural life of the person making the choice. Understanding the factors affecting food choice at the societal level is important for public health (Dikmen et al., 2016). People's food preferences affect their own bodies and also affect food production systems. The importance of global marketing and consumer-oriented product development has increased in recent years. Understanding the reasons for people's food choice behaviors can be useful both in the creation of media content and in the organization of health promotion campaigns (Milosevic et al., 2012).

Understanding the factors affecting the food choices of university students is very important in terms of studies on healthy nutrition of university students and the awareness they will gain. This study compiles the information on food choice, body image perception and eating disorders in the literature and compares our findings with university students. We aimed to identify eating behavior disorders and/or body image perceptions among university students and to determine the factors that university students with eating behavior disorders and/or abnormal body image perceptions pay attention to in their food choices. Hypotheses were formulated to guide this investigation. Hypotheses were formulated to guide this study. The findings from this study may enable health professionals, university students and their parents to better address the risks that influence food choices and the potential health risks that may arise from food choices.

In this study, the effects of body image and eating behaviors on food choices of university students were examined through Partial Least Squares Structural Equation Model (PLS-SEM). Factors affecting food choices were examined under 2 headings: body image and eating behavior.

Body Image

Body image is a multifaceted concept that includes thoughts and behaviors related to one's appearance. Body image perception (body dissatisfaction) is an internal evaluation of one's body, including concerns about one's perception of one's appearance, body control and avoidance behaviors (e.g., choosing clothes that hide body shape) (Chin et al., 2009).

Positive body image perception (body and functioning appreciation) is the respect and appreciation for one's own body with a sense of acceptance, beauty and confidence (Halliwell, 2015). Negative body image perception is defined as a negative evaluation of one's body and includes body shape and body weight status. This leads to maladaptive eating behaviors (Verstuyf et al., 2012). Examples of maladaptive eating behaviors include unrealistic desire to be thin, restricted eating, binge eating, purging and overtraining. Body image disturbance is also associated with poor quality of life and mental health problems and is defined as a public health crisis due to its increasing prevalence and negative effects (Dorfman, 2019).

Many factors affect body dissatisfaction. The most important of these factors is the media. Studies show that there is a positive relationship between social media use and eating disorders and body image perception. For example, appearance-related social media use has a stronger association with negative body image than general social media use (Mingoia et al., 2017). In general, it is stated that negative body image perception is more common in women and adolescents. In a study conducted by Amaral and Ferreira (2017) in adolescents, it was found that negative body image perception was 42.9% in girls and 10.7% in boys. According to the objectification theory, body shame and negative body image perception emerge in women who do not meet unrealistic standards by increasing the focus on the characteristics of certain body parts of social norms with the influence of mass media (Tiggemann, 2011). In addition, it is stated that parents' negative comments and pressures about the child's eating habits and body weight negatively affect the child's body image and eating behaviors. On the contrary, when parents provide emotional support and approval to their children, this may increase positive body image and healthier eating behaviors (Gillison et al., 2016).

Eating Behavior

Eating behavior disorder is defined as problematic eating behaviors and consists of concerns about body weight, body size or shape (Voelker et al., 2014). Eating disorders encompass a variety of psychiatric disorders such as anorexia nervosa, bulimia nervosa, binge eating disorder, and unspecified eating disorders. The American Psychiatric Association has defined these disorders according to the “Diagnostic and Statistical Manual of Mental Disorders-5” (DSM-5) criteria. The diagnostic criteria for Anorexia Nervosa include having a body weight well below normal for age and height, having an excessive fear of increasing body weight, and having a distorted perception of body weight or shape. Blumia Nervosa is characterized by recurrent and uncontrollable episodes of binge eating and compensating for these episodes with compensatory behaviors (e.g. vomiting, excessive exercise or use of laxatives). This leads to intense anxiety and a distorted perception of body weight and shape. Binge eating disorder involves uncontrollably consuming excessive amounts of food over a period of time, feeling guilt, shame or discomfort following these episodes, and experiencing such behavior on a regular basis. This impairs personal functioning and can lead to intense anxiety about body weight or shape. Unspecified eating disorders include conditions that do not fully meet the specific diagnostic criteria for eating disorders but lead to severe discomfort and impaired functioning (APA, 2013).

Eating disorders are caused by factors such as body image dissatisfaction, concerns about body weight, low self-esteem and the desire to be perfect. As a result of these concerns that start in early childhood, restrictive

eating behavior may occur in individuals. The prevalence of eating behavior disorders is increasing day by day. It is reported that 100,000 people are diagnosed with eating behavior disorders every year (Smink et al., 2012). Eating behavior disorders occur as a result of the combination of many genetic, environmental and personal factors. Şanlıer et al. (2008) found that the prevalence of eating behavior disorder among university students in Turkiye was 22.8%.

The first appearance of eating behavior disorders in individuals is often between the ages of 14-25. The reason why eating behavior disorders are more common in this age range may be related to trying to cope with multiple stress factors such as social environments, moving away from family, transition to adulthood, and academic expectations. In the general population, it has been found that the likelihood of anorexia neurosis or bulimia neurosis in women is three times higher than in men, and the frequency of eating behavior disorders is related to women's body weight (Şanlier et al., 2008).

In individuals with eating disorders, behaviors such as overweight and disfigured body image, limited nutrition, self-induced vomiting, laxative use and excessive exercise may be observed. Social pressures to be thin and negative body image perceptions encourage individuals to diet incorrectly. Improper dieting practices increase the likelihood of an eating behavior disorder. Short-term, low-calorie shock diets under very severe conditions may result in breaking the rules and overeating (Wilson, 2010).

Parents play a key role in helping their children develop healthy eating habits. When children reach young adulthood, especially when they start to live away from home, the influence of parents on eating behaviors decreases. It is reported that unhealthy eating behaviors and negative body image perception are more common among university students. There may be significant changes in the lifestyles of university students who do not live with their families. Therefore, it is known that eating behavior disorders increase among university students (Eisenberg et al., 2011).

The literature was reviewed by evaluating the behaviors affecting and being affected by food choice, sample, scale/scales used, methods and package programs. Many national and international studies on food choices of individuals were examined, and when Table 1, which was created as a result of the literature review, was examined, it was seen that food choices were evaluated in many aspects such as self-confidence, body image, social media, family pressure, disordered eating, emotional eating, body mass index, and demographic characteristics. In addition, it was determined that most of the studies were conducted on adolescents and young adults. It was seen that the most preferred package program in the studies was SPSS.

Material and Methods

Sampling and Data Collection

Data were collected through face-to-face and online surveys. The sample of the study was selected from the students of a foundation university in Istanbul. Simple random sampling method was used in the study. In this method, each individual in the population has an equal probability of being selected. The study is a cross-sectional study and data were collected through a questionnaire. The sample size was determined as a minimum of 89 at 95% power, 0.15 effect size and p=0.05 significance level according to the multiple linear regression model in G*Power 3.1 program. The effect size was determined as small (0.15) in line with the reviewed literature (Cohen, 1988). In the study, the questionnaire form was completed by the participants. The exclusion criteria were determined as being outside the age range of 18-24 years, giving incomplete or inconsistent answers to the survey questions; the inclusion criteria were determined as being between the ages of 18-24 years and being a student at the university. As a result of the evaluation, 134 participants were included in the study by excluding those who did not meet these criteria. This number of participants whose data were evaluated in the study is sufficient both in terms of meeting the minimum sample level obtained as a result of power analysis and in terms of the PLS-SEM used in data analysis to provide reliable results in small sample sizes (Henseler et al., 2009). The fact that the factor loadings given in Table 3 are above 0.6 supports this reliability (Nunnally & Bernstein, 1994).

The questionnaire consists of 4 parts. In the first part, there are questions about the demographic characteristics of the students including age, gender, grade level and the department they are studying. The second part includes 36 questions from the Food Choice Questionnaire (FCQ), the third part includes 34 questions from the Body Image Questionnaire (BSQ) and the fourth part includes 26 questions from the Eating Attitude Test (EAT-26). In addition, the relationship between body image and eating behaviors was examined, and hypotheses were formulated regarding the effect of the student's gender and grade level in the university, as it is an important factor in many behaviors related to food choice.

The reliability and validity of the data were analyzed with SMART PLS 3 package program. Factor loadings, Cronbach's Alpha, Composite Reliability and Rho_A values were examined to test the model reliability. R2 value was examined to test the explanatory power of the model. For validity analysis, Construct and Discriminant values were examined. Convergent and discriminant validity were tested with AVE and HTMT values. Then, the results of the hypothesis tests were reached by looking at the t and p values of the sub-samples with bootstrapping to make sense of the PLS-SEM path coefficients. As a result of the analysis, the relationships between body image, eating behaviors and food choices of university students were determined.

Food choice questionnaire (FCQ)

The Food Choice Questionnaire (FCQ) was developed by Steptoe et al. (1995) to determine food choice motivations in the UK. In a study investigating the applicability of this questionnaire in different populations,

it was found to have moderate to good reliability. The questionnaire has been translated into many languages and has been used in many countries and studies have been conducted on the factors affecting food choice. (2016) investigated the validity and reliability of the FCQ in Turkiye and found that it was applicable to the Turkish population.

Body shape questionnaire (BSQ)

The Body Shape Questionnaire (BSQ) developed by Cooper et al. (1987) is used to determine the concerns about body image of people with or without eating behavior disorder (Cooper et al., 1987). As a result of the validity and reliability assessment conducted by Akdemir et al. (2012), it was determined that the BSQ is an applicable measurement tool for Turkish population in determining body image perceptions.

Eating attitude test (EAT-26)

It is the short form of the Eating Attitude Test-40 developed in 1979 to identify anorexia nervosa and later revised by Garner, Olmstad, Bohr and Garfinkel (1982). It is a measurement tool used to identify people who are prone to eating behavior disorder. The scale was adapted into Turkish by Okumuş and Berk (2020) and it was found to be an applicable measurement tool for the Turkish population.

Data Analysis

The reliability and validity analyses of the responses of the questionnaires used in the study and the tests of the hypotheses were carried out using the Partial Least Squares Structural Equation Model (PLS-SEM) and Smart PLS 3 package program, a second generation statistical software. PLS-SEM is a statistical analysis method used in modeling complex relationships between variables. Compared to other methods, it has a more flexible and adaptable modeling technique (Schneeweiss, 1991). PLS-SEM is an important method in terms of requiring normality assumption, providing reliable results in small sample sizes and performing successful measurements in complex model estimations (Henseler et al., 2009). PLS, which is one of the most popular methods for data analysis today, is a variance-based structural equation modeling technique. The PLS-SEM model consists of two stages. These are the evaluation of the measurement model and the evaluation of the structural model. In the first stage, reliability and validity analyses of the theoretical model are performed. In addition to this, in the second stage, the structural model is evaluated, that is, path analysis is performed in which the hypotheses are tested. PLS-SEM was chosen as the most appropriate analysis method for this study because it can evaluate the research model holistically, thus reducing measurement errors, reliably explaining the relationships between variables, and most importantly, providing accurate results for small sample sizes.

Hypotheses Tested

The research hypotheses regarding the effect of body image and eating behaviors of university students on food choices are as follows.

H1: Body image perceptions of university students have an effect on food choices.

H2: University students' eating behaviors have an effect on food choices.

H3: Body image perceptions of university students have an effect on their eating behaviors.

H4: Gender of university students has an effect on food choices.

H5: Gender of university students has an effect on their body image perceptions.

H6: Gender of university students has an effect on their eating behaviors.

H7: Grades of university students have an effect on their food choices.

Limitations of the Study

The study was planned to be conducted by face-to-face survey method, but due to the factors of transportation to the sample and survey administration time, most of the questionnaires were filled out via Google form. For this reason, there is no information on how and in which environment they filled out the questionnaire forms.

Since the study was conducted with the students of a foundation university in Istanbul, the number of samples reached is one of the limitations of this study. The fact that this study cannot be conducted in different regions, universities, populations and larger sample sizes is among the limitations of the study.

Results and Discussion

Demographic findings of the research sample are given in Table 2.

Evaluation of the Measurement Model

Before proceeding to test the hypotheses examined in the study, validity and reliability analyses of the measurement model were conducted. The measurement model was formed with 96 factors and 5 variables, including a total of 94 survey questions and 2 demographic characteristics. Analyses were conducted with Smart PLS package program. The results of the analysis are given in Table 3. Although it is stated that factor loadings should be greater than 0.70, it has been determined that this value should be above 0.60 (Chin, 2010; Hair et al. 2016). When the factor loadings of the model established in this study are examined, it is seen that all statements have values above 0.60. Sample factor loadings for the questionnaire items are given in Table 3. Although Cronbach's Alpha (Internal Consistency Reliability) is frequently used in the literature in terms of reliability, Composite Reliability and Rho_A values are also frequently used in PLS-SEM. For research reliability, the Composite Reliability value should be above 0.80 and other values should be above 0.60 (Nunnally & Bernstein, 1994). When we examine the values obtained in the model established in this study, it is seen that the minimum Composite Reliability value is 0.838, the

minimum Cronbach Alpha value is 0.879 and the minimum Rho A value is 0.846. These results show that the study has a medium level of reliability. R2 value, which is another indicator examined in the established structural model, is used to analyze the explanatory power and stability of the model. If the R2 value is greater than 0.75, the model has strong predictive ability, if it is between 0.50-0.75, it has moderate predictive ability, and if it is between 0.25-0.50, it has weak predictive ability. When we look at the R2 values of the model established in this study, it is seen that the values are in the range of 0.611-0.741. It is possible to say that the prediction/explanation ability of the model is at a medium level.

The validity of the study was examined under two headings: construct validity and discriminant validity. AVE (Avarage Variance Extracted) value should be minimum 0.50 to test the convergent validity (Fornell & Larcker, 1981). When the results obtained from the study are analyzed, it is seen that the minimum AVE value is 0.681. In order to test the discriminant validity, HTMT (Heterotrait-Monotrait Ratio) and Fornell-Larcker values were examined. The HTMT value is the ratio of the mean correlations of the statements of all variables to the geometric mean correlations of the statements of the same variable. These values are required to be below 1.0. Table 4 shows the HTMT values of the variables in the study model. Since all values are below 1.0, the validity values of the model are appropriate.

According to Fornell and Larcker (1981), the square root of the AVE values of the model should be greater than the correlations between all constructs in the study. The values shown in bold in Table 4 are the square roots of the AVE values of the model. Since all of these values are higher than the correlation coefficients, the validity values of the model established in the study are sufficient.

Data Analysis

Table 5 presents the path coefficient, sample mean, standard deviation, t-test and p-test values of the tested hypotheses. In order to assess the significance of the PLS-SEM path coefficients, 1000 sub-samples were taken from the existing sample by resampling (bootstrapping). The t and p values of the sub-samples were calculated. In the study, the threshold t test value was determined as 1.96 for 95% significance level ($p \leq 0.05$) (Chin, 2010).

According to the values given in Table 5, it is seen that hypotheses H2, H3, H5, H6 are accepted. When the accepted hypotheses are ranked according to their degree of importance, it is seen that hypothesis H5, that is, the effect of gender of university students on their body image perceptions, has the highest effect. This hypothesis is followed by H3, H6 and H2 hypotheses respectively.

This study is important as it is the first known study to investigate the effect of body image and eating behaviors of university students on food choices and to use PLS-SEM in this regard and it is thought to contribute to the literature.

Evaluation of the Structural Model

It is important for health and success to identify eating behavior and body image disorders of university students in advance and to take necessary measures. Determining the problems in advance makes it easier to take measures against future disorders.

Of the 7 hypotheses tested in the study, 4 were accepted and 3 were rejected. The results of the hypotheses are summarized as follows:

H1: The hypothesis that body image perceptions of university students have an effect on food choices is rejected. As seen in hypothesis H3, individuals who experience body dissatisfaction may develop different eating behaviors as a reaction to this dissatisfaction. And as we will see in hypothesis H2, these different eating behaviors affect individuals' food choices. However, according to the result of hypothesis H1, there is no effect. It is thought that this result is due to the narrowness of the sample.

H2: The hypothesis that university students' eating behaviors have an effect on their food choices is accepted. Tuğal and Bilgiç (2019) stated that individuals with disordered eating behavior pay more attention to food choices than individuals without eating behavior disorder. This result obtained from university students also supported the literature. In our study, it was concluded that there is a positive relationship between eating behavior and food choice.

H3: The hypothesis that body image perceptions of university students have an effect on eating behaviors was accepted. Individuals who experience body dissatisfaction may develop different eating behaviors as a reaction to this dissatisfaction. Birkenhead and Slater (2015) stated in their study that individuals' personal characteristics or how they see their own bodies are an important factor in their food choices. The negative relationship between body image satisfaction and disordered eating behavior in this study confirms the literature.

H4: The hypothesis that gender of university students has an effect on food choices is rejected. Of the students analyzed, 59.7% were female and 40.3% were male. Pelly et al. (2018) found that there is a difference in the food choices of men and women. In this study, no significant effect of gender on food choices was found. While a direct effect of gender was observed in hypothesess H5 and H6, it is thought that the reason for the lack of an effect on food choice arises from the difference in sampling.

H5: The hypothesis that university students' gender has an effect on their body image perceptions is accepted. It is thought that women are under more pressure than men to have a thin body structure and this pressure may cause eating behavior disorders (Byrne & McLean, 2001). This result obtained on university students also supported the literature. In the study, it was concluded that there is a positive relationship between gender and body image perception, that is, women experience higher body image anxiety than men.

H6: The hypothesis that gender of university students has an effect on eating behaviors is accepted. Tuğal and Bilgiç (2019) stated in their study that women are more risky in terms of developing eating behavior disorder than men. The positive relationship obtained in this study also

supports the literature by showing that female students experience higher levels of disordered eating behavior than male students.

H7: The hypothesis that university students' grades have an effect on their food choices is rejected. There was no significant difference between the eating behaviors of a first-year university student and a senior university student. The fact that the age scale in the hypothesis is narrow (the sample consists of 18-24 age range) supports the accuracy of the hypothesis test result.

The PLS-SEM analysis applied in the study was used for the first time in the literature on the problem of determining the effect of body image perceptions and eating behaviors of university students on food choices, and it is expected to contribute to the literature. The most important reason for preference and the most basic feature of the method and the package program used is that it can provide accurate results at low sample sizes. Nevertheless, the results obtained from the study should be evaluated considering the narrow sample size of the research sample. Therefore, future research on this subject should be conducted with larger sample sizes and the proposed method should be used with different scales.

Negative body image perception may be influenced by factors such as media, social pressures and low self-esteem and may lead to eating behavior disorders. Since eating behaviors and body image disorders of university students affect the food choices of these individuals, early detection is important in terms of taking necessary precautions against future disorders and health and academic success. Parents' emotional support and approval of their children may strengthen positive body image and healthy eating attitudes.

Table 1. General summary of studies

Sources	Sample	Affected people	Influencers	Scale(s)	Data Analysis Method
Tuğal D and Bilgiç P. (2019)	Athletes 16-25 years old	Food Selection	Body Image and Eating Behaviors	BSQ EAT-40 FCQ	SPSS 21.0
Houshyari S and Kalkan I. (2019)	University Students 18-26 years old	Eating Attitudes and Behaviors	Physical Activity Level	DEBQ IPAQ	SPSS 22.0
Akdevelioglu Y and Yörüsün TÖ. (2019)	University Students 18-25 years old	Eating Attitudes and Behaviors	Demographic Characteristics, Emotional Eating, Body Mass Index	YTT-26 DEBQ	SPSS 20.0
Kuseyri G and Kiziltan G. (2019)	University Students 19-23 years old	Nutrition Status	Eating Awareness and Intuitive Eating Behavior	YÖF-30 IES-2 EYBP Consumption Frequency	SPSS 25.0
Karatas YF and Müftüoğlu S. (2020)	School of Health Students 18-35 years	Eating Awareness	Demographic Characteristics, Health Status, Nutrition Knowledge	YOF-30	R 4.0.2
Çil MA et al. (2020)	University Students 18-24 years old	Diet Quality and Eating Behaviors	Anthropometric Measurements	HYDA	SPSS 22.0
Varlık Ö and Arslan M. (2023)	Generations X-Y-Z 18-65 years	Food Selection	Body Mass Index	FCQ	SPSS 26.0
Murray K et al (2023)	Adults 18-74 Years	Intuitive Eating	Gender and Body Image Perception	IES-2 EIS-18 AFES Body Appreciation Scale-2 Body Consciousness Scale	PROCESS 4.0 SPSS 25.0
Baker S et al (2023)	Adults 17-62 years	Disordered Eating Behaviors	Body Image Anxiety Profiles	BCAQ PSI-SR FNAES EAT-26	Mplus 8.7
Giacone et al. (2024)	General Population 38-77 years	Weight and Eating Behavior	Intuitive Eating	IES-2 Emotional, Extrinsic and Restricted Eating Questionnaire	SPSS 29.0

Table 2. Distribution of participants by demographic characteristics

Demographic Characteristics		Frequency	Percentage
Gender	Woman	80	59,7
	Male	54	40,3
	Total	134	100,0
Classroom	1	41	30,6
	2	31	23,1
	3	30	22,4
	4	32	23,9
	Total	134	100,0

Table 3. Measurement model results of the scales

Factor/Variable	Factor Load	T-Value	R2	Cronbach Alpha	Composite Reliability	Rho_A	AVE
Gender	1,00			1,00	1,00	1,00	1,00
Age	1,00			1,00	1,00	1,00	1,00
Food Selection			0,717	0,913	0,903	0,867	0,726
FCQ1	0,651	2,316					
...							
FCQ36	0,622	2,510					
Body Image			0,741	0,956	0,960	0,965	0,731
BSQ1	0,634	5,351					
...							
BSQ34	0,751	4,369					
Eating Behavior			0,611	0,879	0,838	0,846	0,681
EAT1	0,618	3,895					
...							
EAT26	0,624	3,142					

Table 4. HTMT and Fornell Larcker values for discriminant validity

HTMT	Body Image	Food Selection	Gender	Classroom	Eating Behavior.
Body Image					
Food Selection	0,349				
Gender	0,220	0,286			
Classroom	0,117	0,229	0.071		
Eating Behavior.	0,688	0,583	0.382	0.293	
Fornell L.	Body Image	Food Selection	Gender	Classroom	Eating Behavior.
Body Image	0,870				
Food Selection	-0,295	0,827			
Gender	0,203	-0,377	1,000		
Classroom	0,041	0,020	-0,071	1,000	
Eating Behavior	0,720	-0,381	0,331	0,032	0,757

Table 5. Analysis results of the structural model

Hypothesis	Path Coefficient	Sample Mean	Standard Deviation	T Value	P Value	Conclusion
H1	0,229	0,244	0,127	1,797	0,073	Rejected
H2	0,367	0,379	0,127	2,903	0,004	Not rejected
H3	-0,550	-0,540	0,112	4,901	0,000	Not rejected
H4	0,187	0,188	0,118	1,582	0,114	Rejected
H5	0,652	0,647	0,093	7,024	0,000	Not rejected
H6	0,455	0,455	0,111	4,098	0,000	Not Rejected
H7	0,023	0,038	0,174	0,134	0,894	Rejected

Declarations

Acknowledgments
Not applicable.

Conflict of Interest
Authors disclose no potential conflicts of interest.

Ethics Statement
It was discussed at the meeting of the Istanbul Esenyurt University Ethics Committee dated 02.05.2024 and numbered 2024-04, and it was unanimously decided that it was ethically appropriate.

Informed Consent
Within the scope of my scientific study, informed consent forms were given to the participants via an online form and the participants who accepted the consent answered the survey questions.

Author Contributions
Author is identified in the contribution form. H.S.Ç. conceptualized the study, A.T. wrote the original draft, H.S.Ç. performed the statistical analysis, and B.Ç.S. supervised the research and provided critical revisions. M.A. developed the methodology and ensured compliance with ethical standards, and H.S.Ç. conducted the experiments and collected the data. H.S.Ç. curated the dataset and created the visualizations. A.T. reviewed and edited the manuscript for intellectual content and clarity.

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Data Availability
The data used to support the findings of this study can be made available upon request to the corresponding author.

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ORIGINAL RESEARCH

Investigation of the Relationship Between Physical Activity Levels and Depressive Symptoms in Patients with Chronic Musculoskeletal Pain

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ABSTRACT

The objective of the study is to examine the interaction between physical activity levels and depressive symptoms in patients with chronic musculoskeletal pain. The cross-sectional study included 50 patients with moderate or severe musculoskeletal pain (Visual Analogue Scale (VAS) ≥4) for more than 12 weeks. Participants' pain levels were assessed by VAS, physical activity levels by International Physical Activity Questionnaire and depressive symptoms by Beck Depression Scale. In the study, 66% of the participants were physically inactive; however, The analysis revealed no significant statistical connection between physical activity levels and depression scores (p=0.96). Although it is thought that physical inactivity may be one of the factors affecting depression in individuals with chronic pain, this study showed that other psychosocial factors that are effective on depression may be at the forefront. In conclusion, it was concluded that the effects of chronic pain on depression may not be explained only by physical activity level and more comprehensive and multidimensional studies are needed.

Introduction

Chronic pain, which is basically a group of the temporal classification of pain, is now recognised as a separate disease. It is characterised by a duration beyond the normal tissue healing time of 12 weeks. It causes disability, anxiety, depression, sleep disturbances and reduced quality of life (Geneen ve ark., 2017). It affects more than 30% of people worldwide and poses a serious socioeconomic burden (Cohen ve ark., 2021). In addition to psychological, social and biophysical factors, structural changes in the musculoskeletal system are also important in the chronicity of pain (Mokdad ve ark., 2018). As a result, the biomechanical and biopsychosocial structure of the individual with chronic pain is disrupted (Ghamkhar ve Kahlaee, 2015).

Before the 1960s, chronic pain conditions were largely regarded as medical problems with clear pathophysiological fundations, treated primarily through physical methods such as surgery or medication. Treatment was recommended with rest and inactivity. However, today, chronic pain has begun to be defined from a biopsychosocial perspective. Furthermore, exercise has been shown to reduce the severity of chronic pain and has physical and psychosocial benefits (Jensen ve ark., 2014). Therefore, physical activity and exercise

programs have increasingly been promoted and offered in healthcare systems (Brønfort ve ark., 2004).

The biopsychosocial approach views pain and disability as the result of a multidimensional, dynamic interaction among physiological, psychological, and social factors, which influence one another and contribute to the development of complex pain syndromes. (Brønfort ve ark., 2004; Jensen ve ark., 2014). The overlap between the psychological state emphasized in this approach and chronic pain is widely accepted (Gatchel ve ark., 2014). Since pain is both a sensory and emotional experience, it is always necessary to assess the discomfort of pain or emotional responses to pain, together with pain intensity and other "sensory" characteristics. For this reason, it is important to determine how emotionally affected patients are, as well as how physically active they are, who have difficulty managing pain.

The positive effects of physical activity and exercise on pain management in patients with chronic pain are known (Geneen ve ark., 2017). On the other hand, physical activity levels and emotional states should be taken into consideration when planning exercise for individuals with chronic pain. In this context, the aim of this study is to investigate whether there is a relationship between physical activity levels and depressive symptoms in patients with chronic pain. Considering the biopsychosocial structure of humans and the fear-avoidance behavior that chronic pain can create, our hypothesis in this study was that physical activity levels would have an effect on the severity of depressive symptoms in patients with chronic pain and that depressive symptoms would be more severe in individuals with low physical activity levels.

Material and Methods

This cross-sectional study included patients with moderate or severe pain (pain intensity 4 and above according to visual analog scale (VAS)) originating from the musculoskeletal system for more than 12 weeks who started physiotherapy sessions at Sivas Numune Hospital between 01.08.2024 and 01.09.2024. 50 participants included in the study. Sample size was determined using the G*Power 3.1.9.7 program with α=0.05 and effect size:0.It was calculated with 80% power for 40. Patients with any history of surgery, referred pain, pain originating from visceral organs, cancer history, age under 18, pain level under 4 according to VAS, thyroid dysfunction, anemia, metabolic disorders causing chronic pain such as vitamin D deficiency were not included in the study. A total of 12 patients were not included in the study because 7 of the 62 patients evaluated had pain severity below 4 and 5 had metabolic diseases associated with chronic pain. The research protocol was approved by the Sivas Cumhuriyet University Non-Invasive Procedures Ethics Committee with the date and number 2024/06-10, 27.06.2024. The rules of the Declaration of Helsinki and the Good Clinical Practice Guide were followed.

Age and gender, body anthropometric measurements such as height and weight, pain localization, and time elapsed since the onset of pain were recorded for participants who agreed to participate in the study. Then, pain level, mood, and physical activity levels were evaluated.

Visual Analog Scale (VAS) was used to measure the severity of pain in patients. VAS is a very common scale used in practice for pain assessment. In this scale, which is scored between 0 and 10, "0" indicates no pain,1-3 mild pain,4-6 A score of 0 to 10 indicates moderate pain, and a score of 7 to 10 indicates severe pain (Arslan et al., 2016). When applying this scale, patients were asked to give a score between 0 and 10, considering their average pain intensity over the last week.

The International Physical Activity Questionnaire Short Form was used to assess the physical activity levels of individuals. The intra-observer reliability of the Turkish version of this questionnaire was found to be 0.91 with a Cronbach's alpha value (Özdemir ve ark., 2014). For inter-observer reliability, Cronbach's alpha value was calculated as 0.83 (Çolak ve ark., 2011). This insightful scale is a patient-reported tool featuring seven thoughtfully crafted questions that explore the activities you've engaged in over the past week, along with the time dedicated to each. By capturing this information, it unveils your unique physical activity levels. Each recorded duration is multiplied by the corresponding metabolic equivalents for each activity, offering a nuanced understanding of your exertion. Ultimately, the average of these calculations reveals your overall physical activity score, providing a valuable reflection of your active lifestyle. (Saglam ve ark., 2010).

The evaluation of individuals' depressive symptoms was made with the Beck Depression Inventory. The reliability coefficient of the Turkish version of the BDI was reported as Cronbach's alpha value of 0.87 (Hisli, 1988). In the intra-observer reliability study, the Cronbach's alpha value was found to be 0.91, and the inter-observer reliability was determined as 0.85 (Karaoğlan ve ark., 2016). It is a 21-item scale that determines the risk of individuals for depression and evaluates the severity of depressive symptoms. Each item is scored between 0 and 3 on this scale, which has a maximum score of 63. Individuals with a total score between 1-10 are classified as normal, individuals with a score between 11-16 are classified as having mild mental distress, individuals with a score between 17-20 are classified as having depression, individuals with a score between 21-30 are classified as having moderate depression, individuals with a score between 31-40 are classified as having severe depression, and individuals with a score of 40 and above are classified as having very severe depression (Hisli, 1989).

Statistical analysis

Analyses were performed using SPSS v22 program. Visual methods and Shapiro-Wilk test were used to investigate the suitability of variables for normal distribution. Quantitative variables were presented with

mean (SD) or median (min-max) values, categorical variables with n (%). Chi-square test or Mann-Whitney U test was used to compare sociodemographic and clinical data of physically inactive and physically active participants. The relationship between physical activity levels and emotional state was investigated using Spearman correlation analysis. Type 1 error level was accepted as 0.05.

Results

A total of 50 patients, 45 (90%) female and 5 (10%) male, participated in this cross-sectional study. Thirteen (26%) of the participants had chronic knee pain, 10 (20%) hip pain, 13 (26%) low back pain, and 14 (28%) shoulder pain. Participants 33 (66%) were physically inactive and 17 were physically active. The mean age of the patients in the physically inactive group was 61.6±12.5 years, average age of patients in the physically active group was 59.2±10.1 years. The median pain level of physically inactive participants was 7(5-9), and the median pain level of physically active participants was 7(4-9). The sociodemographic data of the groups are shown in Table 1.

Table 1. Sociodemographic data of the participants

	Physically Inactive Participants (n=33)	Physically Active Participants (n=17)	p
Age, mean(SD)	61.6(12.5)	59.2(10.1)	0.34
Gender, female, n(%)	30(91)	15(88.2)	0.76
BMI, kg/m², mean(SD)	32.9(6.2)	31.4(5.1)	0.34
Educational Status			0.86
Primary education, n(%)	29(87.9)	15(89.3)	
Secondary education, n(%)	3(9.1)	22(11.8)	
Higher education, n(%)	1(3)		
Active working life, No, n(%)	31(93.9)	16(94.1)	0.98
Comorbidity, Yes, n(%)	18(54.5)	12(70.6)	0.36
Pain localization			0.67
Knee, n(%)	8(24.2)	5(29.4)	
Hip, n(%)	8(24.2)	2(11.8)	
Waist, n(%)	9(27.3)	4(23.5)	
Shoulder, n(%)	8(24.2)	6(35.3)	
Pain intensity, median(min-max)	7(5-9)	7(4-9)	0.95

The median Beck Depression Inventory score of physically inactive participants was 17 (5-44), accounting for 21.2% with minimal depression (n=7), 24.2% with mild depression (n=8), 33.3% of them had moderate depression (n=11), 21.2% of them had severe depression (n=7). The median Beck Depression Inventory score of the physically active participants was 18 (8-39), and when the depression levels were examined, the depression levels of the physically inactive patients were 5.9% with minimal depression (n=1), 35.3% of them were mildly depressed (n=6), 47.1% with moderate depression (n=8), 11.8% of them were at the level of severe depression (n=1) (Table 2).

Table 2. Depression levels of participants

	Physically Inactive Participants (n=33)	Physically Active Participants (n=17)	p
Beck depression inventory, median(min-max)	18(5-44)	18(8-39)	0.95
Depression Level			0.35
Minimal depression, n(%)	7(21.2)	1(5.9)	
Mild depression, n(%)	8(24.2)	6(35.3)	
Moderate depression, n(%)	11(33.3)	8(47.1)	
Severe depression, n(%)	7(21.2)	2(11.8)	

In addition to all our findings, no significant relationship was found between the physical activity level of the patients and the Beck depression score (p=0.96).

Discussion

In this study, which examined the relationship between physical activity levels and depression levels in patients with chronic pain, no statistically significant difference was found in the Beck Depression Inventory scores between physically inactive and physically active participants. Additionally, no relationship was found between physical activity level and depression level.

Chronic pain is a widespread, complex, and distressing issue that has a profound impact on individuals and society (Mills ve ark., 2019). Although the quality of evidence varies, numerous published systematic reviews have shown that physical activity has positive effects on individuals with chronic pain. It has been found to improve quality of life, enhance physical function, and reduce pain severity (Geneen ve ark.,2017; Marley ve ark., 2017). However, many studies have reported that individuals experiencing chronic pain have reduced physical activity levels, which are negatively affected (İncebacak, 2019; Parker ve ark., 2017; Toraman ve ark., 2021). Individuals gradually reduce their daily physical activities due to the fear that their pain will

worsen. In fact, in this study, the majority of participants had a low physical activity level. The inactivity caused by pain is explained by the fear-avoidance model. In this model, in the presence of chronic pain, individuals restrict their physical activity because they believe that activities will either cause pain or exacerbate it (İncebacak, 2019). Low physical activity levels and prolonged inactivity can increase the occurrence of pain or the severity of existing pain. This leads to more pain being felt in daily life, and the individual avoids movement due to the fear of facing the pain (Soysal ve ark., 2013). Thus, a self-reinforcing cycle is formed. Additionally, patients' emotional states, pain duration, and their approach to pain are influential factors in the development of fear-avoidance behaviors (İncebacak, 2019).

Chronic pain has numerous effects on individuals. One of these effects is on mood. Chronic pain has become a common health issue in clinical practice, evolving from just a symptom to a syndrome. It is frequently associated with psychiatric symptoms and signs (Tütüncü ve ark., 2011). Sometimes, chronic pain can be a symptom of depressive disorder, while at other times, it can lead to disturbances in an individual's emotional world as a physical disorder (Altındağ ve ark., 2006). Chronic pain is associated with all forms of depressive disorders. However, this relationship has not yet been fully understood. Some authors emphasize that chronic pain is a potent physical or psychological stressor that affects mood (Ohayon ve Schatzberg, 2003). While the prevalence of depression in the general population is 5-8%, the incidence of depression in patients with chronic pain ranges from 22% to 78% (Haythornthwaite ve ark., 1991). In studies where more specific criteria and structured interview techniques were used, this rate has varied between 8% and 50% (Aslan ve Nazlıel, 2002). A meta-analysis conducted on patients with depression showed the pain prevalence to be 65% (Greist ve ark., 2008).

In general, as the duration of chronic pain increases, the emergence of depressive symptoms is expected. A correlation has been shown between pain duration and depression levels (Wenzel ve ark., 2002). There are many factors that affect depression in patients with chronic pain. These include the patient's social environment, age, being female, education level, being overweight, and having other chronic diseases (Fillingim ve ark., 2009; Fiske ve ark., 2009; Luppino ve ark., 2010). Due to the close relationship between physical inactivity and pain, it is believed that inactivity could be one of the contributing factors. The constant perception of discomfort from pain and the reduction of daily activities decrease the individual's pain tolerance, negatively affect quality of life, and create a predisposition to depression (Linton, 2000).

Many studies examining the relationship between physical activity and depression have found a significant association between the two. In a study conducted by Dankel et al. (2016), it was shown that inactive individuals and those with obesity or overweight levels had an increase in depressive symptoms. In a longitudinal study conducted by Camacho et al. (2009), it was observed that among participants who initially did not have depressive symptoms, those with low levels of physical activity had a higher risk of depression compared to those with high levels of physical activity. Another study stated that physical activity plays a protective role against depression (Babiss ve ark., 2009). In the systematic review conducted by Mammen and Faulkner (2013), it is emphasized that increasing physical activity is an effective strategy in reducing the risk of depression. These studies demonstrate the impact of physical activity on depressive symptoms. However, in our study, while we expected depression to be more common in physically inactive individuals, contrary to our hypothesis, we found both groups to be similar. The cross-sectional nature of the study, the heterogeneity of the primary pain source, and our categorical assessment of physical activity levels using self-reported survey data may have contributed to this result. Additionally, in individuals with chronic pain, there are numerous factors related to depression within the biopsychosocial framework, such as social support, work and home life, and past psychological trauma. In our participants, factors other than physical activity may have been more prominent.

Our study has several limitations. The fact that the research was conducted within a short time frame, at a single center, and with a relatively small sample size, as well as the use of self-reported questionnaires for the scales, are limitations. Additionally, mood was only assessed using the Beck Depression Inventory, without evaluating anxiety levels, and due to the insufficient number of highly active participants, a third group could not be formed. These are the limitations of our study.

Conclusion

In our study examining the relationship between physical activity levels and mood in patients with chronic pain, it was observed that the majority of participants (66%) were physically inactive. However, no significant relationship was found between the physical activity level and depression level in patients with chronic pain. These results suggest that the effects of chronic pain on depression may not be solely explained by physical activity levels, and other factors (such as psychosocial support, pain perception, and quality of life) should also be considered. Further research with a larger sample size, where physical activity levels are assessed through objective measurements and in conjunction with other potential psychological variables, is needed. This could lead to the development of more effective strategies for managing chronic pain.

Declarations

Acknowledgments
Not Applicable

Conflict of Interest
Authors disclose no potential conflicts of interest.

Ethics Statement

Ethical approval for our study was obtained from the Non-Interventional Research Ethics Committee of Sivas Cumhuriyet University, with the decision number 2024/06-10.

Informed Consent

Written informed consent was obtained from all participants during the conduct of the study.

Author Contributions

R.S.Ö. and M.P. conceptualized the study, R.S.Ö. wrote the original draft, M.P. performed the statistical analysis, supervised the research and provided critical revisions. R.S.Ö. and M.P. developed the methodology and ensured compliance with ethical standards, R.S.Ö. conducted the experiments and collected the data. R.S.Ö. and M.P. curated the dataset and created the visualizations. M.P.reviewed and edited the manuscript for intellectual content and clarity.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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ORIGINAL RESEARCH

Women's Knowledge and Opinions on Midwife-Led Continuity Preconception Care and Counseling

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ABSTRACT

This study was aimed at determining the knowledge and opinions of women about the midwife-led continuity preconception care and counseling (MLCPCC). The research is of descriptive type. The sample of the study consisted of 178 women aged 18-49 years. The study data were collected online the Personal Information Form and Form to Assess Women's Knowledge and Opinions of MLCPCC. Of the women participating in the study, 29.2% were in the age group of 30-34 years, 70.2% were married, 75.3% were at least university graduates, and 12.9% received preconception care and counseling. Of those who received preconception care and counseling, 6.7% received preconception care and counseling from midwives. The mean score the participants obtained from the Form to Assess Women's Knowledge and Opinions of MLCPCC was 41.97 ± 9.22 (Min-Max: 0-48). The participants' descriptive characteristics and pregnancy experience-related characteristics did not affect the scores they obtained from the Form to Assess Women's Knowledge and Opinions of MLCPCC (p> 0.05). Although most of the participants were higher education graduates, they did not receive preconception care and counseling, which is quite surprising. The fact that the mean scores they obtained from the Form to Assess Women's Knowledge and Opinions of MLCPCC were high suggests that they supported MLCPCC, which plays a significant role in the development of women and community health.

Introduction

In many parts of the world, midwives are perceived as the primary care providers of women of reproductive age (ten Hoope-Bender et al., 2014). According to the World Health Organization, Midwife-Led Continuity Care is defined as the provision of care and counseling to women in line with their needs by the same midwife or midwife group (WHO, 2016). In the Midwife-Led Continuity Care model, midwives take part in the planning, organizing and providing of the care from the start of preconception to the postnatal period as pioneering professionals (Czeizel, 2012; Sandall et al., 2016). One of these midwife-led care services provided in every period of the life of women is preconception care and counseling (Czeizel, 2012).

Preconception care is the primary protective health care that supports the preparation of women for pregnancy and the healthy maintenance and termination of pregnancy, and is aimed at contributing to new generations' being made up of healthier individuals (Beckmann et al., 2014; Shawe et al., 2015). It is known that preconception care creates a preliminary preparation for a healthy pregnancy which reduces mortality and morbidity rate among mothers and babies during labor and postpartum, increases mother and infant health in high- and low-income countries, prevents unwanted and unplanned pregnancies, and contributes to the development of fertility awareness and pregnancy planning culture (Karakaya and Coşkun, 2013; Dean et al., 2014; Başli and Aksu, 2018). Within this context, it is thought that midwife-led continuity preconception care and counseling (MLCPCC) can contribute to the improvement of women's health. In this approach, midwives advocate the rights of women, plan their care by assessing their needs, provide training and counseling to them, and refer them to appropriate units when necessary (Czeizel, 2012; Beckmann et al., 2014; Shahid et al., 2014; Sandall et al., 2016).

In MLCPCC, the aim is to increase women's satisfaction by focusing on holistic and humanistic principles. According to the philosophy of such care and counseling, the woman is in the center and benefits from individualized care services uninterruptedly (Sandall et al., 2016; WHO, 2016). For instance, in some countries such as Australia, New Zealand, the Netherlands, England and Ireland, pre-pregnancy, pregnancy, birth and postpartum services are carried out uninterruptedly under the leadership of midwives (Shahid et al., 2014; Shawe et al., 2015; Sandall et al., 2016). In studies conducted on Midwife-Led Continuity Care (MLCC), it was reported that women used less painkillers, that episiotomy, caesarean section and perinatal mortality rates and women's fear and stress levels decreased, that spontaneous birth rates increased, that women had high levels of sense of control and satisfaction at birth and during the postpartum period, and that not unnecessary interventions but natural methods were supported (ten Hoope-Bender et al., 2014; Forster et al., 2016; McLachlan et al., 2016; Sandall et al., 2016; Wiegerinck et al., 2018; Hanahoe, 2020; Vincent et al., 2022).

Centers for Disease Control and Prevention, American College of Obstetricians and Gynecologists and World Health Organization maintain the view that when women are reached before pregnancy, their preconception knowledge, attitudes and behaviors should be improved and all women of reproductive age should be able to receive healthcare both of which are among the objectives of preventing the complications likely to occur after birth (WHO,2013; ACOG, 2019; CDC, 2022). Within this context, it is thought that MLCPCC can support the goals aimed at developing the health of women in particular and that of community in general, and that it can make positive contributions to the mother-child health. Midwife-led continuity care model which has been proved to have both individual and social benefits by several studies should be used in preconception care and counseling and women's awareness of its benefits should be raised. Thus, studies in which women's knowledge and opinions about MLCPCC are determined should be conducted. The present study was conducted to determine women's knowledge and opinions about the midwife-led continuity preconception care and counseling.

Material and Methods

Aim and Type of Research

This study was conducted to determine women's knowledge and opinions on midwife-led pre-pregnancy care and counseling. The research is descriptive in type.

Research Population and Sample

The population of this descriptive study comprised women of reproductive age who were registered in three family health centers in a province located in the Central Anatolian region of Turkey, were selected by the lottery method, were in the age group of 18-49 years, accepted to participate in the study, were not pregnant, had no psychiatric/psychological diagnosis, who had internet access, were able to use the internet, a computer, tablet and/or smartphone, had neither communication nor language problems. The number of 18-49-year-old women of reproductive age who were registered in the aforementioned family health centers was 17,899. The minimum sample size of the study was calculated as 163 using the OpenEpi Version 3 program (N: 17899, p: 50%+/-5, confidence limits (d) =±0.05, confidence level: 80%) (Dean et al., 2021). Considering the possibility of losses during the study, we included 178 women in the sample.

Data Collection and Analysis

The study data were collected using the Personal Information Form and Form to Assess Women's Knowledge and Opinions of MLCPCC between July 2021 and September 2021. Due to the COVID-19 pandemic, data were collected via online surveys (Google Forms). It took the participants approximately 5-10 minutes to fill in the online form.

Personal information form: In the form developed by the researchers based on the literature (ten Hoope-Bender et al., 2014; Sandall et al., 2016; Gökdemir and Eryılmaz, 2017; Başli and Aksu, 2018) there are 12 items questioning

the participants' age, education status, occupation status, income status, and obstetric history.

Form to assess women's knowledge and opinions of the midwife-led continuity preconception care and counseling (MLCPCC): The form developed by the researchers based on the literature (ten Hoope-Bender et al., 2014; Shawe et al., 2015; Sandall et al., 2016; Gökdemir and Eryılmaz, 2017; Başli and Aksu, 2018; Wiegerinck et al., 2018; Hanahoe, 2020; Vincent et al., 2022) includes 24 questions asked to determine the participants' knowledge and opinions about MLCPCC. Responses given to the questions are rated as follows: agree: 2, no idea: 1 and disagree: 0. The higher the score obtained from the form is, the higher the participant's knowledge level is and the more favorable her opinion of MLCPCC is.

Statistical Analysis

The study data were analyzed using the IBM SPSS Statistics 22 statistical package program. In the descriptive statistics, percentage, arithmetic mean, standard deviation, median, minimum and maximum values were used. Shapiro-Wilk normality test and Q-Q plots were used to determine whether the data were normally distributed. Because the data were not normally distributed, the Mann-Whitney U test was used in comparisons of two independent groups, and the Kruskal-Wallis test was used in comparisons of more than two independent groups. Statistical significance level was accepted as $p<0.05$.

Results

Of the women participating in the study, 29.2% were in the age group of 30-34 years, 70.2% were married, 75.3% were at least university graduates, 53.4% did not work in any paid job, 15.7% did not have social security, 54.5% stated that they had income equal to their expenses, and 77.5% had a nuclear family (Table 1).

Of them, 37.7% had never been pregnant, 40.4% had never given birth. Of the women who gave birth, 33.4% underwent a cesarean section, 12.9% received preconception care and counseling. Of those who received preconception care and counseling, 6.7% received preconception care and counseling from midwives. (Table 2).

The analysis of the participants' knowledge and opinions of Midwife-led Continuity Preconception Care and Counseling demonstrated that that most of them (66.9%-89.3%) agreed with the items in the MLCPCC form (Table 3).

The responses the participants gave to the questions in the MLCPCC form are rated as "agree: 2", "no idea: 1" and "disagree: 0". The mean score they obtained from the form was 41.97±9.22 (min-max: 0-48). The participants' descriptive characteristics (Table 4) and pregnancy experience-related characteristics (Table 5) did not affect the scores they obtained from the Form to Assess Women's Knowledge and Opinions of MLCPCC ($p> 0.05$).

Table 1. Descriptive characteristics of the participating women (n=178)

Descriptive characteristics		n	%
Age (years)	18-24	37	20.8
	25-29	41	23.0
	30-34	52	29.2
	35-49	48	27.0
Marital status	Single	53	29.8
	Married	125	70.2
Educational status	Primary school	3	1.7
	Junior high school	8	4.5
	Senior high school	33	18.5
	University and above	134	75.3
Employment status	Not employed	95	53.4
	Employed	83	46.6
Having social security	No	28	15.7
	Yes	150	84.3
Perceived income status	Income less than expenses	41	23.0
	Income equal to expenses	97	54.5
	Income more than expenses	40	22.5
Family structure	Nuclear family	138	77.5
	Extended family	40	22.5
Total		178	100.0

Table 2. Pregnancy experience-related characteristics of the participating women (n=178)

Characteristics		n	%
The number of pregnancies	Nulligravidae	67	37.7
	1	45	25.3
	2	38	21.3
	3	19	10.7
	4	9	5.1
The number of deliveries	Nulliparae	72	40.4
	1	50	28.1
	2	42	23.7
	3	12	6.7
	4	2	1.1
Mode of delivery (n=106)	Vaginal	39	23.1
	Caesarean section	56	33.4
	Vaginal and caesarean section	11	6.5
Receiving preconception care and counseling	No	155	87.1
	Yes	23	12.9
The person from whom preconception care and counseling was received	Those who never received counseling	155	87.1
	Midwife	12	6.7
	Nurse	3	1.7
	Physician	6	3.4
	Others	2	1.1
Total		178	100.0

Tablo 3. Participating women's knowledge and opinions about Midwife-Led Continuity Preconception Care and Counseling (MLCPCC)

Women's knowledge and opinions		Disagree	No idea	Agree
If I decide to have children by receiving MLCPCC, I think it can improve my pre-pregnancy health.	n	9	12	157
	%	5.1	6.7	88.2
I think I can have a health checkup before I get pregnant if I receive MLCPCC.	n	8	13	157
	%	4.5	7.3	88.2
If I get pregnant after receiving MLCPCC, I think I will have a healthy pregnancy.	n	13	10	155
	%	7.3	5.6	87.1
I think I will have adequate knowledge of childcare before I become pregnant if I receive MLCPCC.	n	19	13	146
	%	10.7	7.3	82.0
I think that risk factors such as anemia, diabetes, Rh incompatibility, breast cancer etc. can be determined before getting pregnant if I receive MLCPCC.	n	11	10	157
	%	6.2	5.6	88.2
I think I will have a happy and fulfilling sex life if I receive MLCPCC.	n	39	23	116
	%	21.9	12.9	65.2
I think I will consider using additional supplements (vitamin medicine, Folic Acid/Vitamin B9 etc.) 3 (three) months before getting pregnant if I receive MLCPCC.	n	20	13	145
	%	11.2	7.3	81.5
I think I will have enough knowledge about the vaccines that should be administered before getting pregnant if I receive MLCPCC.	n	9	10	159
	%	5.1	5.6	89.3
I think I will consider getting genetic counseling before getting pregnant if I receive MLCPCC.	n	20	17	141
	%	11.2	9.6	79.2
I think I will consider getting a screening (cervical cancer screening, HIV, Hepatitis B, Syphilis, etc.) before I get pregnant if I receive MLCPCC.	n	13	15	150
	%	7.3	8.4	84.3
I think that I will have enough knowledge about the effect of chronic diseases on the pregnancy process and the necessary treatment if I receive MLCPCC.	n	10	11	157
	%	5.6	6.2	88.2
I think I will gain awareness of fertility if I receive MLCPCC.	n	14	10	154
	%	7.9	5.6	86.5
I will think about planning to get pregnant whenever I want and using family planning methods effectively if I receive MLCPCC.	n	16	12	150
	%	9.0	6.7	84.3
I think that I will have enough knowledge about healthy eating if I receive MLCPCC.	n	15	14	149
	%	8.4	7.9	83.7

Table 4. Distribution of the scores the participating women obtained from the Form to Assess Women's Knowledge and Opinions of Midwife-Led Continuity Preconception Care and Counseling according to their descriptive characteristics

Descriptive characteristics	n	$\bar{X}$ ±SD	Med (Min-Max)
Age (years)			
18-24	37	39.54±11.22	45 (0-48)
25-29	41	40.61±11.19	46 (0-48)
30-34	52	43.46±7.55	46 (14-48)
35-49	48	43.4±6.66	46 (24-48)
Test*		KW=2.849 p=0.411	
Marital status			
Single	53	41.47±10.52	46 (0-48)
Married	125	42.18±8.65	46 (0-48)
Test**		Z=-0.548 p=0.584	
Educational status			
High school and below	44	40.41±10.43	45.5 (0-48)
University and above	134	42.49±8.77	46 (0-48)
Test**		Z=-1.228 p=0.219	
Employment status			
Not employed	95	41.13±9.34	45 (0-48)
Employed	83	42.94±9.05	47 (0-48)
Test**		Z=-1.780 p=0.075	
Social security			
No	28	41.25±8.42	46 (22-48)
Yes	150	42.11±9.38	46 (0-48)
Test**		Z=-0.916 p=0.360	
Perceived income status			
Income less than expenses	41	41.24±11.39	46 (0-48)
Income equal to expenses	97	41.7±9.02	46 (0-48)
Income more than expenses	40	43.38±7.06	46 (14-48)
Test*		KW=0.646 p=0.724	
Family structure			
Nuclear family	138	42.29±9.27	46 (0-48)
Extended family	40	40.88±9.09	46 (10-48)
Test**		Z=-1.298 p=0.194	

**Kruskal Wallis test was used, **Mann-Whitney U test was used.*

Discussion

In the present study, of the participating women who gave birth, 33.4% underwent a cesarean section, and only 12.9% received preconception care and counseling. Of those who received preconception care and counseling, 6.7% received preconception care and counseling from midwives. In a study in which interventions to reduce unnecessary cesarean sections in healthy women and babies were investigated, the researchers determined that midwife-led care was associated with higher rates of physiological births, safer outcomes, and lower healthcare costs and positive motherhood experiences in high-income countries compared to control groups not having undergone these interventions (Betran et al., 2018). In a systematic review and meta-analysis study, organizational reforms supporting the midwife-led continuous care in maternity wards were determined to reduce cesarean rates (Chapman et al., 2019). The comparison of the results of the aforementioned studies with those of the present study revealed that cesarean section rates were higher in the present study, which was probably because most of the participants in the present study did not receive midwife-led preconception care and counseling. On the other hand, although most of the participants were higher education graduates, 87.1% of them did not receive preconception care and counseling is quite noteworthy, which indicates that MLCPCC services are not yet at the desired level for women to access.

According to the data in the Health Statistics Yearbook published by the Ministry of Health in Turkey (2019), the number of midwives and nurses per 100 thousand people is 306 in Turkey. This supports the present study findings indicating that the number of midwives and nurses in Turkey is insufficient in providing health services. In a Cochrane systematic review, it was demonstrated that midwife-led care model was more effective than doctor-led care models for low-risk women during labor because in the former model, there was less intervention, outcomes were better, and maternal and neonatal mortality and morbidity rates were lower (Sandall et al., 2016). In addition, in the report on midwifery in the world, according to the World Health Organization and the International Confederation of Midwives (2021) stated that it was confirmed that an estimated 4.3 million lives could be saved annually by 2035 by increasing the number of midwives and the quality of care they provide. For instance, midwife-led care provided in obstetric units has been reported to have a significant success in placing Sweden among the 5 countries with the best maternal and newborn outcomes in the world (Lindgren and Erlandsson, 2022).

The International Confederation of Midwives (2023) also made such announcement as “Trust the Evidence: Invest in Midwives” and emphasized the importance of investing in midwives. It has also been reported that preconception care and counseling is an area of intervention that reduces poor perinatal outcomes, promotes health by risk assessment, prevents unwanted pregnancies, and forms the basis of a healthy society (Fowler et al., 2022). The results of the present study regarding the participants’ knowledge and opinion indicating that MLCPCC would prepare them better for a healthy pregnancy, that it might ensure the identification of the risk factors before pregnancy, and that it would reduce pre-pregnancy disease burden, maternal and infant mortality rates are consistent with the results of the aforementioned studies. In a study, the researchers concluded that midwife-led care yielded positive results regarding birth control, immunization, and psychosocial and public health. In the same study, it was emphasized that when midwifery care is provided by trained, licensed and supervised midwives, resources are used more efficiently, which leads to better results (Renfrew et al., 2014). The results of the present study indicating that most of the participants would establish an effective communication based on empathic understanding, that they would be supported psychosocially and gain awareness of fertility, that they could plan to become pregnant whenever they want to and use family planning methods effectively, that they would have sufficient knowledge about vaccines, and that they thought that care and counselling would be less costly thanks to the MLCPCC are consistent with the results of the aforementioned studies.

In the literature, midwives’ ability to cooperate with women through the continuity of care is considered important in terms of guiding women throughout the system, which is argued that this situation can help women to make conscious decisions by supporting them to state their needs clearly (Fox et al., 2023). In the present study, most of the participants thought that they would establish an effective communication based on empathic understanding, which supports the view in the previous statement. In a randomized controlled study conducted with 20-40-year-old women of reproductive age, it was reported that the provision of health care and counseling on reproductive health before pregnancy raised the intervention group’s awareness of factors such as quitting tobacco use which affects health, avoiding alcohol, being in normal weight and starting to use folic acid before pregnancy. In the same study, they determined that women's knowledge about fertility and health awareness before pregnancy increased (Skogsdal et al., 2019). In the present study, the participants were in similar age groups and most of them thought that their knowledge and opinions about MLCPCC would help them develop healthy life style behaviors (regular exercise, not smoking, not consuming alcohol, having a balanced nutrition, etc.) and would encourage them to take additional supplements three months before pregnancy (folic acid/ vitamin B9, etc.), which are consistent with the findings in the literature. That the mean score the participants obtained from the Form to Assess Women's Knowledge and Opinions of MLCPCC was high also suggests that the participants supported the MLCPCC which contributes to the development of women and community health, and that they could benefit from it.

Conclusion

Although most of the participants were higher education graduates, 87.1% of them did not receive preconception care and counseling, which is quite surprising. That the mean score the participants obtained from the Form to Assess Women's Knowledge and Opinions of MLCPCC was high also suggests that the participants supported the MLCPCC which contributes to the development of women and community health, and that they thought they could benefit from MLCPCC. The midwife-led continuity preconception care and counseling model which has been proved to have many individual and social benefits in several studies is also expected to be used in preconception care and counseling and to raise women's awareness of the benefits of the model. The number of studies conducted on MLCPCC in the literature is very few. Thus, we recommend that studies in which women receive MLCPCC should be conducted with larger populations.

Table 5. Distribution of the scores the participating women obtained from the form to assess women's knowledge and opinions of midwife-led continuity preconception care and counseling according to their pregnancy experience-related characteristics

Characteristics	n	$\bar{X}$±SD	Med (Min-Max)
The number of pregnancies			
Nulligravidae	67	41.19±10.13	46 (0-48)
1	45	42.82±8.12	46 (10-48)
2	38	42.37±9.7	46 (0-48)
≥3	28	41.93±8.2	46 (15-48)
Test*		KW=0.395	p=0.941
The number of deliveries			
Nulliparae	72	41.56±9.87	46 (0-48)
1	50	42.1±7.96	45 (10-48)
2	42	41.52±10.57	46 (0-48)
≥3	14	45±4.87	46 (32-48)
Test*		KW=1.511	p=0.680
Mode of delivery			
Not given birth yet	72	41.56±9.87	46 (0-48)
Vaginal	39	39.05±12.17	46 (0-48)
Caesarean section	56	44.29±5.18	46 (24-48)
Vaginal and caesarean section	11	43.27±6.07	46 (32-48)
Test*		KW=2.600	p=0.457
Receiving preconception care and counseling			
No	155	41.65±9.64	46 (0-48)
Yes	23	44.13±5.35	46 (30-48)
Test**		Z=-0.736	p=0.462

**Kruskal Wallis test was used, **Mann-Whitney U test was used.*

Declarations

Acknowledgments

This study was presented as an oral presentation at the 5th International 6th National Midwifery Congress on 11-14 November 2021.

The authors would like to thank all of the individuals who participated in the study.

Conflict of Interest

Authors disclose no potential conflicts of interest.

Ethics Statement

Before the study was conducted, we obtained the ethics committee approval from Sivas Cumhuriyet University's non-interventional clinical research ethics committee (Decision number: 2021-04/44, Date:14.04.2021) and written permission from the institution where the study was to be conducted (Commission Decision No. 2021/14).

Informed Consent

Informed consent forms from all participants were collected online. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Author Contributions

Conceptualization: ZBY, OH; methodology: ZBY, OH; software: ZBY, OH; validation: ZBY,OH; formal analysis: ZBY, OH; investigation: ZBY, OH; writing-orginal draft: ZBY, OH; writing-review&editing: ZBY, OH; visualization: ZBY, OH; supervision: ZBY, OH.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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ORIGINAL RESEARCH

Evaluation of Services in MRI Department of University Hospital with Discrete Event Simulation Technique: A Case Study

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ABSTRACT

With the advancement of technology, radiological imaging examinations are vital in clinical diagnosis and treatment processes. Patients with chronic conditions often require diagnostic imaging procedures such as MRI, X-ray, CT scans and Ultrasound. Timely access to these services is critical, especially in situations requiring urgent medical attention. Assessing and improving the performance of radiology departments is critical to optimize patient care. Simulation techniques, especially discrete event simulation, have emerged as an effective tool for optimizing workflow, resource allocation and patient flow in MRI departments. This study aims to contribute to strategic planning and operational decision processes in radiology departments to ensure more efficient use of resources. Using Arena Simulation, recommendations for efficient use of resources and balancing patient flows were developed and modeled. The main bottlenecks identified in the current situation analysis require strategic measures to be taken to improve the efficiency of MRI service processes. The recommended steps, such as procurement of new MRI equipment and staffing, are critical to meet the increasing demand for services in the future. As a result, this study provides concrete recommendations to increase the effectiveness of MRI service processes of the university hospital and serves as a guide to improve operational performance.

Introduction

As technology has advanced, radiological imaging examinations have emerged as vital aids in clinical diagnosis and treatment (Gong et al., 2022). Patients with chronic conditions often require diagnostic imaging procedures such as Magnetic Resonance Imaging (MRI), X-ray radiography, Computed Tomography (CT) scans, and Ultrasound to investigate potential side effects and determine appropriate medical interventions (Shakoor et al., 2017). Timely access to these services is crucial for prompt medical treatment and intervention. Delays in receiving these imaging services can cause disruptions for patients in need of urgent medical intervention. Therefore, the efficiency of the radiology department plays a critical role in enabling healthcare professionals to make timely diagnostic and treatment decisions (European Society of Radiology 2009). Assessment of equipment utilisation and patient waiting times in the radiology department is crucial in optimising patient care. Simulation techniques are valuable tools for assessing and improving the performance of radiology departments and assist in informed decision-making processes to improve overall healthcare delivery (Jun et al., 1999). Significant

transformations and barriers in the healthcare sector, including advances in medical technologies, have reshaped the role and importance of hospitals. These changes underline the critical need for rigorous and effective planning and management of healthcare facilities (Su & Shih, 2003).

Providing radiology services is a complex and technologically demanding endeavour where the use of operations management tools can contribute significantly to the management and improvement of processes (Ondategui-Parra et al., 2004). Well-structured and efficiently managed radiology practices have a competitive advantage characterised by rapid decision-making, decisive actions in line with established policies and a collective responsibility for practice development among group members (Muroff, 2004).

The use of discrete event simulation in the MRI department can be highly advantageous to optimise workflow, resource allocation and patient flow. DES (Discrete-event simulation) has been widely used in healthcare settings to improve operational efficiency and patient care delivery (Zhang, 2018). In healthcare delivery processes, DES has been used to evaluate alternative resource allocation strategies, resulting in improved patient care and operational efficiency (Günal & Pidd, 2010). Furthermore, DES has played an important role in optimising workflow for multimodal imaging procedures such as combined X-ray and MRI-guided interventions in radiology departments (Fernández-Gutiérrez et al., 2016).

The radiology department plays a critical role in the healthcare delivery process at the university hospital. However, it faces several challenges due to fluctuating demand that is not aligned with capacity. The purpose of this study is to identify factors that predict demand variability and opportunities for improvement. By analysing current performance and benchmarking methods, key performance indicators have been established from various perspectives. Through discussions, observations and literature review, the variability and bottlenecks with the greatest potential for improving MRI services were identified.

Interventions were designed and their effects modelled using Arena Simulation. In our study, how existing resources (modalities, personnel) can be used more efficiently in the short and long term and how patient flows can be balanced is addressed. In this context, using the Discrete Event Simulation Technique, the service processes in the MRI department were analysed and potential improvement areas were identified. The research findings aim to provide important contributions to strategic planning and operational decision-making processes in order to ensure more efficient use of resources in radiology departments.

Literature Review

The use of DES in healthcare has increased significantly in recent years with the aim of increasing operational efficiency and improving patient flows. This literature review focuses on the application of DES in healthcare and in particular in radiology departments. Existing studies show that DES is an effective tool in various healthcare processes and reveal how it is used to improve service quality under different scenarios. Studies demonstrating the effectiveness of DES in modelling and optimising system performance in various healthcare settings highlight its ability to assess resource allocation, patient flow, service planning and system interventions (Günal & Pidd, 2010; Landa et al., 2013; Woodall et al., 2013; Zhang, 2018; Moretto et al., 2019; Zouri et al., 2019; Vázquez-Serrano et al., 2021). The importance of DES in healthcare design, resource optimisation and system performance evaluation has been emphasised by researchers (Duguay & Chetouane, 2007). In particular, DES has been used to simulate and analyse complex healthcare systems to identify bottlenecks, improve patient flow and enhance quality of care (Duguay & Chetouane, 2007; Pongjetanapong et al., 2019; Durmuş & Özdemir, 2023).

DES has also played an important role in assessing the impact of staffing levels, turnaround times and service configurations in healthcare settings (Günal & Pidd, 2010; Pongjetanapong et al., 2019). Simulations under different scenarios have provided insights into patient outcomes, resource utilisation and operational efficiency (Günal & Pidd, 2010; Pongjetanapong et al., 2019; Özdemir et al., 2023). For example, Shakoor, evaluated the effectiveness of proposed strategies for resource management in radiology departments. The study revealed that the newly implemented strategy was more effective, but emphasised the need for improvement in services (Shakoor, 2015). Similarly, Suthihono and Kusumastuti investigated alternative solutions that can reduce the waiting time of patients in MRI services during the COVID-19 pandemic period and showed that it is possible to significantly reduce the length of stay of patients using DES (Suthihono, & Kusumastuti, 2021). Oh et al. formed a project team to reduce waiting times for X-ray patients in a tertiary hospital and showed that the implemented strategies accelerated patient access (Oh et al., 2011). Such studies demonstrate the effectiveness of strategies to improve hospital processes.

Nickel and Schmidt focused on analysing patient flow and device utilisation in the radiology department and showed that by modelling and evaluating different scenarios, device utilisation was increased and waiting times were reduced (Nickel & Schmidt, 2009). Similarly, Johnston et al. used DES to reduce patient flow in hospital emergency departments, identifying areas for improvement and supporting the decision-making processes of hospital staff (Johnston et al., 2009). Torabigoudarzi used DES to model patient flow in emergency radiology units and showed that adding additional staff for a shift improves performance (Torabigoudarzi, 2019). Similarly, Luo et al., showed that emergency booking policy can improve hospital performance and shorten patients' waiting times (Luo et al., 2018). Idigo et al. modelled and analysed the workflow process in a radiology department and showed that they can improve the operation planning and control process

(Idigo et al., 2020). Felicitas et al., showed that by analysing the workflow in the radiology department, patient flow can be managed by adopting an optimal scheduling system (Felicitas et al., 2021).

Finally, Singla identified the planning intentions of National Health Service (NHS) radiology services to maintain and improve MRI capacity. His research, which aimed to examine and plan the utilisation of hospital resources for the radiology department using DES, showed positive improvements in reducing patient waiting time and improving resource utilisation (Singla, 2020).

This literature review highlights the benefits and effectiveness of the use of DES in healthcare in a variety of areas. Studies show that DES is an important tool in healthcare design, resource optimisation and system performance evaluation. In particular, DES has been used to simulate and analyse complex healthcare systems, identifying bottlenecks, improving patient flow and enhancing quality of care. Simulations under various scenarios have provided valuable insights into patient outcomes, resource utilisation and operational efficiency. These studies emphasise the importance of developing strategies to increase efficiency and improve quality of care in healthcare. In conclusion, the use of DES as an effective tool in healthcare management can contribute to making healthcare services more efficient and accessible in the future.

Material and Methods

This study uses the discrete event simulation technique to evaluate and improve the service processes in the MRI (Magnetic Resonance) department of a university hospital. Discrete event simulation is an effective method to analyse system performance by modelling the dynamic behaviour of complex systems and interactions between individuals. Within the scope of this methodology, firstly, the existing workflows and processes in the MRI department were analysed in detail. Data were obtained from hospital record systems, observations and interviews with staff.

The first step of the study is to map the service processes in the MRI department and identify key performance indicators. These indicators include the number of shots, shooting time, appointment waiting time, report writing time, personnel and device utilisation. Using the collected data, a simulation model of the current processes was created. The model was designed to cover all steps from the entry of patients to the MRI department to the delivery of reports.

The simulation model was developed using Arena simulation software. In order to verify and validate the model, comparisons with real data were made to ensure that the model accurately represents the actual functioning in the MRI department. This validation process is an important stage to increase the reliability of the model.

The data obtained from running the model were analysed to determine the efficiency of existing service processes and bottlenecks. In addition, various scenarios were simulated and the potential effects of different capacity planning and production methods were evaluated. These scenarios included interventions such as increasing the number of staff, optimising device utilisation rates and improving the appointment system. It is emphasised that process simulation is a powerful tool for visualising the dynamics of workflows, analysing the behaviour of business processes and helping to plan a complex workflow. In this context, the study advocates the use of process simulation methods to make workflows in the radiology department more effective (Teichgraber et al., 2003).

The DES model was developed to simulate the patient flow process receiving MRI services in the radiology department of a university hospital. This involves outlining the patient flow, defining performance measures, establishing model assumptions, collecting and analysing data and validating the model. Ultimately, the study aims to identify optimal programming rules and perform sensitivity analysis.

Patient flow process; The patient flow process for an MRI scanner is shown in Figure 1. The scanner serves three categories of patients offering routine scans. In the event of new emergency patients arriving, these patients are placed in the earliest available non-emergency slots, holding until all previous emergency patients have been serviced. This flow diagram illustrates the process of magnetic resonance imaging of various types of patients and the steps that follow. The process starts with the referral of three different patient groups for MRI imaging: emergency patients, outpatients and inpatients. The first step is to refer the patient to the imaging centre for MRI imaging. After the imaging procedure is completed, the images obtained are interpreted by a specialised doctor. After the doctor's interpretation, a detailed report is written based on these interpretations. The report is reviewed and approved by a second doctor. In the final stage, the approved report is sent to the patient. This process follows a standardised procedure regardless of the type of patient and each stage is carried out on the basis of medical accuracy and reliability.

The flow diagram shows in detail the patient service processes for the MRI (Magnetic Resonance) department of a university hospital (Figure 2). The process starts with the patient arriving at the hospital and being examined. As a result of the examination, it is decided whether an MRI scan is necessary for diagnosis and treatment. If MRI is not deemed necessary, the process ends. However, if MRI is necessary, the patient is referred to the radiology unit.

After the patient is referred to the radiology unit, an appointment is made with the secretariat for MRI. The patient's MRI scan is performed on the appointed appointment day. After the MRI scan is completed, the patient's images are read and evaluated by specialised doctors. After the evaluation phase, the patient's MR report is written.

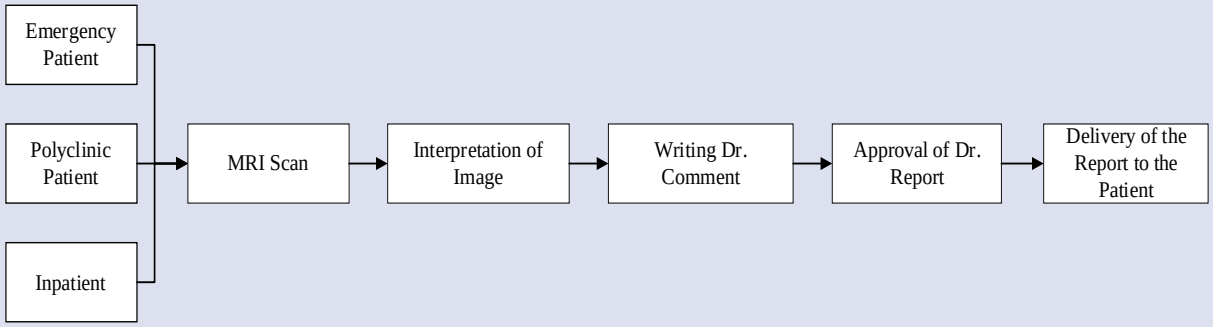

Figure 1. Patient flow process in the radiology unit

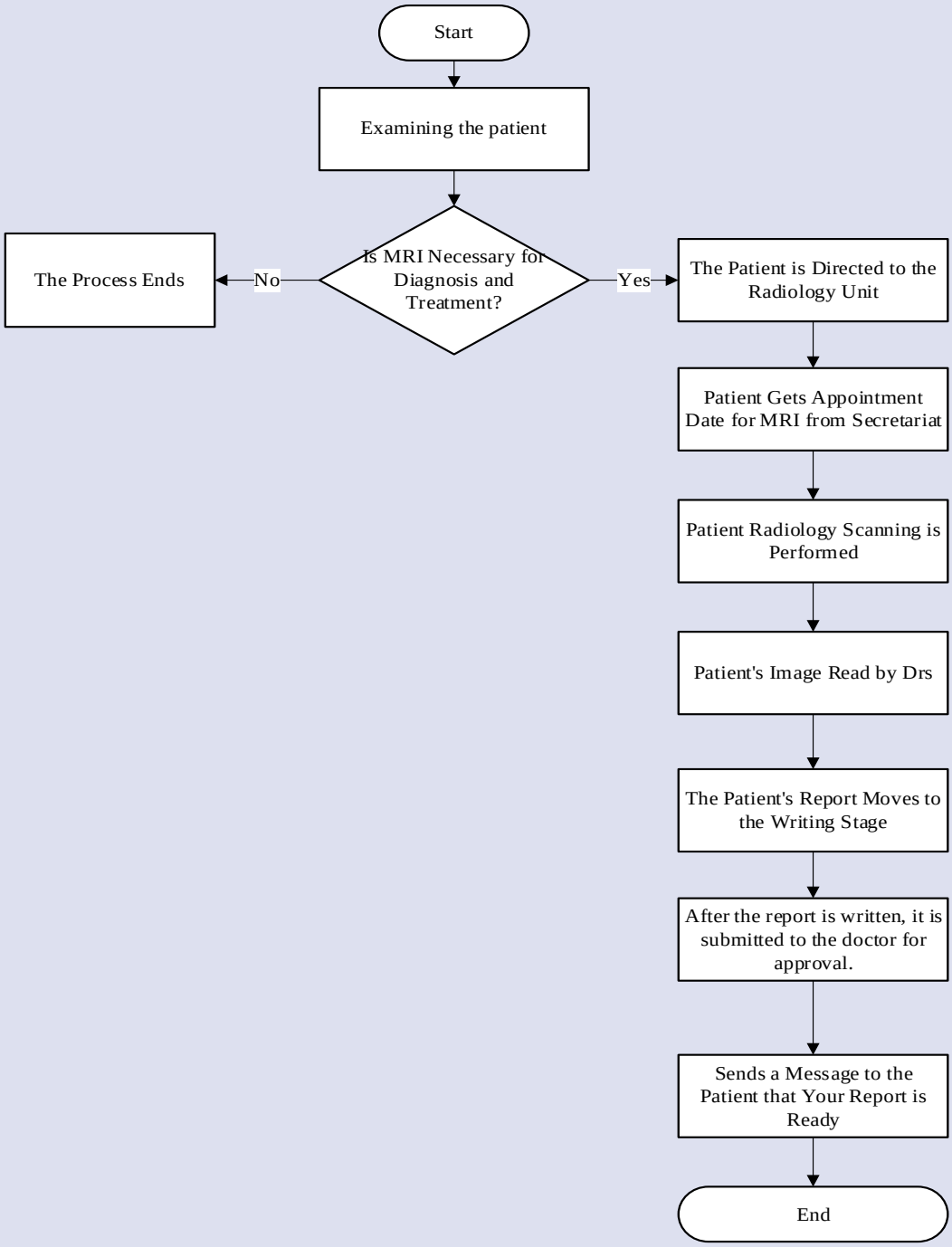

Figure 2. Patient Flow diagram in the radiology unit

The written report is submitted to a doctor to be checked for accuracy and completeness and is subject to the doctor's approval. When the approval process is completed, the patient is notified that the report is ready. The process ends with the patient receiving the report. This comprehensive process is designed to ensure efficient management of patient flow and minimise delays in diagnosis and treatment.

In the study, it is considered that the discrete event simulation model developed to evaluate the service processes in the MRI department of the university hospital is based on certain assumptions. Firstly, the patient flow is assumed to have a statistically random but estimated distribution based on historical data. This assumption aims to accurately reflect the frequency and probability of patient admissions and MRIs in a given time period.

In the model, the possibility of failure of MRI devices is neglected, i.e. it is assumed that the devices operate continuously and without interruption. This assumption reduces the variability and complexity in the system, making the simulation more focussed and manageable. It is also assumed that staff availability is constant and shift changes do not affect the service process. This was done to minimise the impact of staff scheduling and task allocation on the simulation. It is also assumed that the appointment system is efficient and patients keep their appointment times. This implies an arrangement that assumes that the system works regularly and there are no unexpected delays.

Finally, it was assumed that the transition of patients to the next step after completing each step in the MRI process was instantaneous. In other words, it is assumed that at the end of each procedure step, the patient moves to the next step without delay. This assumption is critical to isolate and analyse the impact of procedure times on total patient waiting time. These assumptions are intended to increase the analysability of the model while maintaining its simplicity, and although they do not accurately reflect real-world conditions, they ensure that the results obtained are valid and useful in identifying general trends and potential for improvement.

Sample Selection and Data Collection

In this study, discrete event simulation technique was used to analyse the service processes of the MRI (Magnetic Resonance) department of a university hospital and to identify areas for improvement. The MRI department of the university hospital was selected as the sample. Since this department is an intensively used and critical component of the hospital in terms of service continuity, it constitutes an ideal sample for studies aimed at increasing operational efficiency. A high number of patients are processed in the MRI department on a daily basis, which reveals the need to increase the efficiency of the department.

The collected data were used to create a discrete event simulation model and to analyse the operational performance of the department. Patient confidentiality and ethical rules were observed throughout the data collection process, thus ensuring the accuracy and reliability of the data obtained. This study aims to provide improvement suggestions to increase service efficiency and patient satisfaction in the MRI department, and the findings will provide important contributions to strategic planning and operational decision-making processes for hospital management and other stakeholders.

The data in Table 1 shows the number of MRI scans of the university hospital on a monthly basis in 2021, 2022 and 2023. These data can be used to analyse the changes and trends in the demand for services in the MRI department of the hospital. In 2021, the service demand started with 1849 MRI scans in January, peaked with 2787 scans in March, and closed the year with 2924 scans in December. During this year, fluctuations were observed in the number of MRIs; especially in June, the number of MRIs decreased to the lowest level with 1733, and then entered an upward trend.

Table 1. Number of MRI scans

Year	**2021**	**2021**	**2021**	**2021**	**2021**	**2021**
Month	**January**	**February**	**March**	**April**	**May**	**June**
Number of Shots	1849	2366	2787	2508	2092	1733
Month	**July**	**August**	**September**	**October**	**November**	**December**
Number of Shots	2025	2539	2805	2694	2809	2924
Year	2022	2022	2022	2022	2022	2022
Month	**January**	**February**	**March**	**April**	**May**	**June**
Number of Shots	2758	1894	3098	2980	2589	3108
Month	**July**	**August**	**September**	**October**	**November**	**December**
Number of Shots	2340	2976	3132	2903	2093	2690
Year	2023	2023	2023	2023	2023	2023
Month	**January**	**February**	**March**	**April**	**May**	**June**
Number of Shots	3351	3236	3479	2970	3393	2833
Month	**July**	**August**	**September**	**October**	**November**	**December**
Number of Shots	2844	3076	3155	2865	3121	3325

In 2022, a significant increase was observed in January with 2758 withdrawals compared to the same period of the previous year. The highest level was reached in March with 3098 shots. Fluctuations in the number of shots continued throughout the year, and the year ended with 3108 shots in June and 2690 shots in December. Throughout this year, significant increases and some decreases were observed in the number of shots. The year 2023 started with 3351 MRI scans in January and showed a significant upward trend compared to previous years. In March, the highest level of the year was reached with 3479 MRI scans. Throughout the year, the number of MRI scans generally remained at high levels, and the year was completed with 3325 scans in December. These data indicate a continuous increase in the hospital's capacity and service demand. In general, a significant upward trend in the number of MRI scans was observed between 2021 and 2023. This increase demonstrates the increasing demand for the hospital's MR department services and the need for planning and capacity increase to manage this demand. Increasing number of MRI scans may require more detailed analysis and improvement studies on patient flow management and resource optimisation. In this context, the importance of strategic planning to increase efficiency and patient satisfaction in the MRI department services of the university hospital is emphasised.

Variables

In this study, various variables were analysed in order to evaluate the service processes in the MRI (Magnetic Resonance) department of a university hospital with the discrete event simulation technique. The variables were determined by considering the factors affecting patient flow processes and operational efficiency. The main variables are categorised as number of shots, shooting time, appointment waiting time, report writing time, number of personnel, device usage.

The number of scans refers to the total number of MRI scans performed in the MRI department each month, indicating the level of demand for the department. The scan duration covers the time between the start and end of an MRI scan, directly reflecting the efficiency of device utilization. The appointment waiting time represents the period patients wait between scheduling an MRI appointment and undergoing the scan, impacting both patient satisfaction and access to healthcare services.

The report writing time refers to the period required for doctors to review and document the findings from MRI scans after their completion. The staff count includes the number of doctors, technicians, and support personnel working in the MRI department. The device utilization variable measures how effectively and efficiently the available MRI machines are used.

These variables were used as key inputs in developing the simulation model and played a critical role in analyzing the current performance of the department and evaluating potential improvement scenarios. The results provide a basis for making strategic decisions aimed at enhancing service efficiency and improving patient satisfaction in the MRI department of the university hospital.

Methodology

Discrete Event Simulation, a computer-based modeling methodology, is characterized as an intuitive and adaptable approach capable of simulating the dynamic behaviors of complex systems and the interactions among individuals, populations, and their environments (Karnon et al., 2012). DES is widely used across various fields and serves as a highly suitable tool for modeling and analyzing complex systems (Cihangir et al., 2021). It has been effectively employed in domains such as manufacturing enterprises, healthcare systems, transportation, and logistics (Atalan et al., 2018; Yıldırım et al., 2021). For instance, DES is recognized as an effective tool for modeling the impacts of constraints in health technology assessments (Salleh et al., 2017). Additionally, it is utilized in the application of dynamic simulation modeling methods in healthcare service delivery (Marshall et al., 2015).

These simulations enable the unbiased prediction of performance outcomes, regardless of the system's initial state (Uncu, 2017). Discrete Event Simulation is a widely used technique for modeling complex systems and serves as a critical tool for analyzing and improving system performance. Furthermore, DES has been noted for its applicability in the probabilistic verification of complex systems with real-time features (Younes et al., 2002).

Simulation techniques are widely used in learning processes. For instance, in nursing education, simulations help students develop clinical decision-making skills by replicating clinical environments, thereby reducing the likelihood of errors (Uslusoy, 2018). Similarly, simulation applications in emergency departments are utilized to improve patient treatment processes and enhance the quality of healthcare services (Koçyiğit & Yıldırım, 2022).

The use of DES in the MRI department can provide significant benefits in optimizing workflow, resource allocation, and patient flow. DES is widely applied in healthcare settings to improve operational efficiency and the delivery of patient care. By modeling the MRI department as a series of discrete events over time, DES helps evaluate different scenarios and identify potential bottlenecks or inefficiencies within the system (Raunak et al., 2009; Vieira et al., 2019). In the context of healthcare delivery processes, DES has been used to assess alternative resource allocation strategies in emergency departments, leading to improvements in patient care and operational efficiency (Vieira et al., .2019). Furthermore, DES has been applied to model patient flow in emergency departments, enabling the simulation of various process improvement alternatives to reduce patient length of stay and enhance overall departmental efficiency (Hoot et al., 2008). In this regard, DES is a critical technique employed by researchers across different disciplines for modeling, analyzing, and improving systems. It has been effectively utilized in various fields, including healthcare, transportation, physics, and computer science.

Simulation Model

Based on the data obtained from the Hospital Information Management System, patient arrival distribution was analyzed using Arena Input Analyzer, and it was determined that patient arrivals followed a POIS (0.0152)/day distribution. Additionally, approximately 10% of the daily scheduled patients were emergency cases requiring MRI scans, and these patients were incorporated into the system with a POIS (0.152) distribution. The MRI scan duration was found to follow a NORM (30.5, 4.78)/minute distribution. Interviews with medical secretaries, assistants, and doctors in the MRI department revealed that report review takes 1-10 minutes, report writing takes 8-15 minutes, and report approval takes 8-10 minutes. These processes were incorporated into the model with distributions of UNIF(1,10) minutes, UNIF(8,15) minutes, and UNIF(8,10) minutes, respectively. Currently, the hospital operates with two MRI machines. The model developed using the obtained distributions is shown in Figure 3. The simulation results representing the current state were obtained by running the model for 365 days and are presented below.

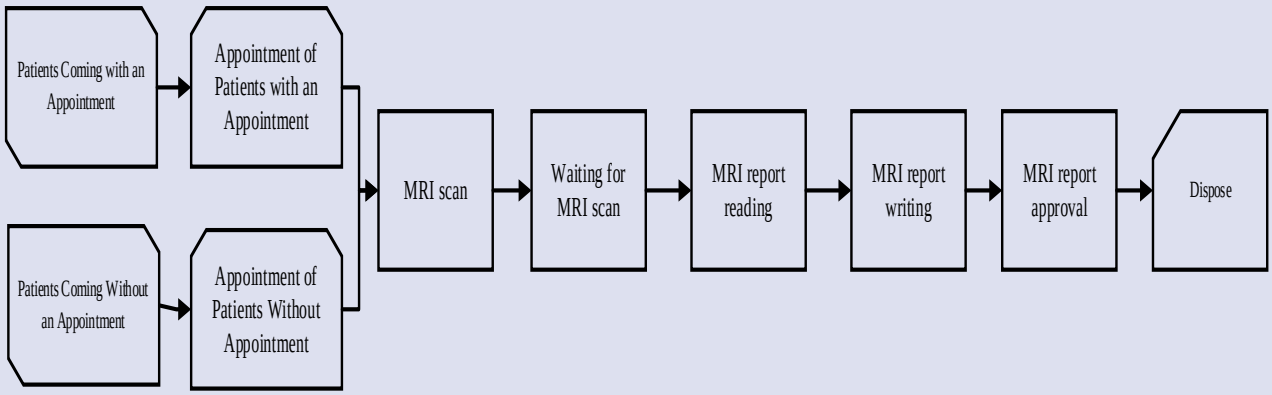

Figure 3. Arena simulation model of the hospital radiology unit

Model Verification and Validation

The verification and validation of the model were conducted by comparing its outputs with real data. This step is critical to ensure that the model accurately represents the actual operations of the MRI department. Using the verified model, the efficiency of current service processes and potential bottlenecks were analyzed. Various scenarios were simulated to evaluate the potential impacts of different capacity planning and operational strategies. These scenarios included interventions such as increasing staff numbers, optimizing device utilization rates, and improving the appointment scheduling system.

Results

This study aimed to analyze the service processes in the MRI department of a university hospital using the DES technique and to provide improvement suggestions. The data used in the study were obtained from historical MRI scan records retrieved from the hospital information management system, direct observations, and interviews with healthcare staff. A simulation model was developed to analyze the current state, and various scenarios were simulated. The findings are summarized below (Table 2).

In the current state (Simulation 1), a total of 37,037 patients entered the model, while the number of patients who completed the system was found to be 17,200.

The number of patients entering the system aligns with the actual number of patients applying for MRI services. In the current state, the average patient waiting time in the system was found to be approximately 2,275 hours (95 days). Accordingly, patients need to wait over three months to undergo an MRI, which is consistent with the hospital's existing data. When examining resource utilization rates in the current state, it is observed that MRI Machines 1 and 2 are operating at 100% capacity.

It was assumed that the long waiting times for patients to undergo MRI scans were due to an insufficient number of MRI machines. In the second scenario, the impact of increasing the number of MRI machines on the system was investigated. The system was re-simulated (Simulation 2) by adding one more MRI machine to the existing patient arrival distribution, and the following results were obtained (Table 3).

In Simulation 2, 38,621 patients entered the system, and it was observed that 38,446 of them completed their MRI scans and exited the system. When the number of MRI machines was increased by one, it was found that almost all patients who applied within a year could have their MRI scans completed within the same year. According to the simulation data, the average patient waiting time in the system would significantly decrease to 51 hours, approximately 2 days. While the utilization rates of MRI machines were at 100% with two devices, the addition of a third MRI machine would result in a substantial reduction in utilization rates.

Based on the analysis of data obtained from the Hospital Information Management System, it was projected that the number of patients would increase by approximately 15% annually. In the third scenario, the system was re-simulated (Simulation 3) with a 15% increase in patient numbers. For this simulation, the number of MRI machines was set to

three. According to the simulation results (Table 4), the number of patients expected to apply for MRI scans was approximately 45,000. Of these, around 44,350 would be able to complete their MRI scans within the same year.

Patients will need to wait an average of 90 hours (4 days) to undergo an MRI scan. Resource utilization rates will increase compared to Scenario 2. According to the third scenario, while the utilization rates for doctors and MRI machines remain at an acceptable level, the utilization rate for medical secretaries is significantly high. Although the current workload can be managed with one medical secretary, this would lead to excessive fatigue and, over time, a decline in productivity.

Table 2. Simulation results of the current state

Number of Patients Entering the System			37037
Number of Patients Exiting the System			17200
Patient Waiting Time in the System (Hours)			
	Average	**Minimum**	**Maximum**
	2274.89	0.00	4582.64
Resource Utilization Rates			
	Average	**Minimum**	**Maximum**
Assistant	0.1810	0.00	1.0000
Doctor	0.2945	0.00	1.0000
Medical Secretary	0.3769	0.00	1.0000
MRI Machine 1	1.0000	0.00	1.0000
MRI Machine 2	1.0000	0.00	1.0000

Table 3. Results of simulation 2

Number of Patients Entering the System			38621
Number of Patients Exiting the System			38446
Patient Waiting Time in the System (Hours)			
	Average	**Minimum**	**Maximum**
	50.4528	0.00	195.60
Resource Utilization Rates			
	Average	**Average**	Maksimum
Assistant	0.4039	0.00	1.0000
Doctor	0.6586	0.00	1.0000
Medical Secretary	0.8419	0.00	1.0000
MRI Machine 1	0.7511	0.00	1.0000
MRI Machine 2	0.7436	0.00	1.0000
MRI Machine 3	0.7386	0.00	1.0000

Table 4. Results of simulation 3

Number of Patients Entering the System			**45128**
Number of Patients Exiting the System			**44346**
Patient Waiting Time in the System (Hours)			
	Average	**Minimum**	**Maximum**
	90.5771	0.00	245.69
Resource Utilization Rates			
	Average	**Average**	Maksimum
Assistant	0.4677	0.00	1.0000
Doctor	0.7597	0.00	1.0000
Medical Secretary	0.9711	0.00	1.0000
MRI Machine 1	0.8712	0.00	1.0000
MRI Machine 2	0.8654	0.00	1.0000
MRI Machine 3	0.8565	0.00	1.0000

Discussion

The operational challenges faced by the MRI department of the university hospital are multifaceted, primarily revolving around excessive patient waiting times and resource constraints. The study indicates that the average waiting time for patients was approximately 95 days, a figure that aligns with existing hospital data. This situation underscores the urgent need for capacity expansion to enhance service efficiency and patient satisfaction. The findings resonate with the literature, which emphasizes that healthcare systems often operate at maximum

capacity, leading to significant delays in patient care (Bahadori et al., 2017; Singla, 2020). The implications of such delays are profound, affecting not only patient outcomes but also the overall operational efficiency of healthcare facilities (Vieira et al., 2019).

The simulations conducted in this study provided compelling evidence regarding the impact of adding a third MRI machine. The results demonstrated a significant reduction in average waiting times from 95 days to just 2 days, highlighting the critical role of capacity in healthcare delivery. This finding is consistent with previous research that has utilized discrete event simulation to identify bottlenecks and improve healthcare workflows (Granja et al., .2014; Bahadori et al., 2017). For instance, studies have shown that increasing service capacity can lead to significant improvements in patient throughput and reductions in waiting times, thereby enhancing the overall quality of care (Pendharkar et al., 2014). Furthermore, the study's projection of a 15% annual increase in patient demand emphasizes the necessity for proactive capacity planning to address future challenges in service delivery (Sun et al., 2023).

While the addition of an MRI machine significantly alleviated waiting times, the study also identified other resource constraints, particularly the high utilization rates of medical secretaries. This finding suggests that operational improvements must extend beyond just technical resources to include human resources as well. Research indicates that optimizing appointment scheduling systems and potentially increasing staffing levels are essential strategies for addressing these challenges (Bahadori et al., 2017; Vieira et al., 2019). The balance between human and technical resources is crucial for achieving sustained operational improvements, as highlighted in existing literature (Ghanes et al., 2014; Singla, 2020). A holistic approach that considers both aspects is necessary for enhancing the overall efficiency of the MRI department.

The assumptions made in the study, such as neglecting MRI machine failures and considering constant staff availability, may limit the model's applicability in real-world settings. Future research could benefit from refining these assumptions by incorporating stochastic elements, such as equipment downtime and variability in staff availability. This refinement would enhance the model's realism and applicability, allowing for more accurate predictions of operational performance (Sun et al., 2023). Additionally, while DES proved effective in modeling patient flow processes, integrating other methodologies, such as process mining or system dynamics, could provide a more comprehensive understanding of long-term operational trends (Ghanes et al., 2014; Singla, 2020; Durmuş & Özdemir, 2025).

The study offers actionable recommendations for enhancing the performance of the MRI department, emphasizing the importance of strategic planning and continuous monitoring. By addressing current bottlenecks and preparing for future demand, healthcare administrators can ensure more efficient, patient-centered care delivery. This aligns with the broader literature on healthcare operations, which advocates for the use of simulation and optimization techniques to improve service delivery and patient outcomes (Bahadori et al., 2017; Vieira et al., 2019). The integration of advanced modeling techniques can facilitate better decision-making and resource allocation, ultimately leading to improved healthcare delivery systems.

In conclusion, the operational challenges identified in the MRI department of the university hospital highlight the critical need for capacity expansion and resource optimization. The study's findings underscore the importance of using simulation techniques to inform decision-making and improve service delivery. By adopting a holistic approach that considers both technical and human resources, healthcare administrators can enhance the efficiency and effectiveness of the MRI department, ultimately leading to better patient outcomes and satisfaction. The insights gained from this study contribute to the growing body of literature on healthcare operations and provide a foundation for future research in this area.

Conclusion

In this study, the service processes in the Magnetic Resonance Imaging department of a university hospital were analyzed using the DES technique, and improvement suggestions were proposed. The current state analysis revealed that 37,037 patients entered the system, while 17,200 patients exited. The average patient waiting time in the system was found to be 2,275 hours (approximately 95 days), and it was observed that the MRI machines were operating continuously at 100% utilization. This indicates that the long waiting times for MRI scans are due to an insufficient number of MRI machines.

In the scenario where the number of MRI machines was increased, 38,621 patients entered the system, and 38,446 patients completed their MRI scans and exited. In this scenario, the average patient waiting time decreased to 51 hours (approximately 2 days). While the utilization rate of MRI machines was 100% with two machines, a significant reduction in utilization rates was observed when three machines were used. In the scenario with a projected annual patient increase of 15%, the number of patients applying for MRI scans was estimated to be approximately 45,000, with about 44,350 of them able to complete their scans within the same year. The average waiting time was found to be 90 hours (approximately 4 days). In this scenario, resource utilization rates are expected to increase compared to the current state. According to Simulation 3, the utilization rates of resources, except for the medical secretary, will remain at acceptable levels. However, the utilization rate for the medical secretary will reach 97%, potentially leading to negative effects such as fatigue and burnout due to overwork. To address this issue, increasing the number of medical secretaries by one is recommended.

Based on these findings, it is recommended to add a third MRI machine in addition to the existing two. This proposal is expected to significantly reduce patient waiting times, thereby improving service quality and hospital efficiency. Furthermore, given the projected annual patient increase of approximately 15%, planned investments and necessary infrastructure preparations should be undertaken to enhance current capacity. To reduce utilization rates and achieve more balanced use of MRI machines, it is essential to review and optimize operational processes. This approach will prolong the lifespan of the machines and reduce maintenance costs. Additionally, improving the training of healthcare personnel involved in MRI procedures and enhancing process management will further increase system efficiency. Identifying and resolving workflow disruptions, along with implementing continuous improvement initiatives, are also recommended. Regular monitoring of MRI service processes and conducting performance evaluations will help identify potential areas for improvement, ensuring the sustainability of service quality.

In conclusion, this study provides concrete recommendations to enhance the efficiency of MRI service processes in a university hospital and highlights the importance of strategic planning for potential future scenarios. The proposed recommendations will serve as a significant roadmap for hospital management. In this context, the scenarios evaluated using the DES technique were analyzed to improve the efficiency of service processes in the MRI department. The current state analysis revealed long patient waiting times and insufficient MRI machine capacity. Increasing the number of MRI machines by one would significantly reduce patient waiting times and improve system efficiency. Furthermore, while the utilization rates of MRI machines would decrease with the use of three machines, the likelihood of potential breakdowns due to excessive use could also be minimized.

Given the projected annual increase of approximately 15% in patient numbers, planning for this growth is essential. Measures such as procuring new MRI machines and hiring additional staff are critical to meeting future service demands. Enhancing the efficiency of the appointment scheduling system and ensuring patient adherence to appointment times will streamline service processes and reduce waiting times. These recommendations will contribute to strategic decision-making aimed at improving service efficiency and patient satisfaction in the MRI department of the university hospital. The improvement suggestions based on simulation results serve as a guide to enhancing the hospital's operational performance.

Declarations

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Conflict of Interest
Authors disclose no potential conflicts of interest.

Ethics Statement
It was evaluated at the meeting of Dokuz Eylül University Social and Human Sciences Scientific Research and Publication Ethics Board dated 02/04/2024 and the decision numbered 29 was taken at the meeting.

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The data used to support the findings of this study can be made available upon request to the corresponding author.

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REVIEW

The Role of Breast Milk in the Formation of the Newborn's Circadian Rhythm

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ABSTRACT

Circadian rhythm, also called the biological rhythm, refers to the repetition of an individual's 24-hour biochemical, physiological, and behavioral cycles. The sleep-wake cycle is the most basic circadian rhythm. The hormones that play a key role in regulating it are cortisol and melatonin. In the first years of life, breast milk plays an important role in the formation of the circadian rhythm and helps the newborn adapt to its new environment outside the womb. The composition of breast milk is quite variable, and this variability provides the baby with clues about the outside world. Breast milk secreted during the day has a high lactose content, which provides energy for the baby, improves learning ability, and quenches thirst. Breast milk secreted at night has a lower lactose concentration but higher fat and melatonin concentrations. In the case of feeding with expressed milk, the time of expression and the time of feeding should align to maintain the sleep-wake cycle.

Introduction

Breast milk is the ideal food for babies. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) advise breastfeeding exclusively for the first 6 months. Breast milk protects babies from infectious diseases and also shortens the recovery period during illness. In addition to its short-term health benefits, it is also known to lower the incidence of chronic diseases such as diabetes, cardiovascular diseases and cancer in the long term (Italianer et al., 2020; WHO, 2023). Although the content of breast milk varies between individuals, it is influenced by pregnancy, birth, maternal and baby-related factors, chronic and environmental factors, and circadian rhythm (Moran-Lev et al., 2015; Fischer Fumeaux et al., 2019; Kiełbasa et al., 2021).

Breast Milk and Nutritional Composition

Breast milk is a unique food that meets all the energy and nutrient needs of the newborn. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend that newborns be breastfed within the first hour after birth and exclusively breastfed for the first 6 months. Breast milk meets all of the baby's energy and nutrient needs in the first 6 months of life, half or more in the second 6 months, and one-third in the second year of life. Breast milk is clean, reliable, and protects against many childhood diseases. It enhances cognitive development and reduces the risk of being overweight or obese (WHO, 2023). Breast milk contains both macronutrients and micronutrients, such as carbohydrates, proteins, lipids, vitamins, and minerals, as well as growth factors, hormones, antimicrobial

components, digestive enzymes, glucocorticoids, and many other bioactive components (Chiurazzi et al., 2021; Zielinska-Pukos et al., 2022). Breast milk contains 87-88% water. The energy value of breast milk is 65-70 kcal/100 mL. The main components that contribute to the energy value are carbohydrates, proteins, and lipids. The carbohydrate content is 60-70 g/L, protein content is 8-10 g/L, and fat content is 35-40 g/L. The main carbohydrate in breast milk is lactose. Oligosaccharides are also important components of the carbohydrate content. Casein and whey proteins (α-lactalbumin, secretory IgA and lactoferrin) are the main proteins in breast milk. The protein content is highest in the early stages of lactation and decreases as time passes. The fats in breast milk are important both for providing energy and for being integral to the structure of the cell membrane. Long-chain polyunsaturated fatty acids are essential fatty acids for babies (Stam et al., 2013; Kim and Yi, 2020). Although the content of breast milk varies between individuals, it also varies according to the time of lactation, maternal diet, and breastfeeding duration (Kiełbasa et al., 2021). Furthermore, the composition of breast milk can vary even within a 24-hour period (Mitoulas et al., 2002).

Circadian Rhythm

Circadian rhythm refers to the repetition of physiological, biochemical, and behavioral rhythms, including the individual's sleep-wake cycle, hunger and satiety, secretion of hormones such as cortisol, melatonin, and growth hormone, heat regulation, gene expression, and metabolic systems, all occurring within a 24-hour period. Circadian rhythm is controlled by the suprachiasmatic nucleus (SCN) located in the anterior hypothalamus. It can be affected by factors such as age, gender, hormones, light, sleep, and nutrition (Koçar and Elçioğlu, 2022). The sleep-wake cycle is the most basic circadian rhythm, with melatonin and cortisol playing major roles. The SCN contains melatonin receptors. Melatonin is the hormone that facilitates the transition to sleep. Melatonin concentrations are suppressed as light increases, increase as light decreases, and reach their highest levels in darkness. In contrast, cortisol is released in response to light and helps keep the body awake (Vasey et al., 2021; Koçar and Elçioğlu, 2022). The circadian rhythm begins with daylight. In the morning, cortisol is released, initiating the circadian rhythm. Approximately 30-40 minutes after waking up, cortisol levels peak, drop within a few hours, and are replaced by melatonin at nightfall. Thus, a daily cycle is completed. In adults, melatonin levels rise in the evening, peak in the middle of the night, and return to low levels in the morning, remaining low throughout the day (Adam et al., 2017; Wong et al., 2022).

The Role of Breast Milk in The Formation of The Newborn's Circadian Rhythm

The circadian rhythm begins in intrauterine life. The first report in the literature indicating that the fetus has a circadian rhythm was published in 1975 (Deguchi, 1975). Although it is believed that the sleep-wake circadian rhythm associated with cortisol develops during the first year of life, the exact timing of this development has not yet been determined (Ivars et al., 2016). It has been observed that the circadian rhythm in premature infants develops similarly to the process observed in term infants. Parallels have been found between the emergence of the circadian rhythm in premature infants and the onset of the sleep rhythm (Antonini et al., 2000).

After birth, the most important stimulating factor for the development of the newborn's circadian rhythm is daylight. However, breast milk and maternal factors also play a crucial role. The mother's activities, body temperature, and transplacental hormones such as cortisol and melatonin found in breast milk, as well as macro and micronutrients, stimulate the circadian rhythm (White, 2017). Glucocorticoids and melatonin pass from plasma into breast milk, and their concentrations in breast milk are the same as in plasma (Italianer et al., 2020). Melatonin is a transplacental hormone, and maternal melatonin production increases after the 32nd week of pregnancy. Premature babies born before this stage, without exposure to maternal melatonin, are a notable group in terms of melatonin deficiency. Circadian melatonin production begins a few months after birth, so melatonin deficiency can be seen in newborns. Some of the newborn's melatonin deficiency can be compensated by the melatonin they receive through breast milk. Melatonin concentrations in breast milk increase in the evening and decrease during the day, reflecting a regular maternal circadian rhythm. The circadian variation in melatonin concentrations in maternal plasma and breast milk influences the development and continuity of the newborn's circadian rhythm (Häusler et al., 2024).

Glucocorticoids in breast milk mainly include cortisol, cortisone (an inactive cortisol metabolite), and corticosterone (Zielinska-Pukos et al., 2022). These hormones play an important role in gluconeogenesis, lipolysis, and energy metabolism, and are produced by the adrenal glands in response to physiological and psychological stress (Pundir et al., 2019). Like melatonin, maternal cortisol levels increase in the third trimester. On the other hand, fetal adrenal cortisol and cortisone production gradually increase to prepare the fetal organs for the postpartum environment. To protect the fetus from excessive cortisol exposure, the placenta expresses the enzyme 11β-hydroxysteroid dehydrogenase type 2 (11β-HSD2), which converts cortisol to its inactive form, cortisone. In preterm infants, several factors—such as maternal obesity, postpartum stress, maternal depression, gestational age, infant head circumference, and body composition—have been associated with glucocorticoid concentrations in breast milk (Muelbert et al., 2022). Pundir et al. (2017) examined breast milk glucocorticoid concentrations over a 24-hour cycle by measuring them at four different time periods: morning, afternoon, evening, and night. According to the research, cortisol and cortisone concentrations were found to be highest in the morning and decreased throughout the day.

These findings support the circadian pattern (Pundir et al., 2017).

In addition to hormonal changes, the nutrient content of breast milk also varies between day and night. Breast milk secreted during the day has a high lactose content, which provides energy for the baby, improves learning ability, and quenches thirst. In contrast, the lactose concentration is lower in breast milk secreted at night, while fat and melatonin concentrations are higher (Sánchez et al., 2013). When the 24-hour circadian variation of breast milk was examined, it was found that the fat content was more variable compared to the carbohydrate and protein content (Moran-Lev et al., 2015; Suwaydi et al., 2023). Compared to formula feeding, the variable fat content in breast milk helps protect against obesity related to nutrition and supports healthy growth (Italianer et al., 2020). These changes in breast milk throughout the day and night also help babies develop the concepts of day and night (Aksoy and Bekar, 2023). In the expressed milk feeding method, it is emphasized that the time of milk expression and the time the baby is fed should align in order to maintain the sleep-wake cycle (Italianer et al., 2020).

Conclusion

Circadian rhythm is the regulation of biological processes that occur in a 24-hour cycle, driven by the body's biological clock. This rhythm begins to develop in the early years of life, with its foundational stages particularly established during intrauterine life. Breast milk plays a crucial role in regulating this rhythm because it helps babies adapt to the day-night cycle through the hormones, nutrients, and biological components it contains, thus supporting the healthy development of their circadian rhythms. Therefore, parents' awareness of these biological changes during breastfeeding offers a significant advantage for their babies' overall health and sleep patterns.

Declarations

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Conflict of Interest
Authors disclose no potential conflicts of interest.

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Data Availability
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REVIEW

Non-pharmacological Approaches in the Management of Fear and Pain Associated with the Birth Process

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ABSTRACT

Fear and pain related to the birth process are interrelated problems that women frequently experience. If these problems are not managed well, they can cause some problems for mother and baby such as attachment, fatigue, breastfeeding problems and psychological problems. Women can use pharmacologic or non-pharmacologic methods to cope with these conditions. When these methods are compared, pharmacologic methods are considered interventional and are effective in managing pain and fear. However, they have more side effects than nonpharmacologic methods. These side effects include increasing the likelihood of intervention during labor and causing negative effects on the newborn and breastfeeding. Nonpharmacologic methods do not have a negative impact on the progress of labor. These methods are also used to reduce both pain and fear of labor. In order for these non-invasive methods to be effective, they should be applied regularly and the partners should be involved in the process. In 1996, the Coalition for the Improvement of Maternity Services (CIMS) established the mother-friendly care model in order to reduce interventions applied to women, guide evidence-based practices and protect/improve maternal and child health. ACOG (American College of Obstetricians and Gynecologists) recommended limiting intervention in labor in 2019. Studies have also shown that limiting intervention increases patient satisfaction. In this review, it is aimed to describe the current non-invasive methods for pain and fear frequently experienced by women in the postpartum period.

Introduction

Fear and pain experienced during the birth process are interrelated problems that women frequently experience (Demirsoy et al., 2015). The pain associated with pregnancy and the birth process is among the important factors that cause many women to fear labor. Therefore, control of labor pain should be one of the main goals of the care given to women in labor (Yeşildağ & Gölbaşı, 2018). This fear and pain perceived by women are influenced by sociodemographic factors such as age, educational status, and income level; obstetric factors such as number of pregnancies and deliveries; family relationships such as spousal support and social support; and social factors (Bilge et al., 2022). Poor management of labor pain leads to a poor birth experience, stress, prolonged labor, fetal hypoxia, decreased satisfaction and fear of labor. Fear of labor pain also increases the rate of cesarean section, which is an elective delivery and has more intervention/risk (Yeşildağ & Gölbaşı, 2018). Fear of childbirth also negatively affects both the pregnancy and the birth process of the woman. This may cause some emotional, behavioral and physical changes in pregnancy. Pregnant women may experience restlessness, irritability, insomnia, crying or tachycardia attacks and changes in activities. Physically, fear of childbirth activates various

mechanisms that activate the sympathetic nervous system and vasoconstriction in blood vessels. The woman's fear of childbirth leads to increased release of catecholamines, thus decreasing blood flow to the uterus and oxygen levels in the placental flow. This increases the need for medical intervention. Increased adrenaline in fear and anxiety causes a decrease in the amount of oxytocin that triggers contractions during labor, prolonging or even stopping labor. Prolonged labor further increases the fear of labor in the pregnant woman. In addition to all these, fear of labor increases the rates of preterm labor, postterm labor, intervention labor, emergency cesarean section and elective cesarean section (Kanbur & Koç, 2023). In a study, it was determined that pain and fear associated with poorly managed labor process can cause maternal depression and negatively affect mother-baby attachment (Arslantaş et al., 2020). Women should manage this situation with the support of health professionals. Pharmacologic or nonpharmacologic methods are used to cope with these conditions (Demirsoy et al., 2015; Gökçek, 2022). When pharmacologic and nonpharmacologic methods are compared, pharmacologic methods are interventional methods, although they are more effective than nonpharmacologic methods. However, while nonpharmacologic methods do not have a negative effect on the progression of labor, pharmacologic methods increase the possibility of intervention in labor and cause low negative effects on the newborn and breastfeeding (Koyyalamudi et al. 2016). Comparing their efficacy, nonpharmacologic agents are not as effective as pharmacologic agents, but they are reliable methods (Zuarez-Easton et al., 2023). In a systematic review by Biana et al. (2021), non-pharmacological methods were found to be effective in reducing adverse events such as labor pain, labor duration, anxiety, and labor intervention. Many non-pharmacologic methods and their effects have been studied in the literature. Some of these studies are given in Table 1. As health professionals, individual counseling programs should be planned for pregnant women, awareness of the birth process should be created, the family should be prepared for the process, supportive care should be provided, counseling about methods for fear and pain that may be experienced should be given, applied, evaluated and continuity of care should be ensured (Akın & Erbil, 2023).

According to Table 1, non-pharmacological methods applied in different ways can reduce fear and pain, shorten the duration of labor, reduce the risk of intervention delivery and the risk of complications, and increase the positive birth experience and satisfaction rate. Some studies in the literature suggest that nonpharmacologic methods may be more effective;

- Regular application,
- Spouses to be involved in the process,
- Women's support systems and guidance by a professional team,
- It has also been reported that methods such as aromatherapy and massage, music and dance, dance and yoga should be used in combination (Gönenç et al., 2020; Dominguez et al., 2021).

In 1996, the Coalition for the Improvement of Maternity Services (CIMS) established the mother-friendly care model in order to reduce the interventions applied to women, to take evidence-based practices as a guide and to protect and improve maternal and child health. ACOG (American College of Obstetricians and Gynecologists) recommended intervention limitation in labor in 2019. Studies have also shown that limiting intervention increases patient satisfaction (Table 1). In this review, it is aimed to explain the current methods that do not require intervention for the problems frequently experienced by women.

Nonpharmacological Methods for Fear and Pain Associated with Labor

Zuarez-Easton et al. (2023) classified the methods used in fear and pain management as relaxation techniques (e.g. hypnosis, yoga and music), manual techniques (e.g. massage, reflexology), other techniques (acupuncture, birthing ball and transcutaneous electrical nerve stimulation) (Zuarez-Easton et al., 2023).

Relaxation techniques

Hypnosis: It is a method commonly practiced by pregnant women to ensure a relaxed state of mind and body and prepare them for the birth experience (Thomson et al. 2019). This method prevents the transmission of painful stimuli to the central nervous system. Thus, the perception of pain in labor decreases, the duration of labor is shortened, self-efficacy, sense of control and courage in labor increase, and negative emotions such as fear, anxiety and stress are prevented. As a result of all these, positive birth experience, comfort and satisfaction are achieved (Türkmen, 2023). A literature review was conducted to evaluate the effects of hypnosis before, during and after pregnancy and most of the data were obtained from case series and low quality studies. In a limited number of studies, it has been reported that hypnosis may be useful to alleviate labor pain and fear of childbirth (Babbar et al., 2021). HypnoBirthing is a birth preparation training that combines hypnosis and suggestion techniques with birth knowledge. It consists of 2.5 hours and is given on five separate days, once a week.

Yoga: Yoga is defined as a mental journey to the inner world of the individual. It is a nonpharmacological method that is an easy-to-learn mind-body and complementary health practice (Bolanthakodi et al., 2018). Physical, mental or psychosocial problems of pregnant women lead to negative pregnancy outcomes such as maternal stress and anxiety, spontaneous abortion, intrauterine growth retardation (IUGR), preterm birth and preeclampsia (Yurtsal and Eroğlu, 2019). Maternal stress has also been associated with increased use of analgesics during cesarean delivery and normal delivery (Riley & Drake, 2013). At the same time, low back and back pain during pregnancy, edema and cramps in the legs, respiratory

problems and sleep disorders due to the pressure caused by the growing abdomen in the following weeks of pregnancy negatively affect the quality of life of the pregnant woman. It is known that yoga balances all these dimensions, including pain and fear, and provides positive outcomes for a normal, uncomplicated pregnancy, birth and postpartum experience and has no side effects. Yoga is considered to be a suitable practice for pregnancy due to its positive outcomes during pregnancy, birth and postpartum period and its feasibility and economy (Yurtsal & Eroğlu, 2019). Available evidence suggests that yoga-based interventions are a complementary method for the treatment of maternal anxiety, stress and depression in pregnancy (Kusaka et al., 2016). Among the benefits; reducing the risk of preterm delivery, cesarean section, fetal death, labor induction, episiotomy rupture and duration of labor, and having a positive effect on mother-infant attachment and ensuring high Apgar scores of infants (Şen et al., 2020; Yekefallah et al., 2021; Corrigan et al., 2022). In the study of Mohyadin et al. (2020), they found that practicing yoga during pregnancy can reduce women's anxiety during labor, shorten the duration of labor and reduce labor pain (Mohyadin et al. 2020). In a retrospective study, regular prenatal exercises, including yoga, were associated with more favorable outcomes related to labor and pregnancy course (Wadhwa et al., 2020). In another study, yoga was found to be effective in combating stress and anxiety as well as increasing immunity in working pregnant women facing the COVID-19 pandemic (Nadholta et al., 2020).

Yoga is organized and practiced in three sections according to the gestational week (Rathfisch, 2015). These sections are expressed as early, middle and late pregnancy weeks. Yoga meditation in early pregnancy (first 16 weeks); in this period, relaxation and breath awareness practices are mostly emphasized. Yoga practice in the early weeks of pregnancy can last an average of 45 minutes. During this time, five minutes can be devoted to breathwork, 25 minutes to yoga asanas, 15 minutes to mother-baby communication and meditation. Yoga in the middle pregnancy week (between 16-34 weeks); During this period, lying on your back can be very uncomfortable due to the growing baby and uterus. Weight gain can affect posture and increase the pressure on the spine and legs. For this reason, yoga practice can take about an hour on average. Within this hour, five minutes can be devoted to breathwork, 40 minutes to yoga asanas, 15 minutes to mother-baby communication and meditation. Yoga in the late pregnancy week (34th week and later); breathing exercises and yoga stages that can be used in childbirth can be taught to the pregnant woman. In this period, transitions between stages should be slower and rest breaks should be given. In the last weeks of pregnancy, yoga practice can take about 40 minutes on average. During this time, 5 minutes can be devoted to breathing exercises, 20 minutes to yoga asanas, and 15 minutes to mother-baby communication and meditation (Rathfisch, 2015).

Music therapy: Music is an easy-to-implement and cost-effective method that enables women to develop a sense of self-control and reduce stress during labor (Gönenç et al., 2020; McCaffrey et al., 2020). Gönenç et al. (2020) reported that dance alone and combined music and dance significantly reduced pain and fear in nulliparous women during the active phase of labor, and also emphasized that the partner actively participated in the care of the woman (Gönenç et al., 2020). In the study by Hepp et al. (2018), music during cesarean section was evaluated as an easy-to-apply and effective way to reduce maternal stress and anxiety (Hepp et al., 2018). Santiváñez-Acosta et al. (2020) stated that music therapy has beneficial effects on pain intensity and anxiety during labor, especially in primiparous women (Santiváñez-Acosta et al., 2020).

Manual techniques

Massage: Massage is the systematic touch and manipulation of the soft tissues of the body, which is non-pharmacological and increasingly used to reduce stress during pregnancy and to reduce pain by providing relaxation and blood flow (El-Hosary et al., 2016). Benefits include;

- It is effective for pregnant women with anxiety, depression, leg and back pain and provides significant benefits in pain perception during labor (Pachtman et al., 2021).
- Antenatal perineal massage reduces the risk of perineal trauma and postpartum complications (Aquino et al., 2018; Miake et al., 2019; Abdulhekim et al., 2020).
- It may play a role in reducing labor duration and improving women's sense of control and emotional birth experience (Smith et al., 2018).
- Sacral massage during labor reduces women's labor pain, decreases anxiety and worry levels, provides a more positive perception of labor among pregnant women, and has no fetal side effects (Akköz et al., 2019).

There are studies showing that when massage is used with other nonpharmacologic methods, its effectiveness increases in reducing pregnancy and labor symptoms:

- - Gönenç et al. (2020) found that dual massage and acupressure application was more effective than both treatment methods applied alone and that massage was more effective than acupressure.
- - (2021) found that massage and hot compresses during labor reduced the rates of major perineal injury and episiotomy and increased maternal satisfaction.
- - Lai et al. (2021) stated that massage application reduced pain perception and painkiller use in women in labor.
- - Schreiner et al. (2018) also found that pelvic floor exercise and perineal massage improved labor-related parameters and pelvic floor symptoms.
- - It was observed that the severity of pain decreased after the intervention in women who received foot massage, they experienced less pain in the postpartum period, the second and third stages of labor

were shorter, and women showed less negative behavioral reactions during labor (Şanlı et al., 2023).

Considering these studies, obstetricians may consider perineal massage in pregnant women as routine prenatal care to reduce the incidence of perineal trauma during vaginal delivery (Ugvu et al., 2018).

Other techniques

Aromatherapy: Aromatherapy is a therapy that uses essential oils, usually obtained by distillation from various parts of aromatic plants, to prevent and treat various diseases. The effect occurs through inhalation, massage, compress and bath applications and each essential oil has its own unique scent and therapeutic properties. In general, it can be used in the treatment of many diseases such as anxiety, depression, concentration problems, psychological disorders such as insomnia, digestive problems, headaches, muscle and joint pains, respiratory tract infections, wounds, burns, alopecia, eczema and some other skin disorders (Cambaz Kurt et al., 2021). The oils used for aromatherapy are essential oils. These oils can be preferred due to their rapid effect, ease of application, ease of control and lack of side effects. There is little evidence on the appropriate and safe use of essential oils in pregnancy. Essential oils should be used in small doses in pregnancy and oils approved for pregnant women should be used. In general, aromatherapy oils should be diluted 2-4% with essential oils before application for pregnant women. ne leaf oils are not recommended. It is recommended not to use any essential oil in the first trimester of pregnancy. During pregnancy; anise seed, arnica, birch (beech), basil, buchu, melon, camphor, cumin, cinnamon, juniper, sage, clove, cedarwood, cypress, bitter fennel, geranium, ginger, jasmine, sassafras, psoriasis, zufa grass, mustard, coral mansion, Myrrh, muscadine, oregano, pennyroyal, rosemary, sage, savory, tansy, tarragon, thuja, thyme, wintergreen, wormwood, goosefoot, myrtle, peppermint, bay leaf oils are not recommended. Oils that are safe to use for pregnant women are peppermint, lavender, lemon, bergamot, citrus, mut, cocoa, bitter almond, rosehip and rose oils (Teskereci and Boz, 2020). In a randomized controlled study, inhalation and massage therapy using lavender essential oil was found to be effective in alleviating perceived labor pain (Karatopuk et al., 2023). In another study, massage using chamomile oil was associated with better outcomes compared to massage without chamomile oil (Eskanderi et al., 2022).

Acupuncture and acupressure: According to traditional Chinese beliefs, there are opposing systems (Yin and Yang) in the body; when they work in balance and harmony, health is achieved, and when this balance and harmony is disturbed, disease occurs. Acupuncture and acupressure are used to reduce pain and disease symptoms by restoring this balance. Acupuncture is defined as the needling of certain pressure-sensitive and predetermined points on the skin for both the treatment and diagnosis of functional, reversible diseases or disorders (Dorsher and da Silva, 2022). Acupuncture shows analgesic effect in the body by affecting the nervous system and neuroendocrine system and helps to reduce pain (Şen et al., 2020). In addition, acupuncture can be applied in cases such as nausea, vomiting, depression, pelvic pain, low back pain and fetal malposition during pregnancy. There are studies suggesting that acupuncture may stimulate uterine contractions and/or cervical change. However, there is no evidence that these effects translate into adverse pregnancy outcomes. Nevertheless, acupuncturists do not recommend the use of certain points during this period, as most spontaneous abortions occur in the first 12 weeks. These points are very stimulating points such as SP-6, ST-36, LI-4, GB-21, BL-67 or sacral and umbilical points (Çayır and Çınar Tanrıverdi, 2022). During labor, BL-67 stimulation reduces the need for oxytocin and is effective in fetal malposition (Lyngso et al., 2010). Acupressure is a noninvasive method. Unlike acupuncture, these methods are associated with pressure on the relevant areas of the body (Atkins et al., 2021). Among the effects of these methods; It can reduce labor pain, the use of pharmacological agents, the use of forceps and vacuum-assisted deliveries, and the duration of labor (Schlaeger et al., 2017). It has also been determined that acupressure can be used with aromatherapy to alleviate labor pain in low-risk pregnant women (Hu et al., 2021).

Bonapace method: The Bonapace Method (BM) was created by Julie Bonapace in 1989. BM is an innovative method of birth preparation. Its aim is to provide the pregnant woman, her partner and health professionals with the resources and practical tools they need to approach pregnancy, labor and the postpartum period with complete confidence. It is a non-pharmacological approach that reduces medical interventions through effective pain management. It provides a better understanding of pain and its role, how to change a pregnant woman's perception of pain, and how to support physiology before, during and after labor (Bonapace, 2009). BM is a proposed method to reduce labor pain by applying pain techniques based on three neurophysiological endogenous pain modulation models (Bonapace et al., 2013). The purpose of these three networks;

- Controlling the central nervous system through breathing, relaxation and cognitive structuring,
- Using non-painful stimuli with Gate Control Theory,
- Acupressure is to maintain reduced inhibition by hyperstimulation of trigger points (Bonapace et al., 2013).

First, the proposed method uses control of the central nervous system through breathing, relaxation and cognitive restructuring. Slow, deep breathing is often part of the techniques often used to relieve pain, such as relaxation. Another pain modulation technique used in this method is painless stimulation, such as gentle massage of the back during labor contractions. The analgesia induced by light massage is based on the Gate Control Theory proposed by Melzack and Wall. Finally, BM is used in analgesic hyperstimulation during contractions (Bonapace et al., 2013). In a study aiming to evaluate the

effectiveness of BM in reducing pain during labor, it was shown that BM reduced labor pain by almost 50% compared to traditional childbirth preparation courses (Bonapace, 2009). Studies on this method are insufficient in Turkey.

Transcutaneous Electrical Nerve Stimulation: Transcutaneous Electrical Nerve Stimulation (TENS), subcutaneous electrical nerve stimulation, is the transfer of low-voltage electrical pulses to the skin through the surface electrodes of a handheld battery-powered generator. It is used with a low-voltage electric current to activate inhibitory systems in the central nervous system to reduce pain (Njogu et al., 2021). To reduce labor pain, one pair of electrodes is placed parallel to the T10-L1 vertebral level and the other to the S2 and S4 vertebral level. The woman controls the intensity of the current by turning a dial and can change the intensity by adjusting the dials on the TENS unit. This application may cause a tingling sensation in women (Simkin & Bolding, 2004). In a randomized controlled trial of TENS, it was reported that TENS can be used as a non-pharmacological treatment to reduce pain and shorten the active labor phase (Rashtchi et al., 2022).

Water Labor: Water labor, which dates back to ancient times, has become an alternative method of childbirth with increasing popularity in recent years (Uzunlar et al., 2017). Benefits include;

- It shortens the first stage of labor and reduces the need for analgesics and anesthesia (Uzunlar et al., 2017),
- It has been found to be associated with more positive maternal experiences (Lathrop et al., 2018).

In hospital settings in the United States, water birth attended by qualified intrapartum care providers has been shown to be a reasonable option for low-risk women and their newborns (Neiman et al., 2019). In a randomized controlled trial, epidural analgesia was found to be effective in alleviating labor pain, but water birth was associated with the highest level of satisfaction among women giving birth (Czech et al., 2018). It is thought that entering hot water at a depth that covers the entire abdomen of the pregnant woman increases relaxation and reduces labor pain. In a study, it was reported that water birth for a low-risk pregnant group reduced the need for analgesia and regional anesthesia, especially in the first stage of labor, and increased patient satisfaction (Cluett & Burns, 2009).

In the evidence statement in the guidance published by the National Institute for Health and Clinical Excellence (NICE) in the UK in 2014, it was reported that water birth reduces labor pain and regional analgesia use, there is no evidence that water birth creates significant differences in the adverse outcomes of water birth compared to other births, there is insufficient evidence regarding the time of use of water in labor, hygiene conditions and measures for water birth, and the effect of water use on neonatal outcomes, especially in the second stage of labor (NICE, 2014). In a study conducted in our country on water birth, it was reported that there was no difference in neonatal intensive care need and Apgar scores between those who gave birth in water compared to those who gave birth vaginally with conventional vaginal delivery and epidural analgesia, and no neonatal death or neonatal infection was detected during the study period. As a result of another study conducted in our country on the neonatal outcomes of water birth, it was reported that water birth is a safe method for newborns provided that certain conditions are met (Mollamahmutoğlu et al., 2013).

Haptotherapy: Haptotherapy is a combination of the words "hapto", meaning touch, and "nomos", meaning rule or law. It does not only mean touch and emotionality, but also means communication and accepting the existence of the individual. One of the basic principles of haptonomy applied to birth is that the mother unconditionally and emotionally accepts the existence of the baby from the first period of pregnancy. In this way, the baby, whose existence is confirmed, is welcomed with emotional touches and early mother-baby bonding occurs. It is emphasized that a healthy mother-baby bond is important in forming the basis of lifelong relationships through these first communication experiences that the mother realizes by communicating with her unborn baby (Küçükkaya and Işık, 2024). Haptotherapy is an intervention protocol that changes the cognitive and perceptual interpretation of giving birth, allows birth to be perceived as a more normal and positive event, reduces the fear of birth in pregnant women, and enables the formation and development of certain skills in the pregnant woman, including birth simulation (Demir, 2022). Over the last decade, there has been increasing clinical evidence suggesting that haptotherapy may be an effective intervention to reduce fear of childbirth in pregnant women (Klabbers et al., 2014). In a meta-analysis study aimed at the effect of psychoeducational interventions applied to pregnant women on reducing anxiety symptoms and fear of childbirth, it was shown that educational interventions applied to women experiencing fear of childbirth were effective in reducing fear of childbirth in pregnant women (Tuğba and Gürhan, 2024). In the systematic review conducted by Akın and Erbil (2019), it was concluded that psycho-education techniques, individual counseling program provided by nurses, breathing awareness, intrapartum supportive care and childbirth education interventions were effective in reducing fear of childbirth in pregnant women, 18-hour mindfulness-based motherhood preparation program improved self-efficacy as well as fear of childbirth in pregnant women, haptotherapy intervention facilitated the development of certain skills that could reduce fear of childbirth, fear of childbirth was lower after distraction techniques but the difference was not significant, and pregnant women were more satisfied with face-to-face counseling compared to internet-based cognitive behavioral therapy intervention. In the randomized controlled study, haptotherapy was found to be more effective than internet and psychoeducation in reducing fear of childbirth (Klabbers et al., 2019). Haptotherapy may also provide broader social benefits (Bayrı Bingöl et al., 2022).

Table 1. Research on nonpharmacological methods for fear and pain related to labor

Researchers /year	Number of included studies / Type of research	Methods used in the study	The result of the study
Aasheim et al., 2017	22/ Cochrane review	Massage and hot and cold applications	Massage and hot and cold applications have been shown to reduce perianal injury.
Tabatabaeichehr et al., 2020	33/ systematic review	Aromatherapy	It has been found that aromatherapy can help relieve maternal anxiety and pain during labor.
Santiváñez-Acosta et al., 2020	12/ metaanalysis	Music	Music therapy has been found to have beneficial effects on pain intensity and anxiety during labor, especially for primiparous women.
Liao et al., 2021	17/ metaanalysis	Aromatherapy	Aromatherapy has been found to be beneficial for physical symptoms such as nausea, vomiting, pain, and psychological symptoms such as pregnancy/prenatal anxiety and fear.
Wu et al., 2021	22/ metaanalysis	Lamaze breathing training	Lamaze breathing training has been found to be effective in improving the labor process and outcomes in primiparous women.
Li et al., 2022	17/ metaanalysis	Perineal massage	Perineal massage initiated during the second stage of labor has been found to significantly shorten the duration of labor in primiparous women.
Chang et al., 2022	8/ metaanalysis	Bonapace method	It has been stated that the Bonapace method can be effective in pain and stress management.
Chen et al., 2022	16/ metaanalysis	Perineal massage	It has been found that prenatal perineal massage may reduce the risk of perineal injury and the incidence of long-term pain.
Melillo et al., 2022	63/ metaanalysis	Massage, birthing balls, mind-body interventions, heat application, music therapy, dance therapy, acupuncture and transcutaneous electrical nerve stimulation (TENS) applications	Massage, birthing balls, mind-body interventions, heat application, music therapy, dance therapy, acupuncture, and transcutaneous electrical nerve stimulation (TENS) have been found to be effective for labor pain.
Zhang et al., 2023	5/ metaanalysis	Yoga	It has been found that yoga during pregnancy can be effective in reducing labor pain.

Conclusion

Women's health also means the health of the baby, family and society. The birth of healthy generations depends on the physical, social and psychological well-being of the pregnant woman. The most common problems encountered during pregnancy and birth, which is a physiological process, are fear and pain related to the process, and this causes negative effects on the health of the mother and baby. Studies have shown that non-pharmacological methods used to manage these conditions reduce labor pain, fear of birth, and the possibility of intervention during birth; and increase patient satisfaction, positive pregnancy experience and mother-baby bonding. In this context, the support provided by health professionals using non-pharmacological methods and the pregnant woman using her own power in labor facilitates the woman's adaptation to the process and communication with the newborn.

Considering the mother-friendly care model and ACOG's recommendation of intervention limitation during birth and the studies indicating that intervention limitation increases patient satisfaction;

- As a health care professional, we can provide education and counseling to women we care for at every stage of pregnancy and labor about pharmacological and non-pharmacological methods for their complaints.
- As a management, we can create an in-service training program about these methods.
- As a researcher, we can conduct research on these methods, develop methods and strengthen the level of evidence.
- Birth preparation classes can be expanded and pregnant women and their partners can be made aware of non-pharmacological methods in these classes and have a more positive birth experience.

More studies can be conducted with different samples to show the reliability and effectiveness of these practices during birth.

Declarations

Acknowledgments
Not Applicable

Conflict of Interest
Authors disclose no potential conflicts of interest

Ethics Statement
Not Applicable

Informed Consent
Not Applicable

Author Contributions
The contributions of the authors to the study were indicated in the journal form and uploaded to the journal system.

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REVIEW

The Impact of Childhood Chronic Diseases on Child and the Family

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ABSTRACT

This study aims to examine the effects of chronic childhood illnesses on children and their families. It addresses the physical, emotional, social, and educational challenges faced by children while also focusing on how families cope with these difficulties. Through a literature review, the study analyzes common chronic illnesses in childhood and their impacts on children and their families based on existing research. Additionally, it highlights the psychosocial challenges encountered during the treatment process and emphasizes family-centered care approaches. Chronic illnesses significantly affect children's lives, imposing physical, emotional, social, and academic limitations. In addition to health issues, these children may experience emotional difficulties such as social isolation, depression, anxiety, and academic failure. For families, their child's illness leads to significant changes in daily life, altering family roles and increasing psychosocial stress. Healthcare services for children with chronic illnesses should not be limited to medical management alone but should also adopt an approach that provides emotional and social support. Encouraging children's active participation in family-centered care and treatment processes is essential to improving their quality of life. Families should also be provided with appropriate support, and professional guidance should be available to reduce family stress and anxiety levels. A holistic approach to disease management is crucial for ensuring that these children can lead a healthy life in the long term.

Introduction

A chronic disease is "a physical, emotional, or mental condition that prevents a child from attending school regularly, completing schoolwork, and participating in age-appropriate activities and that requires regular use of medication or special equipment and constant supervision and monitoring by a physician or health care professional" (Mokkink et al., 2008; Engin et al., 2021). The definition of chronic disease is based on a combination of criteria, including the duration of symptoms, limitations in activities of daily living, and the need for health care services (Suris, 2004; Er, 2006). Although the frequency and severity of symptoms may vary, a chronic condition is one that persists throughout an individual's life. Childhood chronic diseases are classified as those caused by chromosomal abnormalities (Down syndrome), genetic inheritance (sickle cell anemia, cystic fibrosis), teratogenic exposures, birth trauma (cerebral palsy), or acquired conditions (rheumatic fever, epilepsy) (Alves, 2015).

The diagnosis of a chronic disease causes permanent changes in a child's daily habits, interpersonal relationships, and interactions with health care services (Van der Lee et al., 2007). These changes result from the need to control and implement preventive measures for chronic diseases. Chronic diseases are generally incurable, but with proper management, individuals can lead active

lives. Disease management includes elements such as symptom monitoring, medications, lifestyle changes, and physical therapy (Morton, Everard, and Elphick, 2014). Given the need for medications, medical technology and special diets, chronic disease has a significant impact on the lives of children and their families (Er, 2006). Chronic disease encompasses more than just a physical health condition and has emotional, social, and economic implications for both the individual and their family (Herzer et al., 2010). Today, scientific and technological advances in chronic disease management have contributed significantly to increased survival rates among children. This review addresses the impact of childhood chronic disease on children and their families, as well as the principles of approaches to managing these conditions.

Prevalence of Childhood Chronic Diseases

The population of children with chronic diseases is increasing, and chronic diseases have become one of the most important health problems in all industrialized countries and worldwide (Suris et al., 2004; Yeo and Sawyer, 2005). The prevalence of childhood chronic diseases varies between countries/regions. According to studies conducted in our country, the prevalence of asthma, one of the most common chronic disease in childhood, is reported to be 7.4% (Yesilkaya et al., 2017). Additionally, the prevalence of type 1 diabetes, another prevalent chronic disease in childhood, is reported as 0.75/1000, with approximately 20,000 children diagnosed with diabetes (Sekerel et al., 2020). According to the 2020 report of the World Health Organization (WHO), approximately 3.000 children aged 0-14 are diagnosed with cancer annually in our country, and the survival rate for cancer has increased by 72% in the last five years (WHO, 2020; Kutluk and Yesilipek, 2022).

Epidemiological studies show that one in every four children suffers from a chronic health issue (Sawyer, 2007). According to population-based studies, 10-13% of adolescents have a chronic disease that significantly limits their daily activities or requires long-term care and supervision (Jin et al., 2017). Globally, the prevalence of chronic diseases in children is reported to be between 10-20%, with 10% of these children experiencing severe symptoms (Mokkink et al., 2008). Thanks to significant advancements in healthcare, although full recovery is not possible for many diseases, successful symptom control has been achieved. These advancements provide a longer life expectancy while also necessitating living with the disease for many years. For example, today, children with kidney failure can survive through dialysis and transplantation methods, but they face numerous symptoms that require management. Providing high-quality disease management for children living with chronic disease is crucial for them to lead happy and fulfilling lives.

The Effects of Chronic Diseases on Children

Chronic disease limits a child's ability to live independently and engage in social interactions, and requires ongoing medical interventions, including hospitalization. Children with chronic conditions are at higher risk of developing emotional problems compared to their peers without chronic diseases, and they have been shown to exhibit lower levels of academic, physical, and social functioning than healthy children. In addition to regressive behaviors, chronic diseases may cause developmental delays or retardation. For example, children with renal failure have been found to have significantly lower verbal and visual perception abilities (Er, 2006). Children with chronic diseases are 1.5 to 3.4 times more likely to develop emotional problems compared to their healthy peers (Hunt, 2009). Children react to chronic disease in different ways, with pain, cognitive difficulties, and physical appearance being the key factors influencing these reactions. The onset of a chronic condition may occur during a child's development and can lead to changes in the routines of both the child and the family (Engin et al., 2021). Until the clinical condition is confirmed, children try to adapt to new circumstances, cope with pain, potential limitations, and the fear of death.

With the development of treatment methods for chronic diseases, children's life expectancy has increased, but new morbidities and psychosocial issues have emerged (Engin et al., 2021). Chronic conditions affect the child's physical, emotional, and intellectual health. Studies have shown that children with chronic disease experience more emotional and behavioral problems compared to their healthy peers. The most common issues observed in these children are internalizing problems such as adjustment disorders, stress reactions, depression, anxiety disorders, and post-traumatic stress disorder (Emiroglu & Akay, 2008).

The pain, fatigue, and other physical symptoms experienced during the disease process, frequent hospital visits and admissions due to the need for regular treatment, emerging complications, changes in physical appearance, the uncertainty of the prognosis, and the limitations in daily life pose a risk for emotional problems (Ozbay, 2013). Problems with school attendance can lead to disruptions in the child's education and a decline in academic performance. School absenteeism and the inability to participate regularly in extracurricular activities mean that the child has fewer opportunities to make and maintain friendships. Separation from peers and limited opportunities for social interaction can cause these children to withdraw socially and feel helpless or different compared to children without chronic disease (Kansra et al., 2021). Social withdrawal is a major source of concern for children with chronic diseases. Children may avoid participating in activities due to the fear of negative reactions from peers, which can lead to a lack of interpersonal relationship skills and a decrease in self-esteem (Bakula et al., 2019). Additionally, due to the fear of social stigma, children who are afraid of the social consequences of their friends knowing about their chronic disease often resort to hiding their disease and treatment. Studies show that adherence to disease management is

associated with perceived social stigma, which can further jeopardize the child's health condition (Kansra et al., 2021).

Children with chronic diseases are often required to manage symptoms that affect their health and lifestyle, as well as ongoing treatments. These children are at higher risk of developing social, behavioral, or cognitive health issues, such as low self-esteem, poor social skills, disruptive behaviors, substance use, depression, and anxiety. A sense of alienation from their peers is an indicator of their frustration in managing their condition. Additionally, these children are exposed to multiple stressors, and the prevalence of depression, anxiety, and adjustment disorders in both the child and the family is notable (Hunt, 2009).

The onset of a chronic disease during childhood leads to an abrupt interruption of "normal" life. The beginning of chronicity in a child's life hinders their connections with peers, as well as significant moments with friends and family (Alves, 2015). Children often feel "different," socially isolated, and restricted in their activities. When they are unable to cope with these emotional challenges, feelings of anxiety, sadness, depression, defiance, and anger are frequently observed. These children grow up by dealing with the chronic condition that limits different aspects of their lives and by learning to incorporate the hospital environment into their daily routines. Due to repeated hospital admissions and long stays, children require special attention, which further increases the risks to their developmental process (Alves, 2015).

Children with chronic diseases account for 35% of all pediatric hospitalizations, with an average hospital stay of 1.6 to 3 days (Bell et al., 2020). Beyond recovery for the child, the hospital means that their loved ones, who are their natural source of support and security, have their daily lives changed and they enter a new routine that is often very different from their normal life. Hospitalization, painful procedures, and prolonged stays can lead to the development of post-traumatic stress disorder (PTSD). In PTSD, increased stress, emotional problems, treatment non-compliance, and a decline in quality of life are frequently observed (Sekerel et al., 2020).

Recurrent disease and treatment processes can significantly affect a child's school attendance and academic performance, which may lead to the loss of professional and economic independence in adulthood. Children with chronic disease may experience difficulties in school performance, including reduced attention and concentration, poor motivation, resistance to school assignments, and absenteeism (Hu et al., 2022).

In children with chronic disease, severe or insufficiently controlled symptoms, flare-ups, and frequent hospitalizations can lead to school absenteeism, low school engagement, and poor academic outcomes (Bregnballe et al., 2007). Priority conflicts may arise between disease management and school requirements, such as missed appointments on school days or refusal to undergo treatment on those days. Children with chronic diseases are more likely to miss school due to their condition or the treatment they require compared to their healthy peers. School attendance can be affected by the severity of symptoms, and the lost school time for these children can vary from 13% to 35% (Crump et al., 2013). Additionally, if a child does not have a supportive group of friends and teachers at school who are aware of their disease and accept them as they are, feelings of being "different" may lead to issues with self-esteem and self-image (Bregnballe et al., 2007). School absenteeism and lack of participation in recreational and sports activities also put these children at high risk for social isolation (Yeo & Sawyer, 2005). Parents of children with chronic diseases should maintain close contact with the school to ensure that teachers are aware of their child's special needs. Communication and collaboration between parents, the school nurse, and teachers will help identify school-related issues promptly.

The Effects of Chronic Disease on the Family

Chronic disease is a multifaceted experience with many layers, interactive, interconnected and spanning multiple domains. Chronic disease encompasses more than physical disease processes and involves multiple impacts on the lives of both children and families (Mitchell et al., 2020). When a child is diagnosed with a chronic disease, it means the beginning of a stressful process for both the child and the family. Families try to manage the child's disease while trying to maintain their normal family life. When a child is diagnosed with a chronic disease, it creates great upheaval in the lives of families and often leads to stress and anxiety. Families with children with chronic diseases have to cope with extraordinary circumstances. After diagnosis, families face changes that affect many aspects of their lives, such as medical diagnosis (medication, procedures, surgical intervention, hospital visits, hospitalizations, etc.), daily chores, schoolwork, work life and social activities, in addition to managing "normal" family life (Kratz et al., 2009). These changes that occur after the diagnosis create stress and tension on family members.

The presence of a chronic disease has a profound impact on the well-being of every family member, including healthy siblings. In the family, the burden of the presence of the disease can create tensions in all areas of life - physical, emotional, social, behavioral, behavioral, personal and material domains - preventing the family from maintaining its routines (Cardoso Vaz, 2018). The change in responsibilities and roles of family members leads to an inevitable change in family functioning and lifestyle, which in turn affects the overall family dynamic and functioning. Family dynamics can be disrupted when the child needs more time, special equipment, medication and other adaptations than other children. Emotionally, stress and uncertainty about the future, an upcoming procedure or intense worry about the child begin to dominate the thoughts of family members. Socially, families may feel isolated and lonely from extended family members and friends, or overburdened by the extra attention they receive (Mitchell et al., 2020). There are

changes in the roles and relationships of family members and this disrupts the normal functioning of the family. All these disruptions in family routines are particularly difficult for sick children or siblings in early childhood. Family routine in early childhood development gives children a sense of security, helps them develop self-discipline and boundaries, and allows them to cope with change by leading to clear and predictable expectations (Golics et al., 2013).

Chronic disease is an emotionally challenging source of stress for families. It changes the roles of family members, disrupts the hierarchy, affects family communication, interpersonal relationships, financial status, and leads to disruptions in family relationships, family structure, and family integrity (Mitchell et al., 2020). The stressors that families face after a child is diagnosed with a chronic disease are multifaceted, including symptoms, the treatment process, interpersonal conflict, uncertainty, loss, and most often related to daily role functioning. Chronic disease presents children and families with a combination of acute stress and long-term chronic stress. Stress is often an uncertain, unpredictable, uncontrollable, dysfunctional experience for children and their parents, and its severity is related to the amount of care the child requires. Resources for coping with stress depend on both the child and the family, as well as the level of understanding and perception of the situation. Stress can be chronic and prolonged, related to upcoming treatment, recovery, or survival (Alves, 2015). Parents losing their jobs, siblings and sick children missing school, painful ongoing procedures or treatments, uncertainty about the future, emotional and behavioral problems in the child, marital disharmony and conflict, too much or too little social support, and financial constraints are cited as long-term stressors in the family. These parents, compared to parents without sick children, experience higher levels of role strain, greater stress associated with the parental role, frustration, and conflict over division of labor and expectations. Parents may also show increased levels of anxiety and overprotectiveness, have lower expectations for their sick child and siblings, and fail to set boundaries or provide consistent discipline for their children.

The most common determinants of well-being in families with a child with a chronic disease include resilience, the presence of supportive social support, the disease process, balancing family needs, effective communication, and active coping. Many factors, such as family cohesion, shared love, emotional attachment, mutual understanding, and helpfulness, play an important role in mediating the impact of disease on the family. The availability and use of coping resources also influences the way the family and siblings adapt to the disease, and the family is more vulnerable when resources are not available. Lack of resources is also a risk factor for emotional distress and maladjustment (Toledano & Luna, 2020). Parents have to cope not only with disease management, but also with the fear, sadness, grief, anger, despair and long-term disease associated with the loss of a healthy child and therefore the loss of the previous way of life. Research shows that mothers experience higher levels of parental stress, anxiety, and depression (Compas et al., 2012). While mothers experience more parental stress, depression, and feelings of burnout, fathers are generally less functionally involved in the disease management process. At the same time, parents are the primary source of emotional support for the child and an important link between the child and the healthcare team.

Siblings can also be affected by the disease in a variety of ways, both positive and negative. Healthy siblings may experience behavioral and emotional problems and decreased school performance due to changes in their routines, fatigue, high anxiety, and increased attention from their parents. Studies show that siblings of children with chronic diseases are at high risk for emotional effects such as anxiety, restlessness, depression, and sadness (Sharpe & Rossiter, 2002; Vermaes et al., 2012). The status of the sick child, family stressors, perceptions of the sibling's health, coping strategies, parents' emotional state and level of functioning, family functioning, changes in roles and functioning, social support, and financial resources are risk factors that play a role in affected siblings (Alderfer, 2010). Families of children with chronic diseases may lose control in managing their lives with changing routines and the presence of a chronic disease. Informing, supporting and empowering the family in the process of living with a chronic disease, care and treatment of the child will facilitate the child's adaptation to the new situation and thus minimize negative emotions. At the same time, parents' attitudes toward managing their child's disease and adapting to the new lifestyle will contribute positively to the child's self-control in adulthood (Kratz et al., 2009).

Approach to Childhood Chronic Diseases

Children with chronic diseases need supportive, planned and integrated health services. At the same time, these children need comprehensive strategies to effectively manage chronic conditions. It is important for health care professionals to monitor how chronic disease affects the child's appearance, socialization, school life, and emotional health, and to set appropriate goals for the child.

Concrete short-term goals should be developed with the child and family to help the child regain functionality in all areas. The child's active participation in periodic evaluation of the treatment plan should be encouraged, and the child and family should be counseled to take ownership and control of the disease. The child and family should be informed about the treatment process and treatment options. The approach to the child and family should be appropriate to the child's developmental level. The family is an important source of support for treatment compliance, and the adoption of a family-centered care philosophy at every stage of the approach is of great importance in terms of positive health care outcomes. The basic principles in approaching children and families with chronic disease are given in Table 1 (Table 1).

Table 1. Basic principles in approaching children and families in childhood chronic diseases

Assessment of the child and family's knowledge and skills regarding disease management
Disease management education
Planning the disease management plan in accordance with the daily routines of the child and family.
Discussing facilitators and barriers to the management plan
Providing written guides for disease management
Developing short-term goals
Regular assessment of adherence to the disease management plan
Avoiding judgmental attitudes regarding any shortcomings in disease management
Providing support from important individuals and peers for the child and family
Making the management plan as simple as possible for the child and family
Encouraging participation in support groups

Conclusion

Childhood chronic disease is a significant challenge not only for the child, but also for the family. These conditions require ongoing medical management, emotional support, and adjustments to daily routines, which can have a profound impact on various aspects of the child's life, including physical health, emotional well-being, social interactions, and educational performance. The increasing prevalence of chronic diseases in childhood highlights the urgent need for comprehensive health strategies that address both medical and psychosocial aspects of care. While advances in medical treatments have improved survival rates, children with chronic diseases still face ongoing challenges in adjusting to their condition, and the emotional and social consequences for both the child and their family are significant. By providing family-centered care, encouraging active participation in treatment, and offering consistent support for emotional and social development, we can improve the quality of life for these children and their families and enable them to overcome the challenges of chronic disease.

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Conflict of Interest
Authors disclose no potential conflicts of interest.

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Not applicable.

Informed Consent
Not applicable.

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REVIEW

Green Midwifery Care in Climate Change and Newborn Nutrition

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ABSTRACT

Climate change refers to long-term changes in the Earth's climate system, such as temperature increases, changes in precipitation patterns and more frequent extreme weather events, as a result of human activities following the industrial revolution. The main causes of climate change include the burning of fossil fuels, deforestation and industrial processes. These activities cause greenhouse gases to accumulate in the atmosphere and cause global warming. Especially after the Industrial Revolution, the world temperature continues to rise and climate change continues to occur. Since the mid-19th century, both breastfeeding and the Earth's climate have suffered greatly from the rise of industrial capitalism. First called global warming, then climate change due to its many negative consequences, it is seen as the most important global health threat of the 21st century. Factors such as increasing temperatures, thirst, food insecurity and environmental toxins as a result of climate change also affect breast milk production and the breastfeeding process indirectly, if not directly. This situation threatens both the health of the mother and the healthy nutrition opportunities of infants. Therefore, considering the long-term effects of climate change, maternal and child nutrition should be at the top of the climate change agenda. Midwives have important roles in minimizing the negative effects of climate change on health. This review is a review of the literature on the interaction of climate change with breastfeeding and breastfeeding.

Introduction

According to the United Nations Framework Convention on Climate Change, "Climate change" is defined as a change in climate resulting from human activities that directly or indirectly disrupt the composition of the global atmosphere, in addition to the natural climate change observed in comparable time periods (UNFCC, 1994).

Climate change significantly affects human life and health and has reached a level that poses a vital risk if the necessary measures are not taken. The World Health Organization (WHO) describes climate change as the greatest problem of the 21st century (WHO, 2015).

Climate change negatively affects health by disrupting the water, food chain and living environment necessary for life, with direct (such as hot weather, air pollution) or indirect effects (such as water scarcity, migration) on humans. Climate change has a detrimental effect on access to clean water, clean air, the maintenance of social structure, safe shelter and food security. With the change in the distribution of disease-carrying vectors, increases in infectious diseases (e.g. malaria), diarrheal diseases, adverse weather events, and morbidity and mortality rates due to air pollution can be observed (General Directorate of Public Health, 2023).

Changes in weather events and natural balance affect human health physiologically and psychologically in different dimensions. In particular, some groups, those experiencing social exclusion such as age, gender, poverty or being a refugee, are more sensitive and vulnerable to the effects of climate change on health (Xie et al, 2021). Climate change is a long-term process that causes many health problems (WHO, 2014).

The relationship between climate change and breast milk includes the effects of environmental factors on maternal health and infant nutrition on a wider scale. A number of studies investigating the impact of breastfeeding on sustainability and climate change are presented in the UNICEF report (UNICEF, 2021). Climate change may have indirect effects on infant health. Studies conducted on the subject; It is suggested that the high exposure of pregnant women and their fetuses to climate change causes adverse health outcomes (Helle et al., 2009; Dadvand et al., 2011; Robledo et al., 2015; Schifano et al., 2016; Verburg et al.,2016; Booth et al., 2017; Elongi et al., 2017; Janani and Changaee, 2017; Wang et al., 2018; Bekkar et al., 2020; Mandakh et al., 2020; Xie et al., 2021).

The climate crisis is a global challenge that poses potential risks to breastfeeding practices and outcomes. Climate change has multifaceted effects that affect the breastfeeding dyad in environmental, social and human health dimensions.

Health professionals have a key role to play in many of the UN's Sustainable Development Goals, including developing "a food system that provides food security and nutrition for all, so that the economic, social and environmental foundations for food security and nutrition for future generations are not compromised" (WFP, 2018). The International Confederation of Midwives (ICM) has chosen the theme for World Midwives Day 2024 as "Midwives are activists for climate solutions" (ICM, 2024). The purpose of this review is to draw attention to the interaction of climate change with breastfeeding and nutrition, and to discuss the remedial effects that midwifery care can provide on this interaction.

Environmentally friendly nutrition with breast milk

Every person wants to live their life in a healthy way. Governments should also support public health programs to achieve this goal. Breast milk nutrition contributes to health programs as a natural and environmentally friendly resource. Nutrition has a very important place in the development of individual and community health. Good nutrition is necessary for a person's growth, development, physical and mental health, and resistance to diseases, especially infectious diseases (Bilgel, 1997).

Various socioeconomic, cultural and environmental factors play a role in the mother's decision on which path to follow in feeding her baby. In order to protect newborns from infection, reduce malnutrition, ensure their psychosocial development and normal growth, mothers should be encouraged to breastfeed their babies and the necessary conditions should be created on a global scale to facilitate breastfeeding (UNICEF, 2024).

Breast milk basically contains carbohydrates, proteins, fats, vitamins, water and minerals necessary for the growth and development of the baby. It also contains various bioactive components necessary for the health of the baby (Bode et al., 2014). Beyond their nutritional aspects, microorganisms, oligosaccharides, and various bioactive compounds that play an important role in host-microorganism interactions and infant health are critical nutrients that support infant immune development (Bülez, 2022). Microbiota is defined as a community of microorganisms found in a distinct ecological niche or environment (Güney et al., 2017). Breast milk is thought to have positive effects on the infant's intestinal microbiota and therefore the immune system, resulting in protection from infectious diseases and non-infectious diseases (Dinleyici, 2020).

The climate crisis is a global challenge that poses potential risks to breastfeeding practices and outcomes. Climate change has multifaceted effects that affect the breastfeeding dyad in environmental, social, and human health dimensions (Cappelli, 2021; Zadkovic et al., 2021).

Women, infants, and children are extremely vulnerable to climate change. This vulnerability varies depending on various reasons. Climate change events create challenging conditions. This situation makes it difficult for infants to breastfeed at both low and high levels (Zadkovic et al., 2021; Grubesic et al., 2022).

Maternal and child nutrition should be at the top of climate change agendas. Considering how important breastfeeding is for child health in climate-related events, it is imperative to protect and support breastfeeding during development (Cappelli, 2021; Zadkovic et al., 2021).

Maternal, fetal, newborn and child health are disproportionately affected by increasingly frequent epidemics. These epidemics are caused by infectious diseases related to climate change (Blakstad and Smith, 2020). Changes in climate-related environmental conditions cause various water, air, food and vector-borne pathogens. This situation further increases the burden of malnutrition, especially among women, infants and children (Fanzo et al., 2021). Breastfeeding contributes to climate resilience but is also under threat from climate change. Understanding the complex interactions between climate change and breastfeeding is important to ensure that both mothers and infants are protected against the climate crisis (Dall'Oglio et al., 2020; Grubesic et al., 2022).

The effects of climate change on maternal nutrition

Climate change negatively affects food production with its consequences such as drought, flood and adverse weather events. This situation creates food shortages and food insecurity in some regions. Climate change significantly affects migration rates worldwide. According to the IDMC Internal Migration Monitoring Center 2018 Global Migration Report, 17.2 million people were forced to migrate due to natural disasters (IDMC, 2018).

The world continues to warm due to climate change. Heat waves are occurring more frequently and intensely. When comparing temperatures before the 1960s to today, an average increase of 2°C in global temperatures has been accepted as the critical value. However, according to the International Meteorological Organization (WMO) report, a temperature increase of

0.1 to 0.3°C every decade shows that the situation has reached serious dimensions (WMO, 2018).

Breast milk production is directly related to maternal nutrition. Breast milk is 87% water (Samur, 2012). Breast milk is the best source of fluid for newborns. Especially in hot and dry regions, when the mother becomes dehydrated due to lack of access to sufficient water, the risk of decreased milk production may increase due to the disruption of the mother's fluid balance. This is a situation that directly affects the baby's breastfeeding (Zadkovic et al., 2021).

Water insecurity due to frequent and severe droughts is strongly linked to food insecurity affecting women and children. Especially in low-income or rural areas, the climate crisis has negative effects on breastfeeding as mothers cannot meet their nutritional needs. Mothers who are malnourished may not be able to produce enough breast milk, which can make breastfeeding difficult (Blakstad et al., 2020).

Extreme temperatures affect not only mothers but also newborns. High temperatures cause faster dehydration in babies (Xu, 2017).

It is observed that the intensity of heat waves is increasing, especially in Africa (Harrington, 2020). A study examining baby feeding practices with climate change revealed that even under hot conditions, feeding only with breast milk does not dehydrate babies and their urine output is normal (Edney et al., 2022).

The impact of climate change on infections

Climate change also increases the risk of infection due to reasons such as temperature increases and pollution of water resources. 780 million people worldwide lack access to clean drinking water and 2.5 billion people lack improved sanitation. Waterborne diseases and foodborne infections in particular threaten the health of breastfeeding mothers. Infections such as diarrhea cause dehydration. In order for a mother to have plenty of milk, she needs to drink plenty of water in addition to her daily food and breastfeed frequently (Aşılar et al., 2018). For this reason, infections that cause dehydration can reduce the mother's milk production and limit the baby's breastfeeding capacity (CDC, 2021; Ebi et al. 2018).

The World Health Organization has stated that diarrhea, a preventable and treatable disease, is the third leading cause of death in children under the age of five. Diarrhea is responsible for the deaths of approximately 443 thousand children under the age of five each year (WHO, 2024).

The 2016 ''Global Burden of Disease Study'' revealed that babies who are not breastfed are 14 times more likely to die from diarrhea than babies who are exclusively breastfed (IHME, 2018).

Inadequate water and hygiene conditions due to natural disasters or environmental degradation put the health of both the mother and the baby at risk. This prevents the mother from breastfeeding comfortably and makes it difficult for the baby to receive adequate nutrition. UNICEF reports show that climate change increases the spread of deadly diseases such as cholera, malaria and dengue fever, and this situation has serious consequences especially for pregnant women and children (UNICEF, 2023).

Climate change affects the distribution of species carrying zoonotic diseases and their proximity to humans, increasing the risk of exposure to diseases (HCWH, 2019). In recent years, an increase in zoonotic diseases has been observed in Turkey. The spread of diseases such as Crimean-Congo Hemorrhagic Fever, Zika virus, West Nile virus and malaria reveals current and potential health risks in our country (Polat, 2017).

The stress effect of climate change

Environmental stress due to climate crisis creates various negative effects on breastfeeding. Disasters, migrations and natural disasters related to climate change cause psychological stress on individuals (Obradovich et al., 2018).

Stress can be physical or psycho-emotional and negatively affects the initiation, maintenance of breastfeeding and the secretion of breast milk in breastfeeding mothers (Zanardo, 2016). Stress factor can make the breastfeeding process difficult by negatively affecting the regulation of breastfeeding hormones and reducing milk production, as well as weakening the mother-baby bond. It is stated that mothers who are stressed and anxious about the care and nutrition of their babies are also anxious about breastfeeding and breastfeeding rates decrease significantly (Duran et al., 2020).

Increased expenses during pregnancy, birth and postpartum periods affect low-income families more deeply and increase stress levels (Yağmur et al., 2010; Şahin et al., 2021). It is reported that having a low income level causes women's stress levels to increase in the postpartum period (Mollard et al., 2021).

Migration and climate refugees

Adverse weather events and natural disasters caused by climate change are causing climate refugees. According to World Bank estimates, more than 216 million people could be forced to migrate by 2050 due to climate change (Worldbank, 2021).

In many societies, climate change is forcing spouses or partners to seek income-generating activities away from their families, leaving women with more care and provision responsibilities than before the climate change-related crisis (Blakstad, 2020). In developing regions, women and children are among the most vulnerable among those forced from their homes by climate change. Displaced women face risks such as gender-based violence, domestic violence, forced marriage, and human trafficking. Gender inequalities prevalent in low- and middle-income countries often lead to restrictions on women's and girls' decision-making power, their access to resources and basic services, and their ability to manage and recover from climate-related disasters (CARE International, 2020).

Climate change events create conditions that make it difficult for mothers to breastfeed safely and comfortably in both low- and high-income settings. Climate migrants often face challenges such as lack of infrastructure, hygiene problems, and access to clean water. This makes it difficult to provide the necessary hygiene conditions for breastfeeding, and mothers who lack adequate nutrition and rest opportunities during migration experience difficulties in breastfeeding (Zadkovic et al., 2021; Grubesic and Durbin, 2022).

It is reported that the impacts of the climate crisis will vary according to geographical location and the development level of the countries. It is thought that low- and middle-income countries, which are the least involved in the process, may be much more affected by this crisis (Althor et al., 2016).

Protection of infants from climate change depends on their caregivers and community resources. Therefore, the risk of exposure varies around the world. However, government agendas, such as the United Nations, do not pay enough attention to the disproportionate impact of climate change on the health and food security of women, infants and children living in low-income areas (Blakstad and Smith, 2020; CARE International, 2020; Pope et al., 2021).

Environmental toxins and breast milk

With climate change, environmental toxins such as air pollution, agricultural chemicals, and industrial pollution are increasing. These toxins have negative effects on the content of mothers' milk. In particular, pollution of air and water resources can increase the risk of these toxins passing into breast milk and pose potential risks to infant health.

A study published by Ragusa et al., examining the milk of 34 mothers, found that microplastics were found in breast milk and posed a serious threat to newborn and child health (Ragusa et al., 2022).

Breast milk is the most important source of nutrition for the healthy growth and development of babies. Nutrients, antibodies, and other substances can pass to the baby through breast milk. One of these substances is organochlorine pesticides (OCP), which are harmful to human health. Aytaç et al. (2010), the presence of OCP in the milk of 62.7% of the mothers participating in the study was detected, regardless of age, occupation and place of residence (Aytaç et al., 2010). Environmental chemical pollutants, factors that we are exposed to due to reasons such as food, consumer products and environmental air pollution pose a great threat to both human health and nature and climate all over the world. Particulate matter pollution, also known as PM, is a term that describes extremely small solid particles and liquid droplets suspended in the air. Particulate matter (PM) in the air is not a single pollutant; it is a mixture of many chemical types. Arık (2023) reported in his study that particulate matter (PM10) exposure levels, daily life habits such as tap water use, use of disposable containers, especially with hot drinks, and an increase in body mass index have an effect on DNA damage. In addition, it was concluded that breast milk is a useful biological tool for measuring the level of exposure to environmental pollutants and their effects on health (Arık, 2023).

Climate change and alternative infant feeding

Breastfeeding, childbirth, and other forms of reproductive labor are considered natural processes and are therefore ignored and not included in traditional economic indicators. The classification of reproductive labor as 'non-work' creates an artificial scarcity that allows formula companies to find a place in the market without recognizing the value of women's labor (Federici, 2009; Walters, 2019). Despite this, the total global economic loss due to non-breastfeeding is estimated at $341 billion (Smith, 2019).

In some cases, mothers are forced to resort to formula when they cannot breastfeed due to environmental challenges. However, logistical problems caused by climate change can also make formula distribution difficult. In addition, in regions where there is no access to clean water, formula use becomes a riskier feeding option for infants. Hipgrave et al. (2011) found that infants who were formula-fed after an earthquake had a higher incidence of diarrhea during the week than those who were not (Hipgrave et al., 2011).

In difficult conditions, the problems experienced by families in accessing clean water, bottles, heaters and cleaning materials to prepare powdered formula milk pose a risk to infant nutrition. These difficulties also endanger the healthy nutrition and growth of infants (Ratnayake et al., 2022). Malnutrition resulting from inadequate nutrition affects vulnerable groups, especially infants and children (Tsuboyama et al., 2014). Therefore, encouraging and supporting breastfeeding is very important for healthy nutrition of infants. Breastfeeding provides necessary nutrients and protects against infections. It also reduces families' dependence on clean water and equipment such as bottles, ensuring healthy nutrition of infants even in difficult conditions.

During disasters, relief efforts often focus on large amounts of formula donations, creating a dependency and need for continuous formula supply. Because breastfeeding cannot be easily resumed once interrupted. After the Great West China Earthquake in 2008, donated formula remained in the region for five years. This has led to an increase in the use of formula (prelacteal formula) before breastfeeding begins, which has become a major barrier to exclusive breastfeeding (Binns et al., 2019).

Breastfeeding promotion and support are not sufficiently integrated into disaster preparedness and climate mitigation policies. However, infant and young child mortality is highest after disasters, which are aggravated by climate change. In these settings, it is particularly important to provide appropriate support for continued breastfeeding and avoid unnecessary formula distribution (Hirani, 2019; Grubesic).

Long (2021) studied the use of renewable gas in Ireland to replace breast milk presented an analysis

comparing the emission savings achieved in the production of breast milk substitutes using renewable gas in Ireland with the emission savings achieved by increasing exclusive breastfeeding to 50%. The results show that meeting global breastfeeding targets results in greater emission savings than using renewable gas. This suggests that increasing breastfeeding rates could significantly reduce the energy demand associated with breast milk substitutes (Long, 2021). Food security for infants and young children is not possible without encouraging and achieving high breastfeeding rates (Binns, 2021).

The effects of breastfeeding on climate change

Breast milk is a renewable natural resource that is often neglected in discussions about sustainable food production, environmental degradation, and climate change. Breast milk is a natural, renewable food that is environmentally safe, produced without pollution, unnecessary packaging, and waste, and delivered to the consumer (Bülez, 2022). Breastfeeding offers a sustainable and safe solution for infants in terms of nutrition in the face of increasing food and water shortages due to climate change. Breast milk meets the most basic nutritional needs of infants, leading to less food, energy, and water consumption. It also reduces the environmental footprint by reducing dependence on formula. In order to increase breastfeeding and encourage breastfeeding all over the world, the World Health Organization recommends that all infants be exclusively breastfed for the first six months, and breastfed with complementary foods from the 6th month until the age of 2 and beyond (Scott et al., 2015; Grant, 2016; Chan et al., 2022). As of 2021, the breastfeeding rate for the first six months has reached 48%. This shows that the 50% target set for 2025 is approaching. However, we are still far from reaching the 70% rate, which is the sustainable development goal for 2030 (WHO, 2018).

Breast milk is the most suitable source of infant nutrition to ensure normal growth and development (Ballard et al., 2013). It is an ideal physiological food for infancy because its content changes according to the needs of the baby, it protects against infections, and it meets the physiological and psychosocial needs of the baby alone in the first six months. It has been proven that breastfeeding reduces morbidity and mortality rates in the newborn, ensures appropriate nutrition, growth and development of the newborn, and is superior to other forms of nutrition (WHO, 2018).

Even in disaster situations, including famine, breastfeeding continues to be the best option to meet the nutritional needs of infants (Binns et al., 2012). In addition, it is accepted that breastfeeding benefits the family and country economy for many reasons such as its economic advantages. Breastfeeding is an environmentally friendly form of nutrition due to its low cost and the fact that it does not cause waste problems (Gökçay et al., 2021).

Breastfed babies are also less likely to have sudden infant death syndrome, respiratory and gastrointestinal system infections (Ip et al., 2009). At the same time, breastfeeding is also linked to a reduced risk of developing non-communicable diseases such as diabetes, obesity and cardiovascular system diseases in later life (Geddes et al., 2013).

Healthcare services account for approximately 4-5% of total carbon emissions worldwide. This rate is due to many factors such as energy use of healthcare systems, production of medical supplies, pharmaceuticals, transportation and waste management. According to the report ''The Health Sector's Contribution to the Global Climate Crisis and Opportunities for Action'', if the global healthcare sector were a country, it would be the fifth largest greenhouse gas emitter on the planet (HCWH, 2019). Improving breastfeeding helps reduce climate change because it is a "green" infant feeding practice compared to infant formula (Smith, 2019; Pope et al., 2021). Increasing breastfeeding rates will improve infant and adult health while also helping to reduce greenhouse gases. Breastfeeding has been shown to reduce the energy demands associated with breast milk substitutes and to help reduce the negative environmental impact of food alternatives, including reducing greenhouse gas emissions (Long, 2021).

Breastfeeding provides health benefits both in infancy and throughout life, and protects against the effects of climate change by preserving the body microbiome (Binns 2016; Wilson 2020).

Breastfeeding can reduce all these health costs by reducing morbidity rates and thus reducing carbon emissions. Going forward, supporting breastfeeding under normal conditions as well as in humanitarian emergencies due to climate change is key (Grubesic et al., 2022).

Breast milk adapts to changing environmental conditions. When a mother is exposed to an infection, her body produces antibodies against that infection, and these antibodies are passed on to her baby through breast milk, potentially protecting the baby against diseases. Peng (2020) reported in her study that mothers had COVID-19 antibodies in their breast milk after infection or vaccination (Peng, 2020).

Global average temperatures are increasing and communities all over the world will be exposed to these temperatures. Necessary interventions should be made to protect the health of babies. Breastfeeding rates should be increased, which is the most beneficial, economical and environmentally friendly form of nutrition, and babies should be fed exclusively with breast milk for the first six months (Dall'Oglio et al., 2020).

The duties of midwives in breastfeeding under the shadow of climate change

The International Confederation of Midwives (ICM) emphasizes the importance of midwives in combating

climate change and states that midwives play a key role in reducing carbon emissions. The ICM has determined the theme of World Midwives Day 2024 as "Midwives are climate solution activists", indicating that the health of women and babies is significantly affected by disasters experienced as a result of the effects of global warming on nature and humans. The role of midwives in advocating life includes protecting the lives of not only humans but also all living things in nature. In health systems where preventive health services are important, the role and status of midwives are both important and respected (Çalışıcı, 2024).

Conclusion

In conclusion, it is clear that climate change and its negative effects are inevitable. These negative effects pose an increasing threat to individual and community health. In particular, the effects of climate change on the breastfeeding process pose serious health risks for mothers and babies.

Increasing the knowledge and awareness levels of midwives on climate change and breastfeeding will strengthen the capacity of societies to cope with this global problem and raise healthy generations. According to the recommendations of the ICM, it is of critical importance for midwives to take a leadership role in combating climate change and to support mothers in breastfeeding. In this context, it is recommended that modules on climate change be added to midwives' training programs and that their participation in research on this subject be encouraged.

In addition, awareness of resource use at individual and institutional levels is one of the important steps to be taken in combating climate change. Such training and awareness programs for midwives will not only increase the quality of health services, but will also create a solid foundation for a sustainable future.

Recommendations

ICM's midwifery care recommendations for climate solutions are as follows:

Recommendation 1: Midwives provide environmentally sustainable health services and play a key role in making health systems more climate resilient. During climate crises, midwives can adapt to provide safe, respectful and quality care for women and gender diverse people. Simply put, midwives are a vital climate solution.

Recommendation 2: Midwives provide services where people live, reducing the need to travel to health facilities. Access to a midwife's care provides more time and expertise for obstetricians for women with complex care needs. This reduces the vehicle footprint of health services, making them more sustainable and accessible for all.

Recommendation 3: Continuity of midwifery care improves maternal health outcomes and ensures more babies are born alive, on time and healthy. Better health outcomes mean that mothers and babies will need less medical care in the short and long term. This reduces the use of medical resources and limits medical waste.

Recommendation 4: Midwives help mothers achieve their breastfeeding goals, and mothers often breastfeed for longer. Breastfeeding does not require packaging or shipping, saves water, and improves the health of women and babies. Midwives supporting women to breastfeed successfully is good for babies, women, and the planet.

Recommendation 5: Midwives are champions of sexual and reproductive health. They empower women to manage their own reproductive health by providing education, contraception, comprehensive abortion care, and support. This supports women's rights and economic resilience, while reducing their vulnerability to the impacts of climate change.

Recommendation 6: Community-based midwives can more easily reach areas affected by climate disasters and provide essential reproductive and maternal health services quickly. Midwives are a valuable community in the face of climate disasters, and their evidence-based knowledge and supply distribution ensure that women and babies have access to care, even in the worst conditions.

In our warming world, funders and health systems are funding midwifery services to support providers who can coordinate effective crisis response plans.

Declarations

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Conflict of Interest

Authors disclose no potential conflicts of interest.

Ethics

Not applicable.

Informed Consent

Not applicable.

Author Contributions

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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CASE REPORT

Nursing Care of Immigrant Earthquake Victim with Multiple Fractures According to NANDA, NIC and NOC Classification Systems

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ABSTRACT

The most common type of injury following an earthquake is extremity injuries, which can result in multiple fractures. Appropriate orthopedic surgical interventions should be determined to maintain the physiological integrity of the patients. Additionally, the needs of earthquake survivors must be addressed in a comprehensive manner, ensuring that care is provided not only physiologically but also socially and psychologically. In this context, nursing care becomes critically important. It is essential for the provided care to be based on a standardized foundation to achieve the desired patient outcomes. The scientific basis for nursing care is grounded in the North American Nursing Diagnosis Association, Nursing Interventions Classification, and Nursing Outcomes Classification taxonomy, which are utilized in many countries. In this case presentation, the nursing process for a migrant earthquake survivor with multiple fractures employed the North American Nursing Diagnosis Association diagnoses, Nursing Interventions Classification and Nursing Outcomes Classification systems. Accordingly, ten nursing diagnoses were established in the areas of nutrition, elimination and exchange, activity and rest, coping and stress tolerance, safety/protection, and comfort, along with 29 nursing interventions aimed at these diagnoses, resulting in improvements in these domains.

Introduction

Multiple fractures are defined as injuries that occur due to natural disasters, gunshot wounds, traffic accidents, falling from a height, fire, etc., which can affect more than one bone in the skeletal system and also affect soft tissues (Sener, 2011; Tuna & Karaaslan, 2024). In cases with multiple fractures, careful planning of surgical procedures is required because more than one bone is damaged. Long bone fractures, contusion of extremities and major soft tissue trauma result in high survival rates when treated correctly and in a timely manner. Pre-hospital advanced life support protocols provide a systematic approach in cases with multiple fractures and increase the success rate of hospital interventions on survival (MacKenzie et al., 2017; Missair et al., 2013). Extremity injuries are the most common type of injury following an earthquake and can result in multiple fractures (Kang et al., 2016). After the 1999 Marmara earthquake, it was reported that 66% of the earthquake victims had extremity injuries and orthopedic interventions were among the most frequently needed interventions; however, there is no study that clearly demonstrates this rate after the earthquakes that occurred in 11 provinces centered in Kahramanmaraş on February 6, 2023 (Bulut & Vatansever, 2022; Gao et al., 2023).

Today, nurses, who are among the indispensable professionals of the health system, continue their nursing practices all over the world with systematic and high

evidence-value initiatives of nursing science, and the North American Nursing Diagnosis Association (NANDA) is undoubtedly one of the leading organizations that pioneer this systematics. NANDA is an internationally recognized organization of nurse educators, theorists and clinicians working in the United States of America (USA) and Canada. The Association first came together in 1973 to establish a common language and classification of nursing diagnoses (Herdman et al., 2021). NANDA International (NANDA-I) has created a standardized terminology for nursing diagnoses and presented their diagnoses in a classification scheme, more specifically a taxonomy. The twelfth edition of the NANDA-I taxonomy (2021-2023) includes 13 domains (Health management and promotion, Nutrition, Elimination and change, Activity/rest, Perception/cognition, Self-perception, Role relationships, Sexuality, Coping/stress tolerance, Life principles, Safety/protection, Comfort, Growth/development), 47 classes and 267 nursing diagnoses (Herdman et al., 2021).

One of the leading taxonomic structures in nursing is the Nursing Interventions Classification (NIC) system. NIC is a nursing classification system created by the Nursing Classification Center at the University of Iowa School of Nursing in 1987 to evaluate and standardize the interventions applied by nurses (Aslan & Emıroglu, 2012; Ay, 2008; Iskender & Kaplan, 2019). The NIC classifies and defines nursing interventions that are continuously evaluated and updated based on the research and scientific inputs of nursing. The interventions included in the NIC are considered evidence-based nursing practices (Bulechek GM et al., 2017). Selecting evidence-based nursing interventions is part of the nurse's clinical reasoning and decision-making process. NANDA nursing diagnoses were utilized while creating the NIC (IOWA College of Nursing, n.d.). Codes are defined for each nursing intervention (Aslan & Emıroglu, 2012). The latest edition of the NIC, the eighth edition, includes 614 interventions, thirty classes, and seven domains (Physiological: Basic, Physiological: Complex, Behavioral, Safety, Family, Health System, and Community) (Wagner et al., 2024).

The Nursing Outcomes Classification (NOC) is the result of nearly 25 years of work by the team at the Center for Nursing Classification and Clinical Effectiveness at the University of Iowa College of Nursing to develop nursing terminology focused on patient outcomes. The NOC standardizes outcome concepts, definitions, indicators and measurement scales for use in practice, education and research. Outcomes help nurses to assess and measure the condition of the patient, family and/or community. The NOC uses a five-point Likert scale for the outcomes and indicators (‘5’ being the best possible score and ‘1’ being the worst possible score). The seventh edition of the NOC includes 612 outcomes, thirty-six classes and seven domains (Functional Health, Physiological Health, Psychosocial Health, Health Knowledge and Behavior, Health and Quality of Life, Family Health and Community Health) (Moorhead et al., 2024).

Today, providing quality and effective health care services is very important in terms of achieving the desired patient outcomes and ensuring recovery. This is only possible by selecting the right nursing diagnoses, implementing effective nursing interventions and determining the outcome criteria. While the correct nursing diagnoses are determined under the guidance of NANDA, NIC is taken as a guide in determining effective nursing interventions appropriate for this diagnosis, and NOC is taken as a guide in achieving the determined goals (Bulechek GM et al., 2017). Diagnoses frequently recommended by NANDA for individuals with multiple fractures include acute pain, impaired mobility, impaired tissue integrity and lack of self-care (Camilo Ferreira et al., 2023; Ferreira et al., 2023). Within the scope of NIC, interventions such as pain management, positioning, wound care and self-care assistance are recommended for these diagnoses, while NOC outcomes include indicators such as pain control, improvement of mobility, tissue integrity and self-care performance (Bulechek GM et al., 2017; Camilo Ferreira et al., 2023; Clarke & Drozd, 2023; Ferreira et al., 2023). In this study, NIC interventions and NOC results determined in line with NANDA nursing diagnoses of a migrant earthquake survivor with multiple fractures will be presented.

Material and Methods

In this case report; NIC nursing interventions and NOC results applied in accordance with NANDA-I Taxonomy II to a foreign national patient who was rubble under the earthquake that occurred in Kahramanmaraş on February 6, 2023 are presented. The study was planned within the scope of the ethical rules in the Declaration of Helsinki, verbal and written consent was obtained from the patient's relatives to make a case presentation and to use the patient's information in this presentation, and a pseudonym was created using the initials of the patient's name within the scope of the Personal Data Protection Law.

Case

N.M., a 16-year-old female patient, is a foreign national (Iraqi) and single. N.M. came to Turkey with her family five years ago and lives in Kahramanmaraş. On February 6, 2023, she was trapped under a cave-in during the earthquakes centered in Kahramanmaraş and was pulled out of the cave-in after about two hours. After the first intervention by the health teams in the disaster area, N.M. was transferred to a health institution in the region, but due to multiple fractures, she was transferred to a public hospital in Sivas province. After the examinations and tests performed at the hospital, a fracture was detected in the right femur, pelvis and tibia. An operation plan was prepared by orthopedic physicians for N.M. who needed to undergo more than one operation due to multiple fractures. During hospitalization, her vital signs were monitored at frequent intervals and she received many treatments (Table 1., Table 2.). The first operation stabilized the femoral and tibial fracture line, and three weeks later the fracture line in the pelvic ring was stabilized.

Table 1. Vital signs of N.M.

	Temperature	Pulse	Blood Pressure	Respiratory	SpO_2	Pain(NRS)
During hospitalization	36,7 ºC	74/min	110/65 mmHg	17/min	%98	4/10 score
Pre-op (first surgery)	36,4 ºC	86/min	123/72 mmHg	18/min	%98	3/10 score
Post-op (first surgery)	36,0 ºC	68/min	110/60 mmHg	16/min	%98	8/10 score
Pre-op (second surgery)	36,6 ºC	92/min	128/73 mmHg	19/min	%98	3/10 score
Post-op (second surgery)	36,2 ºC	78/min	110/66 mmHg	16/min	%98	7/10 score
Before the first mobilization	36,5 ºC	72/min	115/70 mmHg	18/min	%97	2/10 score
After the first mobilization	36,6 ºC	90/min	120/79 mmHg	21/min	%99	3/10 score

NRS: Numerical Rating Scale

Table 2. Pharmacological treatment of N.M.

Drug	Dose	Route	Explanation
Pulcet 40 mg	1x1	IV	Applied every morning if the patient is hungry
Parol 100 ml	3x1	IV	Applied to provide analgesia during hospitalization
Oksapar 6000 anti-Xa IU/0.6 ml	1x1	SC	Applied to prevent embolism during the immobilization process
Ketavel 25 mg	in case of need	PO	Applied when oral intake is available and when necessary
Eqızolın 1 g	2x1	IV	Pre-op prophylactic antibiotic
Sulbaksit 500 mg	4x1	IV	Applied to reduce the incidence of post-op wound infection
Contramal 100 mg	1x0,5	IV	Applied when pain score>7
Kabiven TPN	1440ml/24h	IV	Applied as continuous IV infusion until 8 hours before the first operation
Potassium chloride 10 ml	1x1	IV	When serum potassium value was <3.5 mmol/L, it was applied
Magnesium Sulphate 10 ml	1x1	IV	When serum magnesium value was <1.8 mg/dL, it was applied
Calcium Gluconate 10 ml	1x1	IV	When serum calcium value was <8 mg/dL, it was applied
Erythrocyte suspension 1 IU	2x1	IV	When Hgb was <7 g/dL, it was applied as a 4-hour infusion

***IV:** Intravenous, **SC:** Subcutaneous, **PO:** Oral, **IU:** Unit*

N.M., who had to remain immobile for bone stabilization, was not mobilized during this process. In-bed exercises were started approximately six weeks after the first surgery and the first mobilization was performed soon after. Mobilization, which started with the help of a walker, was gradually increased with an appropriate physical therapy program. During this period, only her mother and clinic nurses provided support for N.M., who had great problems in self-care. Although there were occasional difficulties in communication with N.M., who did not speak Turkish very well, there was no disruption in care during hospitalization and no complications developed until the time of discharge.

Results

In this study, nursing care of a foreign national patient with multiple fractures who was buried under a cave-in during the earthquakes centered in Kahramanmaraş on February 6, 2023 is presented. In line with the NANDA taxonomy, 29 nursing interventions in the NIC were applied for ten nursing diagnoses determined for the areas of nutrition, excretion and change, activity and rest, coping and stress tolerance, safety/protection and comfort, and it was determined that improvement was achieved in these areas with 25 NOC results.

Intravenous (IV) fluid therapy, initiated in the disaster area as part of initial management, was continued during hospitalization. Electrolyte support (NaCl, KCl, calcium gluconate, $MgSO_4$) and fluid resuscitation were administered based on laboratory findings. Nutritional support was provided through total parenteral nutrition (TPN) for three days. Following NIC interventions targeting TPN management, a two-point improvement was achieved in the NOC outcome for parenteral nutrition. A 1-point increase was also observed in the NOC outcome for 24-hour fluid balance following interventions related to fluid monitoring and management. Electrolyte management and monitoring interventions addressing imbalances in sodium, potassium, calcium, and magnesium levels resulted in a total 8-point improvement across these four NOC indicators (Tables 3.1, 3.2, 3.3).

Due to the patient undergoing two major surgical procedures, opioid analgesics were administered in conjunction with non-pharmacological pain management strategies. The total NOC score for indicators related to pain—such as pain level, restlessness, and vocal expressions of discomfort—increased from five at baseline to 15 after interventions (Table 3.4). Constipation, a common adverse effect of opioid therapy, was exacerbated by prolonged immobility. This issue was effectively addressed through laxative use and short-term opioid therapy guided by NIC interventions targeting bowel and constipation management. As a result, the NOC score for constipation increased from two to five (Table 3.5).

An external fixator was applied to ensure fracture site stability. In addition to limited mobility from the fracture itself, pain and discomfort related to the fixator

necessitated immobilization/traction care, leading to an extended immobilization period. This posed a risk for pressure injuries. Preventive NIC interventions for pressure ulcer management were implemented throughout the six-week immobilization period, resulting in a two-point improvement in the NOC outcome for skin integrity, from three to five. Notably, no pressure-related tissue damage was observed (Tables 3.6, 3.7).

The prolonged hospitalization due to the complexity of treatment limited the patient's ability to perform activities of daily living, reduced self-care capacity, and increased stress levels. Additionally, communication challenges related to the patient's foreign national status further compounded her distress. Comprehensive NIC interventions aimed at enhancing coping mechanisms and supporting self-care were implemented throughout the hospital stay. Improvements in relevant NOC outcomes were observed. Six NOC indicators related to self-care activities—including nutrition, dressing, elimination, bathing, hygiene, and ambulation—showed an increase in total score from 12 to 29, reflecting an average three-point improvement per indicator (Tables 3.8, 3.9, 3.10).

Table 3.1. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Risk of Nutritional Imbalance: Less Than Body Requirement (00002)		
Diagnostic Domain	2. Nutrition	**Diagnostic Class**	1. Eating
Descriptive Characteristics	Inability to oral feed, prolonged fasting, trauma.		
Intervention Name-NIC Code	Total parenteral nutrition (TPN) administration (1200)		
Intervention Domain	1. Physiological: Basic	**Intervention Class**	D. Nutrition Support
Activities			
Upon acceptance of admission, a peripheral intravenous catheter suitable for TPN was placed.			
Attention was paid to the osmolarity of TPN solutions administered peripherally to be less than 900 mOsm/L.			
Infiltration, infection and metabolic complications were observed.			
Sterile technique was maintained during the preparation and application of TPN.			
The use of the catheter for purposes other than TPN was avoided.			
TPN solution was applied with an infusion pump at a constant flow rate for 72 hours.			
Intake and output monitoring was performed.			
Serum albumin, total protein, electrolyte, glucose levels, lipid and chemistry profile were monitored.			
Urine glucose was monitored for glycosuria, acetone and protein.			
Universal precautions were followed during the application process.			
Expected Patient Outcome	Nutritional requirements will be met parenterally.		
NOC Results	Food and Fluid Intake (1008)		
Result Domain	2. Physiological Health	**Result Class**	K. Digestion and Nutrition
Parenteral Nutritional Intake (100805)	**1. NOC Score:** 2	**2. NOC Score:** 4	

NOC Score Scale: 1: inadequate, 2: somewhat adequate, 3: moderately adequate, 4: very adequate, 5: completely adequate

Table 3.2. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Risk of Fluid Volume Imbalance (00025)		
Diagnostic Domain	2. Nutrition	**Diagnostic Class**	5. Hydration
Descriptive Characteristics	Trauma, lack of fluids for a long time, Hb 9,1 g/dL.		
Intervention Name-NIC Code	Fluid Monitoring (4130), Fluid Management (4120)		
Intervention Domain	2: Physiological: Complex	**Intervention Class**	N. Tissue Perfusion Management
Activities			
Potential risk factors for fluid imbalance were identified.			
Daily intake and output were recorded.			
A Foley catheter was inserted upon admission.			
Symptoms of dehydration or fluid volume imbalance were monitored.			
Vital signs were monitored daily.			
Serum and urine electrolyte levels were monitored.			
Clinical signs and laboratory findings of fluid overload/retention were observed.			
Prescribed IV fluid therapy was administered over a 24-hour period.			
When serum sodium levels dropped below 130 mEq/L, free water intake was restricted.			
The amount and type of total fluid intake, as well as elimination patterns, were documented.			
Expected Patient Outcome	Hypo/hypervolemia will not develop, intake-output balance will be achieved..		
NOC Results	Fluid Balance (0601)		
Result Domain	2. Physiological Health	**Result Class**	G. Liquid-Electrolyte
24 Hourly Intake-Output Balance (060107)	**1. NOC Score:** 3	**2. NOC Score:** 4	

NOC Score Scale: 1: severe, 2: serious, 3: moderate, 4: mild, 5: no danger

Table 3.3. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Risk of Electrolyte Imbalance (00195)		
Diagnostic Domain	2. Nutrition	**Diagnostic Class**	5. Hydration
Descriptive Characteristics	Na: 128 mEq/L, K: 3.3 mEq/L, Ca: 8.2 mg/dL, Mg: 1.7 mEq/L, muscle weakness, nausea, constipation.		
Intervention Name-NIC Code	Electrolyte management (2000) Electrolyte management: Hypercalcemia (2001); Hypocalcemia (2006); Hyperkalemia (2002); Hypokalemia (2007); Hypermagnesemia (2003); Hypomagnesemia (2008); Hypernatremia (2004); Hyponatremia (2009) Electrolyte monitoring (2020)		
Intervention Domain	2: Physiological: Complex	**Intervention Class**	G. Electrolyte and Acid-Base Management
Activities			
Abnormal serum electrolyte levels were monitored. Risks and clinical signs of electrolyte imbalances were observed. Intake and output monitoring was performed. Adverse effects of electrolytes included in the treatment plan were monitored. Renal function was monitored (e.g., BUN and creatinine levels). Clinical signs of hypercalcemia were monitored (e.g., excessive urination, thirst, muscle weakness, loss of appetite, abdominal cramps). Clinical signs of hypocalcemia were monitored (e.g., tingling in fingertips, muscle spasms in extremities, anxiety, nausea, constipation). Clinical signs of hyperkalemia were monitored (e.g., muscle weakness, hyporeflexia, and nausea). Clinical signs of hypokalemia were monitored (e.g., muscle weakness, confusion, tachycardia, polyuria, nausea, constipation, abdominal distension). Clinical signs of hypermagnesemia were monitored (e.g., hypotension, lethargy). Clinical signs of hypomagnesemia were monitored (e.g., insomnia, auditory and visual hallucinations, agitation, fatigue, muscle twitching, foot or leg cramps, paresthesias, nausea, vomiting). Clinical signs of hypernatremia were monitored (e.g., restlessness, irritability, fatigue, disorientation, hallucinations, peripheral and pulmonary edema, tachycardia). Clinical signs of hyponatremia were monitored (e.g., lethargy, headache, anxiety, fatigue, muscle weakness, cramps, cold and clammy skin, hypovolemia, nausea). Acid-base imbalances related to electrolytes were monitored. Fluid loss and associated electrolyte depletion were monitored. The planned treatment was implemented and documented.			
Expected Patient Outcome	Electrolyte levels will not deviate from normal, and acidosis/alkalosis will not develop in N.M.		
NOC Results	Electrolyte and Acid-Base Balance (0600)		
Result Domain	2. Physiological Health	**Result Class**	G. Liquid-Electrolyte
Serum Sodium Level (060005)		**1. NOC Score:** 3	**2. NOC Score:** 5
Serum Potassium Level (060006)		**1. NOC Score:** 3	**2. NOC Score:** 5
Serum Calcium Level (060008)		**1. NOC Score:** 3	**2. NOC Score:** 5
Serum Magnesium Level (060009)		**1. NOC Score:** 3	**2. NOC Score:** 5

NOC Score Scale: 1: severe, 2: serious, 3: moderate, 4: mild, 5: no deviation from normal

Table 3.4. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Pain (00132)		
Diagnostic Domain	12. Comfort	**Diagnostic Class**	1. Physical Comfort
Descriptive Characteristics	NRS: 7 points, facial expression, groaning and crying.		
Intervention Name-NIC Code	Pain Management: Acute (1410) Analgesic Administration (2210)		
Intervention Domain	1. Physiological: Basic	**Intervention Class**	E. Improving Physical Comfort
Activities			
A comprehensive pain assessment was performed including the location, onset, duration, frequency of the pain; factors that relieve and increase the pain (pain in the lower extremity that is constantly felt and is assessed between 4-7 points during the day, increasing with minimal movement). The intensity of pain was determined during the activity (e.g. ambulation, transfer to a chair). The patient's knowledge and beliefs about pain (cultural influences, etc.) were determined. Pain was assessed with a valid and reliable rating tool appropriate for age and communication ability (NRS is used in the clinic). Non-verbal signs of discomfort were observed. Analgesic was administered before the activities that caused pain. Sedation and respiratory status were monitored before and after opioid administration. The interventions applied were recorded and the pain was re-evaluated.			
Expected Patient Outcome	No pain-related groaning, crying or restlessness will be observed, NRS pain score will be <7, N.M. will not report pain.		
NOC Results	Pain Level (2102)		
Result Domain	5. Perceived Health	**Result Class**	V. Status of Symptoms
Reported Pain (210201)		**1. NOC Score:** 1	**2. NOC Score:** 5
Groaning and Crying (210217)		**1. NOC Score:** 2	**2. NOC Score:** 5
Restlessness (210208)		**1. NOC Score:** 2	**2. NOC Score:** 5

NOC Score Scale: 1: severe, 2: serious, 3: moderate, 4: mild, 5: none

Table 3.5. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Constipation (00011)		
Diagnostic Domain	3. Excretion and Exchange	**Diagnostic Class**	2. Gastrointestinal Function
Descriptive Characteristics	Inability to defecate (4 days), tenderness and tension in the abdomen.		
Intervention Name-NIC Code	Bowel Management (0430) Constipation/Fecal Impaction Management (0450)		
Intervention Domain	2: Physiological: Complex	**Intervention Class**	B. Elimination Management
Activities			
Signs and symptoms of constipation were monitored. Bowel sounds were listened to. Factors that may cause or contribute to constipation, such as medications, bed rest, and diet, were determined. Laxative treatment was administered. Weight was taken at regular intervals.			
Expected Patient Outcome	N.M. will defecate, constipation will not develop.		
NOC Results	Bowel Evacuation (0501)		
Result Domain	2. Physiological Health	**Result Class**	F. Excretion
Constipation (050110)	**1. NOC Score:** 2		**2. NOC Score:** 5

NOC Score Scale: 1: severe, 2: serious, 3: moderate, 4: mild, 5: none

Table 3.6. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Impairment of Physical Mobility (00085)		
Diagnostic Domain	4. Activity/Rest	**Diagnostic Class**	2. Activity/Exercise
Descriptive Characteristics	Trauma, immobilization.		
Intervention Name-NIC Code	Traction/immobilization care (0940)		
Intervention Domain	1. Physiological: Basic	**Intervention Class**	C. Immobility Management
Activities	The immobilization fixator was positioned at the appropriate body level. The fixator was supported during bed ambulation. The fixator entry sites were cleaned using appropriate dressing materials. The disrupted tissue integrity was observed for infection, allergy, etc. Circulation, movement, and sensation of the extremity were monitored. Immobilization complications were monitored (e.g. deep vein thrombosis, chest infection, muscle loss, foot drop).		
Expected Patient Outcome	N.M. will perform traction care effectively and bone integrity will be ensured.		
NOC Results	Mobility (0208)		
Result Domain	2. Functional Health	**Result Class**	C. Mobility
Bone Integrity of Lower Extremity (020815)		**1. NOC Score:** 2	**2. NOC Score:** 5

NOC Score Scale: 1: bone integrity is severely compromised, 2: bone integrity is seriously compromised, 3: bone integrity is moderately compromised, 4: bone integrity is mildly compromised, 5: bone integrity is not compromised

Table 3.7. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Risk of Perioperative Positional Injury (00087)		
Diagnostic Domain	11. Safety/Protection	**Diagnostic Class**	2. Physical Injury
Descriptive Characteristics	Prolonged bed rest, major surgery and trauma.		
Intervention Name-NIC Code	Prevention of Pressure Ulcer (3540)		
Intervention Domain	2: Physiological: Complex	**Intervention Class**	L. Skin/Wound Management
Activities	Risk factors were determined using the Braden scale (a valid and reliable scale used in the clinic). Daily tissue integrity was observed and recorded since hospitalization. Tissue moisture was kept at an optimal level by using a moisture absorbing pad to eliminate sweating caused by sweating, wound drainage, stool or urinary incontinence. In-bed positioning was provided every two hours until mobilization (first 6 weeks). Bone prominences and pressure areas were observed during repositioning. Positioning was provided with pillows to elevate pressure points in the bed. Bed linens were ensured to be clean, dry and wrinkle-free. An air mattress was used. A diet program supporting protein, B and C vitamins, iron and calorie intake was created in cooperation with a dietician.		
Expected Patient Outcome	Tissue integrity will be maintained and pressure ulcers will not develop.		
NOC Results	Skin and Mucous Membranes (1101)		
Result Domain	2. Physiological Health	**Result Class**	L. Tissue Integrity
Skin Integrity (110113)		**1. NOC Score:** 3	**2. NOC Score:** 5

NOC Score Scale: 1: severely damaged, 2: severely damaged, 3: moderately damaged, 4: mildly damaged, 5: skin integrity complete

Table 3.8. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Lack of Self-Care: Bathing (00108); Dressing (00109); Feeding (00102); Elimination (00110)		
Diagnostic Domain	4. Activity/Rest	**Diagnostic Class**	5. Self-care
Descriptive Characteristics	Need for assistance in performing self-care activities, limited mobilization.		
Intervention Name-NIC Code	Self-care assistance (1800) Self-care assistance: Bathing/hygiene (1801); Dressing/grooming (1802); Feeding (1803); Toileting (1804); Transfer (1806)		
Intervention Domain	1. Physiological: Basic	**Intervention Class**	F. Self-Care Relief
Activities			
Self-care activities were planned according to the patient's culture and age. The need for assistance with personal hygiene, dressing, mobility, toileting, and eating was assessed. Necessary personal items were provided (pajamas, socks, toothbrush, comb, shampoo, etc.). Assistance was provided until the patient fully assumed responsibility for self-care (as of the 6th week). A routine was established for self-care activities. Bathing was performed using the necessary materials to meet hygiene needs. Tooth brushing was appropriately facilitated. Nail hygiene was maintained. Skin integrity was monitored. Hair was appropriately combed. The patient was dressed in laundered (laundry-provided) and clean clothes. Efforts to dress independently were progressively encouraged. The diet was adjusted in accordance with the start of enteral nutrition. An appropriate position was provided to facilitate chewing and swallowing. Oral hygiene was maintained before and after meals. Clothing was removed for elimination, and hygiene was ensured afterward. An exercise program was developed in coordination with a physiotherapist (starting from the 6th week). The patient was gradually supported in transferring from bed to chair or armchair. Support was provided in the use of crutches, wheelchair, and walker. The patient was encouraged and supported while performing independent transfers. Implemented practices and progress were documented. Privacy was maintained during self-care support activities.			
Expected Patient Outcome	N.M. will perform daily living activities and will not need support in performing self-care.		
NOC Results	Activities of Daily Living-Self-Care (0300)		
Result Domain	2. Functional Health	**Result Class**	D. Self care
Feeding (030001)		**1. NOC Score:** 2	**2. NOC Score:** 4
Dressing (030002)		**1. NOC Score:** 2	**2. NOC Score:** 5
Emptying (030003)		**1. NOC Score:** 2	**2. NOC Score:** 5
Bathing (030004)		**1. NOC Score:** 2	**2. NOC Score:** 5
Hygiene (030006)		**1. NOC Score:** 2	**2. NOC Score:** 5
Walking (030008)		**1. NOC Score:** 2	**2. NOC Score:** 5

NOC Score Scale: 1: severely endangered, 2: severely endangered, 3: moderately endangered, 4: slightly endangered, 5: no endangerment

Table 3.9. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Anxiety (00146)		
Diagnostic Domain	9. Coping/Stress Tolerance	**Diagnostic Class**	2. Coping Responses
Descriptive Characteristics	Crying, anger, silence at certain times.		
Intervention Name-NIC Code	Anxiety reduction (5820)		
Intervention Domain	3. Behavioral	**Intervention Class**	T. Supporting psychological comfort
Activities			
A calm and reassuring approach was adopted.			
A sense of trust and safety was established.			
The patient was accompanied to enhance safety and reduce fear.			
The presence of a family member (mother) with the patient was ensured.			
The patient was encouraged to verbally express their emotions, perceptions, and fears.			
The period when the level of anxiety changed (from the 4th week onward) was identified.			
Activities aimed at reducing tension were provided.			
Support was given to help identify situations that trigger anxiety.			
The patient was supported in the use of appropriate defense mechanisms.			
Training was provided on the use of relaxation techniques.			
Verbal and non-verbal signs of anxiety were assessed.			
Expected Patient Outcome	N.M. will be able to tolerate anxiety-provoking factors and demonstrate effective coping behavior.		
NOC Results	Anxiety Level (1211), Fear Level (1210)		
Result Domain	2. Psychological Health	**Result Class**	M. Psychological Well-being
Restlessness (121101)	**1. NOC Score:** 3	**2. NOC Score:** 5	
Exaggerated anxiety about life events (121013)	**1. NOC Score:** 2	**2. NOC Score:** 5	
Crying (121032)	**1. NOC Score:** 2	**2. NOC Score:** 4	
Fear (121033)	**1. NOC Score:** 2	**2. NOC Score:** 4	

NOC Score Scale: 1: severe, 2: serious, 3: moderate, 4: mild, 5: none

Table 3.10. Care plan prepared according to NNN taxonomy

Nursing Diagnosis-NANDA Code	Readiness to Strengthen Endurance (00212)		
Diagnostic Domain	9. Coping/Stress Tolerance	**Diagnostic Class**	2. Coping Responses
Descriptive Characteristics	Silence, crying, not wanting to remember the trauma and not wanting to talk.		
Intervention Name-NIC Code	Emotional support (5270) Strengthening Coping (5230) Strengthening Support System (5440)		
Intervention Domain	3. Behavioral	**Intervention Class**	R. Coping therapy
Activities			
Emotional experiences were discussed with the patient.			
The current status of the family and support network were assessed.			
The adequacy of existing social relationships was assessed.			
Differences in body image were addressed realistically.			
Communication was established with supportive or empathic expressions.			
Help was provided to recognize and express feelings such as anxiety, anger, or sadness.			
Encouragement was provided to talk to reduce emotional reactions.			
A sense of security was provided by being present during periods of anxiety.			
Expected Patient Outcome	N.M.'s reaction to the trauma she has experienced will not be exaggerated; she will display effective coping behavior and will be in harmony with her environment.		
NOC Results	Personal Resilience (1309), Psychosocial Adaptation-Life Change (1305)		
Result Domain	3. Psychosocial Health	**Result Class**	N.Psychosocial Adaptation
Expressing Emotions (130903)	**1. NOC Score:** 2	**2. NOC Score:** 4	
Expressing Empowerment (130507)	**1. NOC Score:** 1	**2. NOC Score:** 4	
Feeling Comfortable in Physical Environment (130525)	**1. NOC Score:** 2	**2. NOC Score:** 4	

NOC Score Scale: 1: Never observed, 2: Rarely observed, 3: Sometimes observed, 4: Often observed, 5: Always observed

Discussion

Unexpected deaths and injuries caused by natural disasters such as earthquakes negatively affect the health of individuals physically, socially and mentally. The onset of stress response and the development of crush syndrome in the later stages is a devastating situation for metabolism. For this reason, IV fluid support is initiated at the first encounter with the earthquake victim in order to maintain volume and prevent worsening of the cilinical picture (Abu-Zidan et al., 2024; Ozpulat et al., 2023). Metabolic balance was achieved with early fluid and electrolyte support applied to the patient in the study; nutritional status supported by TPN resulted in clinical improvement.

Multiple fractures, an inevitable effect of earthquakes, have a negative impact on physical health. Postoperative complaints of patients with multiple fractures are generally due to severe pain (Ilce, 2021) Therefore, providing analgesia at the right time is an important approach to alleviate the level of pain experienced. Due to the high postoperative pain level of N.M. who underwent two major surgical interventions, opioids were included in her treatment and at the same time pain control was realized with non-pharmacologic approaches. In addition, drug-related adverse effects should be monitored in patients receiving opioids (Yıldırım & Can, 2019) Constipation and respiratory depression are among the common and undesirable effects of opioids (Ilce, 2021). The slowed intestinal peristalsis of N.M. due to prolonged bed rest contributed negatively to the development of constipation with the use of opioids. After four days of inability to defecate, this situation was managed effectively with the use of laxatives and short-term use of opioids under the guidance of NIC interventions targeting bowel management and constipation management.

In order for healing to occur in the reduced bone fragments, the stability of the fracture site must be maintained and immobilized. This stability is achieved with internal or external fixators (Ilce, 2021; Unal, 2023). External fixator was also used in N.M. (Table 3.6). In addition to the immobilization caused by the fracture, movement limitation and pain due to the fixator necessitated postoperative immobilization/traction care of N.M., and the duration of immobilization increased accordingly (Unal, 2023). This situation brings the risk of perioperative positional pressure injury (Sahın & Basak, 2020). NIC interventions for pressure injury prevention were implemented throughout the six-week immobilization period, resulting in a two-point improvement in the NOC skin integrity score and the absence of any pressure-related tissue damage.

The complexity of the treatment process in cases of multiple fractures prolongs the duration of hospitalization. This situation restricts activities of daily living, reduces the ability to perform self-care, and leads to increased stress levels. Therefore, in procedures requiring long-term hospitalization, coping mechanisms should be learned, and interventions aimed at strengthening them should be planned in order to support patients in maintaining their self-care (Ilce, 2021). In addition to N.M.'s prolonged hospitalization, her status as a foreign national posed communication challenges. Experiencing a major trauma such as an earthquake, being immobilized, having difficulty performing self-care, and being unable to communicate with her siblings who were receiving treatment in external centers all contributed to elevated stress levels. Considering the negative effects of stress on the body, interventions were planned and implemented throughout the hospitalization period to help N.M. develop effective coping strategies and to strengthen her support systems. Improvements in relevant NOC scores were observed following these interventions. s a result, the planned interventions addressing the various underlying issues effectively met N.M.'s needs and brought her stress level to a manageable range.

Conclusion

In conclusion, natural disasters such as earthquakes have a multidimensional and devastating impact on many individuals. The well-being of individuals affected by earthquakes can only be maintained through both physiological integrity and psychological support. In the case of our patient—an adolescent and a migrant who sustained multiple fractures after being trapped under rubble, underwent two major surgeries, and relied solely on her mother for social support—a scientifically grounded and systematic nursing care approach was essential. Accordingly, nursing diagnoses were formulated based on the NANDA taxonomy, nursing interventions were determined according to the NIC classification, and outcomes were evaluated using the NOC system. These structured interventions, implemented throughout the hospitalization period, were found to effectively meet the patient's needs and demonstrated the efficacy of the care provided. In this context, it is recommended that care for individuals with multiple fractures, those affected by earthquakes or who are migrants, be guided by the NANDA, NIC, and NOC classification systems.

Declarations

Acknowledgments

We would like to thank the patient's relative who granted permission for the case presentation.

Conflict of Interest

The authors declare that there is no conflict of interest regarding this study.

Ethics Statement

Not Applicable

Informed Consent

Written informed consent was obtained from the participant(s) of this study.

Author Contributions

A detailed description of each author's role in the study was provided using the CRediT taxonomy and an author contribution form was completed.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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CASE REPORT

Nursing Care of a Patient with Total Abdominal Hysterectomy + Bileteral Salfingooferectomy (TAH+BSO) According to Gordon's Functional Health Patterns Case Report

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ABSTRACT

Menopause is an important life stage in which women experience physical and psychological changes. Menopause can occur spontaneously in the natural process or surgically. In this process, nurses have important roles in the treatment, care and follow-up of women. The use of models and theories is very important to increase the effectiveness of care and treatment. In this study, a patient who applied to a state hospital and underwent TAH+BSO surgery was followed up for four days in the postoperative period. A care process was created for the patient within the scope of the Gordon Functional Health Patterns Model, and 11 functional care needs were determined. These patterns are health perception-health management pattern, nutritional-metabolic pattern, elimination pattern, activity-exercise pattern, sleep-rest pattern, cognitive perceptual pattern, self-perception-self-concept pattern, role-relationship pattern, sexuality-reproductive pattern, coping-stress tolerance pattern, and belief- value pattern. Within the scope of patterns, nursing diagnoses of pain, fall risk, nausea and vomiting, activity intolerance, fatigue, deterioration in roles and relationships, death anxiety, ineffective coping with stress, deterioration in sexual pattern were made. Verbal and written consent was obtained from the patient for the case report. With this study, it was concluded that Gordon functional health patterns model was useful in the care given to the patient. In this sense, the use of the model in patient care in the fields of gynaecology and oncology will be beneficial in increasing the effectiveness of the nursing care provided.

Introduction

Menopause is a natural process experienced by women and is defined as the absence of menstruation for at least 12 months as a result of irreversible loss of ovarian function (Polat & Geçici, 2021). Surgical menopause is the removal of the ovaries (oophorectomy) as a result of external intervention. This process causes a rapid cessation of androgen production, resulting in sudden and uncontrolled menopausal symptoms (Comparetto & Borruto, 2023). Even natural menopause is a process in which women may experience some problems due to some changes in their lives, but especially menopause that develops unexpectedly can be more severe for women (Córdoba Iñesta et al., 2023).

Oophorectomy is the surgical removal of the ovaries and indications for surgery include ovarian cyst, ovarian torsitoneum and ovarian cancer. Ovarian cancer is the most lethal gynaecological cancer. In 2022, it ranks 18th in all cancers in both sexes and 14th in mortality rate (GLOBAL, 2024). Ovarian cancer is the most lethal cancer among gynaecological cancers and it is predicted that the

number of cases will increase further until 2040 (GLOBAL, 2024). The high mortality rate in ovarian cancer can be explained by the fact that it is asymptomatic and diagnosed at an advanced stage (Duman et al., 2023).

In his 1987 study on nursing diagnoses, Gordon created a theory called 'Functional Health Patterns (FHP)' to collect detailed data for nurses and to organise the data (Günay et al., 2021). According to the theory, the FHP nursing process is defined as the sequence of behaviours in a certain period of time. These patterns analyse human health and life process in 11 interrelated sections. These sections are;

1. Health perception and health management pattern,
2. Nutrition and metabolic pattern,
3. Elimination pattern,
4. Activity and exercise pattern,
5. Sleep and rest pattern,
6. Cognitive and perception pattern,
7. Self-perception and self-concept pattern,
8. Role and relationship pattern,
9. Coping and stress tolerance,
10. Sexuality and reproduction pattern,
11. Beliefs and values pattern (Zanotti & Chiffi, 2015; Karadağ et al., 2017).

Gordon facilitates data collection by systematically analysing individual needs in these 11 functional areas and provides a holistic approach for nursing care. The theory is useful in terms of creating an individualised and holistic nursing care process in the field of women's health (Erbaş & Demirel, 2016). As a result of the case studies of Aksu et al. on urinary incontinence and pelvic organ prolapse, it was found that the model is an effective and useful model because it allows the patient to be evaluated physically, cognitively and socially, offers a holistic nursing approach and standardises care (Aksu et al., 2021). Karpuz et al. concluded that the model could provide guidance in planning nursing care, education and counselling services in their case studies with pelvic relaxation diagnosis (Karpuz et al., 2023).

In this study, a patient who applied to a state hospital and underwent TAH+BSO surgery was followed up for 4 days postoperatively. A care process was created for the patient within the scope of Gordon Functional Health Patterns.

Case Report

Introductory information

- Mrs. Z. 36 years old, married, civil servant.
- She has no smoking and alcohol habits.
- She has no chronic disease and has never undergone a surgical operation.
- Her family history includes breast cancer in her aunt.
- Her obstetric history includes 2 pregnancies, 1 normal delivery, 1 abortion.
- Mensturation history includes irregular and painful menstruation and intermittent bleeding (before diagnosis).

History

Approximately 5 months ago, the patient presented to the gynaecology emergency department with complaints of exacerbated abdominal pain and USG (Ultrasonography) and laboratory tests (Urine+Complete Blood Count + Biochemistry) were performed. USG evaluation revealed left ovarian enlargement and outpatient clinic was recommended for further evaluation. Detailed USG evaluation and CA markers were analysed in the outpatient clinic examination. MRI (Magnetic Resonance Imaging), CT (Computed Tomography) and PET (Positron Emission Tomography) scan were performed for definitive diagnosis due to elevated CA-125 (Canser Antigen-125) value and confirmation of left ovarian enlargement on USG. The patient was diagnosed with ovarian cancer (Stage 1). After 4 cycles of chemotherapy, TAH+BSO was applied and postoperative follow-up was performed in the gynaecology oncology service.

Laboratory values

Haemoglobin: 9.3 g/dl, Platelet: 210000/mm3, Cell Reactive Protein: 5.8 mg/dl, Urea: 336 mg/dl, Creatinine: 0.71 mg/dl, Phosphorus: 3.36 mg/dl. Cancer Antigen 125 (CA-125) value was 61 U/mL at the time of diagnosis and 16 U/mL at the last test.

Treatment

2*1 Desefin (IV), 3*1 Metrosel (IV), 2*1 Dolantin (IM, LH), 2*1 Ondansetron (IV), 3*1 Metoclopramide (IV), 1*1 Pantoprozole (IV), 3*1 Diclomec (IM), 1*5mg Diazepam (IM, LH), 1000 ml Serum Physiological, 1000 ml Ringer's Lactate, 1000 ml 5% Dextrose.

Vital values

The vital signs of the patient were closely monitored for the first 6 hours in the postoperative period. The first hour was monitored every 15 minutes, the next two hours every half hour, and then hourly until the sixth hour. After close follow-up, vital signs were monitored 8*1. During the follow-up period, there was no deviation in the patient's vital signs that would require intervention. The patient's vital values are as follows; Blood Pressure: 110-60/100-60 mmHg, Pulse: 70-75/min, Respiration: 20-22/min, Temperature: 36-36.2 oC, SPO2: 95-97 %.

Incision Care

The incision site remained closed for 24 hours after the operation. During the hospitalisation, the dressing was maintained daily with 1*1 Povidone iodine solution and changed by covering with a dry and gauze. Signs and symptoms of infection at the incision site (redness, swelling, temperature increase, discharge, etc.) were observed during dressing change. No signs and symptoms of infection were observed at the incision site.

Infection Prevention

In the nursing care provided to the patient, the healthcare personnel performed nursing interventions

using disposable gloves after providing hand hygiene with hygienic hand washing techniques. Care was provided by using sterile gloves for dressing the incision site of the patient. Antibiotic treatment including 2*1 Ceftriaxone (IV) and 3*1 Metronidazole (IV) was administered to the patient for three days in the postoperative period. At the same time, the patient was informed about the recognition of infection symptoms and prevention methods.

Evaluation of the Patient According to Gordon's Functional Health Patterns Model

Health Perception and Management Pattern

Mrs. Z. stated that she did not feel well and had a lot of pain and her VAS (Visual Analogue Scale) score was determined as 10. The patient described her pain as burning and stinging pain in the abdomen, which increased with position and continued at frequent intervals. Mrs. Z. stated that she had difficulty walking due to her pain and felt very tired. Mrs. Z. has sufficient knowledge about the disease and treatment process and is aware of the process. The postoperative Itaki fall risk score was 11.

Nutrition and Metabolic Pattern

The patient had nausea and vomiting in the postoperative period. The patient stated that her appetite decreased and she lost weight in general due to the process (the patient's weight before diagnosis was 70-72 kg and her current weight was 59 kg). The patient's oral food intake was closed until 6 hours postoperatively. With the onset of bowel movements, oral food intake started as Regimen 1 after the 6th hour. Afterwards, oral intake continued as regimen 2 and regimen 3 and was followed up. The patient stated that she regularly cared for her mouth and teeth and there were no wounds in her mouth. The patient reported daily fluid intake as 2-2.5 liters.

Elimination Pattern

The patient's bowel sounds are 6/minute. The patient's normal bowel habit is once a day. Urinary frequency is five to six times a day. The patient had gas+ on the 1st postoperative day.

Activity and Exercise Pattern

Vital signs were stable and the patient was mobilised at the 6th postoperative hour. During walking, the patient stated that she had a lot of pain and felt tired in general. The patient stated that she did not want to move too much because of the pain due to the incision site in the abdomen. The patient rated her fatigue as 7 out of 10.

Sleep and Rest Pattern

The patient stated that h er pain decreased with the treatment and care provided for her pain in the postoperative period and that she slept well and felt rested because she was tired.

Cognitive and Perception Pattern

The patient is conscious. The patient is orientated in time and place. There is no hearing and vision loss.

Self-Perception-Self-Concept Pattern

The patient has clearly stated her feelings and thoughts. She is open to communication. The patient is semi-dependent in activities of daily living on postoperative day 1 and independent on the other days. Her knowledge about her disease is adequate.

Role and Relationship Pattern

The patient who stated that she lived with her nuclear family stated that she could not fulfil her responsibilities related to the disease process in the roles of parent and spouse sufficiently. She stated that her husband provided financial and moral support. She stated that her close environment was very supportive during her treatment and that they helped her with her responsibilities. The patient stated that she wanted to recover more to fulfil her responsibilities towards her child.

Coping and Stress Tolerance

The patient stated that he was informed about the effect of stress on her disease and therefore she tried to stay away from stress. She stated that her family also attached importance to this issue. The patient stated that she occasionally experienced stress due to the diagnosis and treatment process, and in such cases, spending time with her child and turning to spirituality made her feel comfortable. However, in the postoperative follow-up, the patient stated that there was a distress that she could not cope with and that she could not get rid of the thought of what would happen to her child if she died.

Sexuality and Reproduction Pattern

The patient stated that her sexual life was disrupted during the treatment and surgery process and that this situation made her feel guilty towards her husband. The patient also expressed that she was worried that her sexuality would worsen due to surgical menopause.

Beliefs and Values Pattern

Mrs. Z. stated that her spirituality increased during her illness and she spent more time for prayer and worship. In the postoperative period, the patient was frequently observed to pray the rosary (Table 1.1 and Table 1.2).

Table 1.1. Nursing diagnoses and interventions of the patient with TAH+BSO surgery

Functional Health Pattern	Nursing Diagnosis	Nursing Outcomes Classification (NOC)	Nursing Interventions (NIC)	Assessment Results
Health perception and management	Acute Pain (Nanda International, 2018).	The patient expresses that the pain is relieved, the VAS score decreases from 10 to 3, and the pain is under control.	Monitoring of vital signs (blood pressure, pulse, respiration, fever). Evaluation of the severity, location, nature, duration, frequency of pain, determination of factors that reduce or increase pain. Use of analgesics - Use of non-pharmacological methods in addition to pharmacological treatment (such as daydreaming, relaxation exercises, hot/cold application, music therapy, acupressure, massage) (Wilkinson & Barcus, 2018; Ackley et al., 2019).	Mrs Z's pain decreased from 10 to 3 and she stated that her pain was relieved
Health perception and management	Fall Risk (Nanda International, 2018).	Reduction of the patient's ITAKI value to 4, Prevention of traumas that may occur in the patient and minimisation of the risk of falling	Assessment of fall risk. Environmental arrangement (lighting of the room, positioning of the furniture was planned to reduce the risk of falling). Not leaving the patient alone in the room and informing the caregivers about this issue. Informing the patient and her relatives about the risk of falling and interventions for this. Creating soft areas around the patient's bed with supports such as pillows and blankets to prevent falling. Taking support in daily life activities.	The patient's Itaki Fall Risk Scale was evaluated as 6 points. It was said that the patient got out of bed and walked with slow steps. The risk of falling continues.
Nutrition and Metabolic Status	Nausea-Vomiting (Nanda International, 2018).	Reducing the patient's nausea and vomiting, ensuring the patient's balanced and adequate nutrition.	Determination of factors that may cause nausea and vomiting. Ventilation of the room where the food is eaten and removal of bad odours. Explaining the importance of fluid intake in order to replace the fluids lost due to vomiting. Suggesting the patient to consume her meals little by little and at frequent intervals. Monitoring her intake. Daily food intake and weight follow-up, and administration of antiemetic medication depending on the physician's request. Training the patient to ensure oral hygiene before and after meals.	It was observed that the patient did not lose weight as a result of the nursing interventions. The patient stated that her nausea and vomiting decreased.
Activity and Exercise Pattern	Fatigue (Nanda International, 2018).	Determining the factors that increase or decrease the patient's fatigue, decreasing the fatigue level from 7 out of 10 to 4, expressing that the fatigue has decreased.	Determination of factors that increase fatigue such as pain and insomnia or decrease fatigue such as rest. Assessment of the patient's level of fatigue together with sleep and diet. Encouraging the patient to drink at least 8 glasses of water a day and informing him/her that he/she should not experience dehydration. Evaluation of emotional factors that may cause fatigue. Explaining the importance of social support resources and evaluating the number and quality of resources. Monitoring of vital signs. Recommending exercises that will relax the patient, such as walking or breathing exercises, and providing information (Wilkinson & Barcus, 2018; Ackley et al., 2019).	-It was observed that the patient's fatigue decreased from 7 to 5. The patient stated that he realised the factors causing her fatigue, avoided them and decreased her fatigue by using energy conservation techniques.

Table 1.2. Nursing diagnoses and interventions of the patient with TAH+BSO surgery

Functional Health Pattern	Nursing Diagnosis	Nursing Outcomes Classification (NOC)	Nursing Interventions (NIC)	Assessment Results
Activity and Exercise Pattern	Activity Intolerance (Nanda International, 2018).	Reducing the patient's activity intolerance, providing comfort.	Evaluation of the patient's activity level and rest periods. Assessment of vital signs (blood pressure, respiration, temperature, pulse, oxygen saturation). Identification of factors limiting the patient's activity. Mobilisation of the patient. Assessment of fatigue and pain levels of the patient. Informing the patient about activities that can conserve energy (sitting on a chair while fulfilling needs such as brushing teeth, etc.). Oxygen and analgesic administration according to physician's order.	As a result of the nursing interventions, it was observed that the patient's activity intolerance decreased, the patient's pain decreased with the analgesic given, and accordingly, the patient performed her activities more easily.
Role and Relationship Pattern	Impaired Role and Relationships (Nanda International, 2018).	The patient manages family processes and develops positive relationships within the family.	Encouraging the patient to express her feelings. Ensuring that the patient realises the strengths of her spouse and social support providers by highlighting them. Sharing her discomfort about sharing responsibilities with her spouse and sharing her wishes with her spouse. Increasing the patient's social support. Teaching the mother techniques for coping with stress (such as relaxation, breathing exercises).	The patient stated that she felt relieved to share her feelings with her husband and health personnel, that she and her husband would share their responsibilities and that she felt good.
Coping and Stress Tolerance	Death Anxiety (Nanda International, 2018).	The patient shares her feelings and thoughts, expresses that the fear of death has decreased, knows the methods of coping with stress and applies them in her life.	Sharing the patient's feelings about the fear of death Providing information about methods of coping with stress (exercise, listening to music, massage, daydreaming, showering, etc.). Using therapeutic communication techniques when communicating with the patient. Supporting spiritual practices (praying, praying, etc.) that relax the patient and do not adversely affect physical and mental health. Talking about the patient's life plans for the future and supporting the patient to set goals for the future. Evaluating the patient's social support status, increasing the social support systems by interviewing the family.	The patient stated that he was relieved because he expressed her feelings, but that he occasionally thought about death. The patient continues to have death anxiety.
Coping and Stress Tolerance	Ineffective coping with stress (Nanda International, 2018).	Reducing the factors causing stress in the patient and gaining the ability to cope with the problems experienced	Sharing feelings and thoughts of the patient. Assessment of situations that cause anxiety and interfere with the patient's ability to cope. Supporting the patient to increase their participation in their own treatment and care. Nursing interventions aimed at reducing factors that negatively affect the patient's ability to cope such as fatigue, sleep problems or pain (such as analgesic administration, creating a calm and quiet environment, creating rest periods for the patient) and informing the patient about this. Teaching the patient techniques to cope with stress (breathing exercises, sharing emotions, etc.).	It was observed that the patient relaxed and calmed down. The patient stated that her negative thoughts decreased.
Sexuality and Reproductive Pattern	Disruption in Sexual Pattern (Nanda International, 2018).	The patient expresses satisfaction with her sexual life and develops solutions to the problems he/she experiences.	Encouraging the patient to express their feelings. Determining the factors that negatively affect the patient's sexuality. Informing the patient about the surgical procedure and its effects on sexual life. Answering the patient's questions by eliminating the lack of information. Encouraging the patient to talk to her partner about her concerns about sexuality.	The patient stated that her anxiety about her sexual life decreased, but she continued to worry about the future process.

Conclusion

In the case study, the patient with first stage ovarian cancer received nursing care within the framework of Gordon's Functional Health Patterns Model. According to the 11 functional areas of Gordon's Functional Health Patterns Model, nursing diagnoses of pain, fall risk, nausea-vomiting, inadequate fluid intake, activity intolerance, fatigue, deterioration in roles and relationships, death anxiety and ineffective coping with stress, deterioration in sexual pattern were made and holistic individualised care was provided.

In general, nursing theories provide to add originality to professional practices, to provide evidence-based care and to guide nursing care. Gordon's Functional Health Patterns Theory is one of these theories and as a result of the study, it was concluded that the use of this theory in the care given to the patient will benefit the patient's physical, emotional and social relief. In this respect, the use of Gordon's Functional Health Patterns Theory in patient care in the fields of gynaecology and oncology is recommended in terms of the benefits and contributions to the patient.

Declarations

Acknowledgments

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Conflict of Interest

Authors disclose no potential conflicts of interest

Ethics

The patient and her family were informed about the study and verbal and written informed approval was obtained.

Informed Consent

The patient was informed about the study and informed consent was obtained from the patient

Author Contributions

The contributions of the authors to the study were indicated in the journal form and uploaded to the journal system.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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